UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
777 Sonoma Avenue, Room 325
Santa Rosa, California 95404-4731

April 15, 2022 **Refer to NMFS No:** WCRO-2021-01962

William M. Connor
North Branch Chief Regulatory Division
U.S. Department of the Army
Corps of Engineers, San Francisco District
450 Golden Gate Avenue, 4th Floor
San Francisco, California 94102

Re: Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Sonoma Water Stream Maintenance Program in Sonoma County, California

Dear Mr. Connor:

Thank you for your letter of August 10, 2021, requesting initiation of consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act of 1973 (ESA) (16 U.S.C. 1531 *et seq.).* The Sonoma County Water Agency (SCWA) has applied for a regional general permit from the U.S. Army Corps of Engineers (COE) pursuant to Section 404 of the Clean Water Act of 1972, as amended, 33 U.S.C. § 1344 *et seq*. SCWA is proposing to conduct routine stream maintenance activities as part of their ongoing Stream Maintenance Program (SMP) in Sonoma County, California.

In this biological opinion, we conclude that the proposed action is not likely to jeopardize the continued existence of the federally threatened Central California Coast (CCC) steelhead (*Oncorhynchus mykiss*). We also conclude the proposed action is not likely to result in the destruction or adverse modification of designated critical habitat for CCC steelhead or the federally endangered CCC coho salmon (*O. kisutch*). However, NMFS anticipates that incidental take of CCC steelhead is reasonably certain to occur as a result of the proposed action. Therefore, an incidental take statement with terms and conditions is included with the enclosed biological opinion.

Thank you, also, for your request for consultation pursuant to the essential fish habitat (EFH) provisions in Section 305(b) of the Magnuson–Stevens Fishery Conservation and Management Act [16 U.S.C. 1855(b)] for this action. Based on NMFS' review of the likely effects of the proposed action on EFH, the proposed action will occur within an area identified as EFH managed under the Pacific Coast Salmon Management Plan. The proposed action includes measures to avoid or minimize potential adverse effects to EFH. Thus, no additional EFH conservation recommendations are provided.

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

Sincerely,

Alecia Van Atta
Assistant Regional Administrator
California Coastal Office

Enclosure

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Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion and Magnuson–Stevens

Sonoma County Water Agency Stream Maintenance Program

NMFS Consultation Number: WCRO-2021-01962
Action Agency: U.S. Army Corps of Engineers

Affected Species and NMFS' Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species?	Is Action Likely to Jeopardize the Species?	Is Action Likely to Adversely Affect Critical Habitat?	Is Action Likely to Destroy or Adversely Modify Critical Habitat?
Central California Coast Steelhead	Threatened	Yes	No	Yes	No
Central California Coast Coho Salmon	Endangered	No	No	Yes	No

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

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

Issued By:

Alecia Van Atta
Assistant Regional Administrator
California Coastal Office

Date: April 15, 2022

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1. INTRODUCTION

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

1.1. Background

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

We completed pre-dissemination review of this document using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). The document will be available within 2 weeks at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. A complete record of this consultation is on file at NMFS' North-Central Coast Office in Santa Rosa, California.

1.2. Consultation History

August 10, 2021 – NMFS received an email from the U.S. Army Corps of Engineers (COE), requesting formal Section 7 consultation.

August 12, 2021 – NMFS and COE coordinated via email to transfer consultation documents, including: the January 7, 2021 *Biological Assessment for Anadromous Fish Species, Sonoma Water Stream Maintenance Program* (BA, SCWA 2021), the September 10, 2020 Mitigation Plan Memo, Attachment 2 – Supplementary Information, and copies of all relevant permits.

September 1, 2021 – NMFS emailed COE and the Sonoma County Water Agency (SCWA) with a request for additional information related to project timing, herbicide use, the action area, and project limits for stream disturbance.

September 16, 2021 – SCWA responded to NMFS via email with some initial requested information.

October 1, 2021 – NMFS emailed SCWA with an update on the timeline for internal review on herbicide measures.

October 18, 2021 – NMFS provided draft proposed herbicide measures for SCWA to include in their project description to SCWA via email.

October 28, 2021 – NMFS and SCWA met virtually to discuss pending information needed to initiate consultation. Herbicide measures, limits on vegetation management, and how incidental take will be assessed were agreed upon. Project limits for sediment maintenance and bank repairs still needed from SCWA.

November 18, 2021 – SCWA emailed NMFS with all outstanding requested information and NMFS replied with notification that the Section 7 consultation process was initiated and the due date for a Biological Opinion would be April 2, 2022.

February 8, 2022 – SCWA and NMFS met virtually to discuss reach limits to be included in Appendix A and referenced in the ITS.

March 2, 2022 – SCWA provided final reach limits table to be included in Appendix A.

March 8, 2022 – NMFS provides clarification of the existence of critical habitat for coho salmon within the Action Area.

1.3. Proposed Federal Action

Under the ESA, "action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies (see 50 CFR 402.02). Under the MSA, Federal action means any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken by a Federal Agency (50 CFR 600.910). We considered, under the ESA, whether the proposed action would cause any other activities and determined that it would not.

SCWA has applied to COE to renew their Section 404 Clean Water Act permit for an additional 10 years to cover work in the engineered channels of their SMP. The SMP was developed to define and improve the management and maintenance of approximately 89 miles of engineered flood control channels and reservoirs under SCWA's authority. NMFS previously issued the following biological opinions to cover these activities (NMFS 2008, 2010):

1. 2008. Biological Opinion for Water Supply, Flood Control Operations, and Channel Maintenance conducted by the U.S. Army Corps of Engineers, the Sonoma County Water Agency, and the Mendocino County Russian River Flood Control and Water Conservation Improvement District in the Russian River Watershed.
    - Covers actions in the lower Russian River and tributaries in zones 1A, 4A, 5A, and 6A.
    - Expires in 2023.

2. 2010. Biological Opinion for Sonoma County Water District Stream Maintenance Program in the Petaluma River and Sonoma Creek Watersheds, Sonoma County, California, 10-year Individual Permit.
    - Covers actions in the Petaluma River and Sonoma Creek in zones 2A, and 3A.
    - Expired in 2020 – NMFS approved one-year extensions on April 13, 2020, and again on May 12, 2021.

COE and SCWA are proposing to combine the actions covered under the 2008 and 2010 opinions into the renewed CWA 404 permit. Routine stream maintenance activities would be implemented in accordance with the SCWA's Stream Maintenance Program Manual (SCWA 2020). This opinion will cover engineered stream reaches within Zones 1A, 2A, 3A, 5A, and 6A that are known (or have the potential) to support or provide habitat for CCC steelhead (Figure 1. Tables 1 and 2). SMP reaches within Santa Rosa Creek and the Laguna de Santa Rosa are also considered designated critical habitat for coho salmon. However, these reaches do not currently contain the physical and biological features necessary to support coho salmon and there are no known occurrences of this species in the action area. Since coho salmon do not occur in the action area, there will be no impacts to individuals of this species and effects due to the implementation of SMP activities are not anticipated and will not be addressed further in this opinion. SMP activities occurring in stream reaches classified as modified or natural channels will be consulted on separately and are not considered in this opinion. Over 95 percent of SMP activities are located in the engineered flood control channels of Zones 1A, 2A, and 3A – the Laguna de Santa Rosa, Petaluma River, and Sonoma Creek. The other 5 percent occur in the engineered channels in Zones 5A and 6A.

Table 1. The status of CCC steelhead and their critical habitat designations in stream reaches and sediment basins (by zone) covered under this opinion. See Table B-1 of the BA (SCWA 2021) for a full list of creeks and reaches included in the SMP, many of which are not considered designated critical habitat or do not support CCC steelhead.

Zone/Watershed	Creek	Steelhead Status	Critical Habitat
1A – Laguna de Santa Rosa	Austin Creek	O (M/R)	
	Brush Creek	O (M/R)	
	Copeland Creek	O (M/R)	
	Laguna de Santa Rosa[1]	M	
	Paulin	O (M)	
	Piner Creek	O (M)	
	Santa Rosa Creek[1]	O (M/R)	
	Windsor Creek	O (M/R)	
2A – Petaluma River	Adobe Creek	O (M/R)	Y
	Lichau Creek	O (M)	Y
	Lynch Creek	O (M)	Y
3A - Sonoma Creek	Nathanson Creek	O (M)	Y
	Rodgers Creek	M	Y
5A -Middle Russian, Guerneville	Fife Creek	O (M/R)	Y
6A – Middle Russian, Healdsburg	West Slough	P	

[1] SMP reaches within the Laguna de Santa Rosa and Santa Rosa Creek are also considered designated critical habitat for coho salmon. However, these reaches do not contain the physical and biological features necessary to support coho salmon and there are no known occurrences of this species in the project area.

O - Occurrence known in reach
P - Potential habitat
M - Migration corridor
R - Known or potential rearing habitat

Engineered channels are typically built with a trapezoidal cross-sectional shape. Most have earthen banks and streambeds, but some have hardened banks and beds. SCWA maintains several modified and natural channels that are not included as part of the proposed action and will be consulted on separately as needed. Maps of engineered channels within each zone can be found in Appendix C of the SMP Manual (SCWA 2020). Structures such as access roads, drop inlet culverts, outfalls, flap gates, and road crossing culverts also require routine maintenance. The primary flood control maintenance activities conducted annually (or on an as-needed basis) are: 1) sediment management; 2) bank stabilization; and 3) vegetation management. Other maintenance activities include landscaping, fencing, and debris removal. See Appendix A for the proposed frequency and extent of SMP activities over the 10-year permit period. A maximum of five localized sediment maintenance and bank stabilization projects will occur annually. The combined average length of channel for both intermediate and reach scale sediment maintenance is expected to be approximately 3,500 linear feet, with a 35,000 linear-feet maximum over the 10-year period. No more than 100 feet of contiguous woody vegetation will be removed in any given engineered channel reach.

The SMP is managed as an annual cycle of activities. Stream assessment begins in late winter or early spring, followed by the development of the maintenance workplan. The year’s maintenance projects are further refined, appropriate mitigation is identified, and the relevant regulatory agencies overseeing program permitting are notified in the spring. Projects are then implemented during the summer season, when the channels are at their driest. An annual summary report of the year’s maintenance, mitigation, and monitoring activities is sent to the permitting agencies before the end of the year.

In 2019, SCWA developed a comprehensive SMP Database to assist with monitoring program activities, permitting compliance, and tracking habitat and canopy development. The SMP Database incorporates GIS mapping and aerial photography to accomplish the following: 1) organize the initial stream assessment and inventory; 2) characterize reach conditions; 3) identify maintenance needs, sensitive habitats, weed populations, or other environmental considerations; 4) document maintenance, restoration and mitigation activities; 4) monitor on-going status of mitigation activities; and 5) track all regulatory reporting requirements.

All supporting materials used in developing the SMP, are housed in the SMP program library under the management of the SMP Manager and are available for viewing upon request. Most of the program documents and materials are available for view through the program website at: www.scwa.ca.gov/stream-maintenance-program/.

Figure 1. Map of all zones within the SMP area (modified from SCWA 2021).

Sediment Management

Sediment transport processes within the project area are strongly affected by historic and current land use conditions, urban development, past engineering and alterations to the channel network. As a result of these influences, sediment transport processes and loadings may be augmented or depleted depending upon the reach. In a system already largely impacted through such conditions, additional maintenance is required to manage sediment and ensure the protection of streamside land uses.

Sediment management involves the removal of excess accumulated sediment that reduces flow capacity and increases the potential for flooding. SCWA anticipates removing on average between 20,000 and 25,000 cubic yards of sediment throughout the SMP area each year. A summary of sediment removal volumes for the 2008-2018 maintenance years is presented in Appendix A of the SMP (SCWA 2020). These activities occur annually during the June 15 – October 31 dry season and are managed for the following specific outcomes:

- Adequate flood conveyance capacity.
- Balance between channel aggradation and channel erosion.
- Development and preservation of the desired vegetation condition for the reach.
- Preservation and enhancement of beneficial instream bed forms and habitat features (including large woody debris [LWD]) that support in-channel complexity, diverse cover, and micro habitats to the extent feasible.

The two types of sediment removal projects include: 1) reach scale projects where sediment is removed from an entire stream reach (typically 1,000-3,000 feet long removing between 2,000 and 7,500 cubic yards of sediment); and 2) localized projects that are typically less than 400 feet long at culverted crossings, and 400-1,000 feet long with 500-1,000 cubic yards of sediment removed at other locations for geomorphic channel shaping, individual bar grading, and sediment basin management. The number of these projects and quantity of sediment removed is dependent on weather and hydrologic conditions as well as the frequency and extent of past maintenance activities. Reach-scale projects may be revisited every 5-7 years, whereas localized sediment removal projects are typically revisited every 1-3 years. Removing sediment at culvert crossings is one of SCWA's most common sediment management activities.

Localized sediment management may include targeted geomorphic shaping and minor contouring of existing channel features. Geomorphic shaping activities maintain the low-flow channel and other features in their basic form but may alter their alignment to reduce the bank erosion potential. Geomorphic shaping activities are focused on realigning the low-flow channel and adjacent bars more than increasing channel capacity. During sediment management activities SCWA will also often develop a low-flow channel along the thalweg that can successfully transport sediment under lower flow conditions. The goal is to reduce sediment deposition in certain channel reaches which can improve water quality, habitat conditions, and fish passage during summer flows.

Sediment is removed with a long-reach excavator, bulldozer, scraper, or front loader. When using a long-reach excavator, sediment is excavated from the channel bed, collected, and removed with the excavator usually positioned on maintenance roads located along the top-of-bank. If the channel shape or the presence of large mature vegetation along the channel banks prevent working from the top-of-bank, then the excavator may be positioned lower on the channel banks using an access ramp. When working near the upstream or downstream limit of the reach the excavator may be positioned on the stream road crossing or culvert. Once excavated, sediment is either placed directly into dump trucks parked on the access road or stockpiled into central locations along the channel and then lifted to the adjacent dump trucks. Sediment removed as part of these projects is hauled off-site for reuse to an approved upland disposal site, or to the Sonoma County Central Landfill.

Dewatering may be required in order to conduct sediment removal in a channel. A temporary gravel or water-filled bladder cofferdam, pump, and re-routing pipeline are used together to dewater a short section of channel reach at a time. Pump intake lines are protected with screens according to passage criteria within NMFS 2019 *Guidelines for Salmonid Passage at Stream Crossings* to prevent the entrainment of aquatic species. All aquatic species are captured during dewatering and relocated out of the work area. The diverted flows are released back into the channel as near as possible to the downstream end of the project area. Silt bags are used at the end of the diversion pipe to reduce any sediment discharge downstream and to dissipate flow velocity and prevent scour at the discharge site. Water quality is monitored before, during, and after dewatering.

SCWA operates four reservoirs including: Brush Creek, Matanzas Creek, Piner Creek, and Spring Lake. Sediment removal around reservoir dam inlet structures is conducted every one to two years to maintain flow-through capacity from the reservoir to the outfall and creek downstream. Brush Creek and Matanzas Creek reservoirs are flow-through, designed to detain and store peak flood flows during storm events and provide controlled release of flows following the storm peak. These reservoirs are generally dry throughout the year, with some perennial flow occurring in the creeks that flow through them. Only Spring Lake maintains water throughout the year.

SCWA currently maintains one engineered sediment basin for a creek containing steelhead, on Adobe Creek. The Adobe Creek Sediment Basin is located on Adobe Creek upstream of South McDowell Drive. This is an "in-line" basin meaning that the basin is formed directly in the flow path of the creek. Sediments collect in abundance in the Adobe Creek sediment basin. When maintaining sediment basins, all accumulated sediment is removed and the structure is returned to as-built conditions.

Access to maintenance sites and staging of equipment and vehicles take place on existing access roads adjacent to the channel. The engineered channels have at least one access road running along the top-of-bank on one side of the channel. Where feasible, work is conducted from the north side of the channel to avoid removing vegetation (and the accompanying shade reduction) from the south side. Many of the SMP area channels also have access roads at a lower level along the banks. When the channel shape, bank height, or presence of mature trees prevents the use of the top-of-bank access roads, an access ramp (earthen or hardened if already existing) is used to move the equipment lower on the bank of the channel, or move the equipment into the channel. A pad may be placed halfway down the bank slope so that an excavator can work from that point. When necessary, sediment removal activities can be conducted from within the channel bed. This approach is favored where top-of-bank or side-bank access is unavailable, or would require unnecessary damage to trees along the riparian corridor. In-channel sediment removal activities only occur under dry channel conditions. Scrapers, skid loaders, bulldozers, and smaller Bobcat® type loaders are used when working directly in the channel bed.

Bank Stabilization

Most of the streambanks in the program area are earthen and not hardened. While several locations in the program area do have rip-rap banks or concrete, these typically occur at crossings or other structures. The presence of mostly earthen banks provides the SMP with greater management and resource enhancement flexibility; though it does also increase the potential for bank instability, slumping, or erosion.

In general, bank protection is conducted to achieve one or more of the following goals:

- Increase channel and/or bank stability.
- Decrease need for repeated maintenance.
- Reduce loading of eroded sediment into the channel and to downstream reaches; reduce the need for sediment management.
- Improve streambank area for vegetation development, facilitating increased habitat value.

Bank stabilization is implemented to address potential damage to adjacent properties or infrastructure and reduce flood hazards when a stream or reservoir bank is weakened, unstable, or failing. Bank stabilization activities are conducted during the June 15 to October 31 dry season and may also require dewatering as detailed above.

Similar to the sediment removal activities described above, the number of new bank stabilization projects undertaken in a given year depends on weather and hydrologic conditions during recent years. A higher number of bank stabilization projects are likely to occur in wet years. Another key factor influencing bank stability is rodent activity and the presence of burrows within the bank that can reduce bank integrity. Following wet years such as 2005-2006, as many as 30 bank stabilization projects were conducted. Following the drier winters of 2007 and 2008, only three bank stabilization projects were conducted per year. In an average year approximately one or two bank stabilization projects are implemented.

Bank stabilization designs incorporate bioengineering techniques such as using engineered back filled soils, erosion control fabric, and planting of native riparian trees at the top-of-bank and the toe-of-slope. As available, sediment used in bank stabilization projects are taken from stockpiled materials collected during sediment removal projects. Where soil compaction, erosion control fabrics, and revegetation are not adequate in providing a stable slope on their own, other bioengineered solutions are prioritized over the use of hardscape installations.

Banks are recontoured to match the adjacent bank slope (i.e., returned to pre-failure condition). Most engineered channels have bank slopes of 2:1 or steeper. If site conditions allow, the bank slope may be stabilized at a less steep slope to reduce the likelihood of renewed failure, but only if there is available space to grade the banks back and the work is conducted within the original channel design. Stabilized banks are flush with the existing bank slope, and only limited new material may protrude from the bank. Individual bank stabilization projects are confined to an area not to exceed 20 feet beyond the failed or failing bank or structure. If a riparian zone is present adjacent to the bank failure site, care is taken to disturb the least amount of vegetation, including mature trees.

Vegetation Management

Vegetation management refers to the trimming, mowing, and removal of vegetation within the flood control channels and other constructed facilities. Vegetation management activities are conducted to maintain flow conveyance capacity, establish a canopy of riparian trees, control invasive vegetation, remove hazardous vegetation, reduce fire fuel, and increase visibility for public safety. Mechanical removal is the primary method for managing problematic vegetation. Herbicides are used only outside of water and after monitoring indicates that they are needed and minimized to the smallest amount necessary to be effective. Vegetation management and removal activities are relatively consistent from year to year, though locations change depending on recent growth and blockages. Vegetation management also includes the planting of new trees and shrubs along engineered channels in accordance with the SMP's restoration and mitigation program.

SCWA's goal is to maintain and not remove vegetation that provides channel stability, anchors in-channel bars, or provides habitat benefits through the presence of large woody debris (LWD). Key determinants for retention include whether the LWD is deflecting flow toward banks and the proximity to a channel crossing or other facility. While the habitat benefits of LWD are sought, these benefits are evaluated in balance of the potential flooding or erosion effects, or threats to downstream infrastructure. See Chapter 6 of the SMP (SCWA 2020) for greater detail related to vegetation management.

The primary goals of vegetation management are to:

- Ensure that adequate flood conveyance capacity is maintained.
- Develop a mature and complex riparian canopy and corridor that offers habitat, shading of the creek, and aesthetic value while minimizing future understory maintenance requirements.
- Maintain channel for public safety purposes including reducing fire fuel, keeping sightlines open, removing hazardous trees, and clearing dense vegetation in the upper bank to improve visibility and discourage areas prone to homelessness and trash.
- Encourage native vegetation and discourage nonnative vegetation, particularly invasive species.
- Control emergent vegetation in the channel.
- Minimize flow obstructions.
- Improve bank stability.

Herbicides

SCWA uses herbicides sparingly as part of the SMP. Glyphosate-based products approved for use around aquatic environments (Round-up Pro, Aquamaster, or similar), as well as a pre-emergent (Semera) herbicide, and surfactants (AgriDex and Dyne-Amic) are used to manage Himalayan blackberry and trees in the flood control channel, and along gravel access roads as described below. Approximately 5-10 gallons of herbicides are applied per month during the dry season (June-October) throughout the SMP area. More specifically, in 2017 SCWA used one gallon of AquaMaster for stump treatment, 2 gallons for access road maintenance, and 21.5 gallons for invasive species control. The SMP does not include application of herbicides directly to water bodies and aerial spraying of herbicides is not included in the proposed action.

> **Cut stump treatment:** Direct hand-application of 100 percent herbicide solution painted on cut stem of a tree to stop regrowth. This application is typically used to stop regrowth of problematic or noxious tree species including eucalyptus, white poplar, tree of heaven, and arroyo willow. This method of application may be allowed below OHWM.
>
> **Targeted spray application:** Herbicides are applied either using a truck-mounted hand-sprayer with a hose reel or with a backpack sprayer. Spray is focused approximately 1-2 feet above the vegetation or targeted surface. This method will be used in the following instances:
>
> 1. To control the growth of Himalayan blackberry or other select invasive vegetation – this action mostly occurs from October through December.
> 2. A subset of gravel access roads that tend to have a proliferation of grassy vegetation are sprayed to maintain the integrity of the road. Herbicide is not applied to those roads that do not need it. This action mostly occurs in early spring.

Other

The following activities that are minor and small in scale may also occur under the SMP:

- Maintaining channel access roads for accessibility.
- Maintaining proper drainage along channel access roads.
- Maintaining proper functioning of drop-inlet culverts that direct local surface flow toward the flood control channels.
- Repairing fences along the channels.
- Removing or covering graffiti on SCWA facilities.

Avoidance and Minimization Measures

The SMP Manual includes avoidance and minimization measures (AMMs) that will be implemented before, during, and after SMP activities to prevent and minimize project-related effects to CCC steelhead and their designated critical habitat. These measures include, but are not limited to: restricting instream work to within the designated construction work window (June 15 – October 31); ensuring proper handling and relocation of listed species during dewatering events; implementing erosion control best management practices (BMPs); minimizing effects to riparian vegetation; ensuring establishment of revegetation areas; preventing introduction of 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 chapters 5-9 of the SMP (SCWA 2020). Table 1 in the BA lists best management practices that are implemented specifically to benefit anadromous fish (SCWA 2021). Together, these measures are hereby incorporated into the project description by reference.

Avoidance and Minimization Measures Specific to Herbicides:

- All herbicide treatments will be overseen by a certified applicator and will only be applied after primary methods such as mechanical removal and mowing are used for managing problematic vegetation.

- Herbicide use will comply with regulations and procedures, applicable handling and disposal laws, and the use of appropriate herbicide application methods and be conducted consistent with Sonoma Water's Integrated Pest Management Plan (Blankinship & Associates, Inc. 2019).

- Cut-stump treatment is the only application method allowed within 15 feet of aquatic features in salmonid habitat and only targeted spray application (applied directly using a truck or backpack sprayer) will be allowed between 15-100 feet.

- Foliar herbicides within the 100-foot buffer zone of salmonid habitat will be limited to Glyphosate-based products such as Round-up Pro, and Aquamaster. Pre-emergent herbicide in salmonid habitat buffers will be limited to Flumioxazin-based products such as Semera. Surfactants used in salmonid buffers will be limited to AgriDex and Dyne-Amic. If other chemicals are proposed for use in this buffer zone, they will be restricted to those approved by EPA for use in aquatic environments.

- Herbicides will not be applied via targeted spray methods when average wind speeds exceed 10 miles per hour at plant height or when air temperature exceeds 85 degrees.

- Herbicides other than pre-emergent on gravel roads will not be applied within 24 hours of predicted rainfall (>20 percent chance) or until plants are dry following rainfall and not under wet conditions due to dense fog.

Mitigation

SCWA mitigates potential impacts of SMP implementation that are not reduced through avoidance measures. The SMP's well-established, scientific, mitigation approach was developed over several years (2006-2010) and incorporates adaptive management derived during multiple discussions with representatives from the regulatory agencies (RWQCBs, CDFW, NMFS, USFWS, and the COE). Mitigation may involve the restoration, establishment, and/or preservation of aquatic resources.

Since 2013, the SMP incorporates planting plan templates that identify the target density for upper bank and in-channel riparian toe trees (permanent trees) used for restoration. These templates have been developed for different channel sizes, forms, flow capacities, and for those with a range of existing instream vegetation and roughness conditions. Target planting densities are designed to move the successional stage of riparian vegetation from an early seral stage (less than 10-20 years old) to a manageable climax stage and then maintain (to the template) the diversified canopy and understory into the future. In general, woody species create the greatest roughness in the channel, so in-stream planted or naturally recruited trees are managed for longer-term sustainable densities. However, some locations may need to be managed for more open riparian canopy (see chapters 7 and 11 in the SMP (SCWA 2020) for more detailed information on vegetation management related to mitigation).

The mitigation planning approach follows a three-tiered system:

1. Tier 1 mitigation is implemented at a 1:1 ratio of acres restored to acres disturbed at the specific project reach where the maintenance work was conducted. The goal of on-site mitigation is to enhance and restore the stream and aquatic functions and resources (in-kind) that were impacted through the maintenance activities.

    a. SCWA's on-site mitigation program includes a variety of planting and habitat enhancement approaches. These approaches include natural recruitment techniques as well as nursery stock tree and acorn planting, understory plantings along the bank and channel edge, and the installation of red and Pacific willow cuttings and nursery stock at the toe-of-bank. The primary objective is to enhance riparian habitat through greater canopy cover, shading, and develop a functioning understory along channels that are currently degraded.

2. Tier 2 mitigation uses similar techniques as Tier 1, but is applied at other stream channels when there are no suitable opportunities for enhancement or restoration on-site.

3. Tier 3 mitigation is off-site mitigation that provides compensating watershed-based functions and addresses residual impacts from SMP activities that are not adequately avoided or minimized as described above or mitigated through Tier 1 and 2 mitigation.

    a. A key objective of Tier 3 mitigation is to reduce the overall necessity for channel maintenance through erosion control and improved land use practices in upper watershed lands. Headwaters are a source for eroded sediments that are transported downstream. Reducing the sediment loading from headwater areas or upstream reaches is anticipated to reduce the need for subsequent downstream sediment removal activities. The area required to be restored off-site as is at least 10 percent of the area impacted by annual on-site sediment removal.
    b. Tier 3 mitigation is funded through SCWA's Watershed Partnerships Program (WPP), a collaborative effort, whereby SCWA provides funds to projects that are implemented with local non-profit agencies, municipalities, restoration organizations, creek groups, schools, and Resource Conservation Districts (RCDs). SCWA contributes 10 percent of the annual cost of implementing SMP sediment removal and bank stabilization

projects into a fund to distribute annually to WPP partners and to conduct Tier 2 mitigation described above.

While not necessarily considered a mitigation action, SCWA also removes trash twice per week along and within channels. Since 2010, SCWA has removed approximately 250,600 pounds of trash. In the last few years (between 2017 and 2019) in which more trash removal data has been collected, SCWA has removed on average 72,100 pounds of trash per year.

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

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

2.1. Analytical Approach

This opinion includes both a jeopardy analysis and an adverse modification analysis. The jeopardy analysis relies upon the regulatory definition of "jeopardize the continued existence of" a listed species, which is "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species. This opinion also relies on the regulatory definition of "destruction or adverse modification," which "means a direct or indirect alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species" (50 CFR 402.02).

The designation of critical habitat for CCC steelhead uses the term primary constituent element (PCE) or essential features. The 2016 final rule (81 FR 7414; February 11, 2016) that revised the critical habitat regulations (50 CFR 424.12) replaced this term with physical or biological features (PBFs). The shift in terminology does not change the approach used in conducting a "destruction or adverse modification" analysis, which is the same regardless of whether the original designation identified PCEs, PBFs, or essential features. In this biological opinion, we use the term PBF to mean PCE or essential feature, as appropriate for the specific critical habitat.

The ESA Section 7 implementing regulations define effects of the action using the term "consequences" (50 CFR 402.02). As explained in the preamble to the final rule revising the definition and adding this term (84 FR 44976, 44977; August 27, 2019), that revision does not change the scope of our analysis, and in this opinion, we use the terms "effects" and "consequences" interchangeably.

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

- Evaluate the rangewide status of the species and critical habitat expected to be adversely affected by the proposed action.
- Evaluate the environmental baseline of the species and critical habitat.
- Evaluate the effects of the proposed action on species and their critical habitat using an exposure–response approach.
- Evaluate cumulative effects.
- In the integration and synthesis, add the effects of the action and cumulative effects to the environmental baseline, and, in light of the status of the species and critical habitat, analyze whether the proposed action is likely to: (1) directly or indirectly reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species; or (2) directly or indirectly result in an alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species.
- If necessary, suggest a reasonable and prudent alternative to the proposed action.

To conduct the assessment presented in this opinion, NMFS examined an extensive amount of information from a variety of sources. Detailed background information on the biology and status of the 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. For information that has been taken directly from published, citable documents, those citations have been reference in the text and listed at the end of this document.

Additional information regarding the potential effects of the proposed activities on the listed species, their anticipated response to these actions, and the environmental consequences of the actions was formulated from the aforementioned resources, and the following:

- NMFS 2008. Biological Opinion for Water Supply, Flood Control Operations, and Channel Maintenance conducted by the U.S. Army Corps of Engineers, the Sonoma County Water Agency, and the Mendocino County Russian River Flood Control and Water Conservation Improvement District in the Russian River watershed. PCTS Tracking Number F/SWR/2006/07316. September 24.
- NMFS 2010. Biological Opinion for Sonoma County Water District Stream Maintenance Program in the Petaluma River and Sonoma Creek Watersheds, Sonoma County, California, 10-year Individual Permit. PCTS Tracking Number F/SWR/2009/03082. April 10.
- NMFS 2016. Final Coastal Multispecies Recovery Plan: CC Chinook Salmon, Northern California Steelhead, CCC Steelhead. West Coast Region, Santa Rosa CA. October 2016.
- SCWA 2020. Sonoma County Water Agency Stream Maintenance Program Manual. February 2020.
- SCWA 2021.Sonoma Water. Biological Assessment for Anadromous Fish Species, Sonoma Water Stream Maintenance Program. Prepared by Dave Cook, Senior Environmental Specialist.

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

2.2. Rangewide Status of the Species and Critical Habitat

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

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

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

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

This opinion analyzes the effects of the proposed action on the CCC steelhead DPS and designated critical habitat for CCC steelhead DPS and CCC coho salmon ESU. CCC coho salmon are not present in the action area for this consultation and effects on CCC coho salmon individuals are not analyzed below.

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

CCC coho salmon ESU
Critical habitat designation (64 FR 24049; May 5, 1999).

2.2.1. <u>CCC Steelhead Status</u>

CCC steelhead was listed as federally threatened in 1996 and updated in 2006 and critical habitat was designated in 2005. This DPS includes all naturally spawned steelhead from the Russian River in Sonoma County to Aptos Creek in Santa Cruz County as well as the drainages of San Francisco, Suisun, and San Pablo Bays eastward to Chipps Island at the confluence of the Sacramento and San Joaquin Rivers. Historically, approximately 70 populations[2] of steelhead existed in the CCC steelhead DPS (Spence *et al.* 2008, Spence *et al.* 2012). About 37 of these were considered independent, or potentially independent (Bjorkstedt *et al.* 2005). The remaining populations were dependent upon immigration from nearby CCC steelhead DPS populations to ensure their viability (McElhaney *et al*. 2000, Bjorkstedt *et al*. 2005).

While historical and present data on abundance are limited, CCC steelhead numbers are substantially reduced from historical levels. A total of 94,000 adult steelhead were estimated to spawn in the rivers of this DPS in the mid-1960s, including 50,000 fish in the Russian River - the largest population within the DPS (Busby *et al.* 1996). Though still below historic levels, the trend of adult returns to the Warm Springs and Coyote Valley fish facilities on the Russian River has improved since the 1980s and '90s. 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, Caspar creeks) of individual run sizes of 500 fish or less (62 FR 43937; August 18, 1997). 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 fragmentation of habitat has likely also led to loss of genetic diversity in these populations.

A 2008 viability assessment of CCC steelhead concluded that populations in watersheds that drain to San Francisco Bay are highly unlikely to be viable, and the limited information available did not indicate that any other CCC steelhead populations were demonstrably viable (Spence *et al*. 2008). Although there were average returns (based on the last ten years) of adult CCC

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

steelhead during 2007/08, research monitoring data from the 2008/09 and 2009/10 adult CCC steelhead returns show a decline in returning adults across their range compared to the previous ten years. The lack of adequate spawner surveys within the Russian River precludes the estimation of wild steelhead escapement within the basin; however, hatchery returns suggest the vast majority of returning fish are of hatchery origin. Information from years of the Coastal Monitoring Program in the Santa Cruz Mountains suggests that population sizes there are 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. Population-level estimates of adult abundance are not available for any of the seven independent steelhead populations (i.e., Novato Creek, Corte Madera Creek, Guadalupe River, Saratoga Creek, Stevens Creek, San Francisquito Creek, and San Mateo Creek) inhabiting the watersheds of the coastal strata.

The scarcity of information on CCC steelhead abundance continues to make it difficult to assess whether conditions have changed appreciably since the previous status review assessment (Williams *et al*. 2016). The most recent status update concludes that steelhead in the CCC DPS remain "likely to become endangered in the foreseeable future", as new and additional information does not appear to suggest a change in extinction risk (Howe 2016). NMFS concluded that the CCC steelhead DPS shall remain listed as threatened (81 FR 33468; May 26, 2016).

2.2.2. Status of Critical Habitat

PBFs for CCC steelhead critical habitat within freshwater include:

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

For CCC coho salmon critical habitat, the following essential habitat types were identified: 1) juvenile summer and winter rearing areas; 2) juvenile migration corridors; 3) areas for growth and development to adulthood; 4) adult migration corridors; and 5) spawning areas. Within these areas, essential features of coho salmon critical habitat include adequate: 1) substrate, 2) water quality, 3) water quantity, 4) water temperature, 5) water velocity, 6) cover/shelter, 7) food, 8) riparian vegetation, 9) space, and 10) safe passage conditions (64 FR 24029, 24059; May 5, 1999).

The condition of designated critical habitat for CCC steelhead and CCC coho salmon, 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[3]: logging, agriculture, mining, urbanization, stream channelization and bank stabilization, dams, wetland loss, and water withdrawals (including unscreened diversions for irrigation). Impacts of concern include: altered stream bank and channel morphology, elevated water temperature, lost spawning and rearing habitat, habitat fragmentation, impaired gravel and wood recruitment from upstream sources, degraded water quality, lost riparian vegetation, and increased erosion into streams from upland areas (Weitkamp *et al.* 1995; Busby *et al*. 1996; 64 FR 24049; 70 FR 52488). Diversion and storage of river and stream flow has dramatically altered the natural hydrologic cycle in many of the streams within steelhead DPSs. Altered flow regimes can delay or preclude migration, dewater aquatic habitat, and strand fish in disconnected pools, while unscreened diversions can entrain juvenile fish.

2.2.3. Additional Threats to Listed Species and Critical Habitat

Another factor affecting the rangewide status of steelhead, their critical habitat, and CCC coho salmon critical habitat, is climate change. Impacts from global climate change are already occurring in California and listed salmonids here may have already experienced some detrimental impacts. For example, average annual air temperatures, heat extremes, and sea level have all increased in California over the last century (Kadir *et al.* 2013). California has a history of episodic droughts. However, the state has experienced a two-decade period of persistently warm and dry conditions. The five-year period from 2012 to 2016 was the driest since record keeping began (Williams *et al.* 2016). The extreme drought conditions for most of California from January 2020 through October 2021 resulted from the lowest total precipitation and near-highest temperatures recorded since 1895 (Mankin *et al.* 2021).

The threat to salmonids from global climate change will continue to increase in the future. Modeling of climate change impacts in California suggests that average summer air temperatures are expected to continue to increase (Lindley *et al.* 2007; Moser *et al.* 2012). Heat waves are expected to occur more often and be comprised of higher temperatures (Hayhoe *et al.* 2004, Moser *et al.* 2012; Kadir *et al.* 2013). Total precipitation in California will likely decline and critically dry years may increase (Lindley *et al.* 2007; Schneider 2007; Moser *et al.* 2012). Although wildfires are an integral ecological feature in California, they are expected to increase in frequency and magnitude (Westerling *et al.* 2011, Moser *et al.* 2012, Goss *et al.* 2020).

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[3] 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.

For Northern California, most models project heavier and warmer precipitation. Extreme wet and dry periods are projected, increasing the risk of both flooding and droughts. Many of these changes are likely to further degrade salmonid habitat by reducing stream flow during the summer and raising summer water temperatures. For example, in the San Francisco Bay region, warm temperatures generally occur in July and August, but as climate change takes hold, the occurrences of these events will likely begin in June and could continue to occur in September (Cayan *et al.* 2012). Climate simulation models project that the San Francisco region will maintain its Mediterranean climate regime, but will also experience a higher degree of variability of annual precipitation during the next 50 years.

Estuaries may also experience changes detrimental to salmonids. Estuarine productivity is likely to change based on changes in freshwater flows, nutrient cycling, and sediment amounts (Scavia *et al.* 2002, Ruggiero *et al.* 2010). In marine environments, ecosystems and habitats important to juvenile and adult salmonids are likely to experience changes in temperatures, circulation, water chemistry, and food supplies (Brewer and Barry 2008; Feely *et al.* 2004; Osgood 2008; Turley 2008; Abdul-Aziz *et al.* 2011; Doney *et al.* 2012).

2.3. Action Area

"Action area" means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). The action area for this project is the area that will be directly and indirectly impacted by the proposed action and will cover engineered stream reaches within Zones 1A, 2A, 3A, 5A, and 6A in Sonoma County, California that are known (or have the potential) to support or provide habitat for CCC steelhead (Fig 1. Tables 1 and 2). Over 95 percent of SMP activities are located in the flood control channels of Zones 1A, 2A, and 3A – the Laguna de Santa Rosa, Petaluma River, and Sonoma Creek. The remaining 5 percent of SMP activities in Zones 5A and 6A occur in the Middle Russian River Watershed. See Appendix C of the SMP Manual (SCWA 2020) for maps that identify specific reaches within each stream where SMP activities may occur. Streams within these zones that that may support ESA-listed coho (*O. kisutch*) or Chinook salmon (*O. tshawytscha*)are not covered as part of this opinion. Reaches within the Laguna de Santa Rosa and Santa Rosa Creek are the only areas that are designated as critical habitat for CCC coho salmon.

Table 2. Streams included in the SMP action area that are known (or have the potential) to support or provide habitat for CCC steelhead.

Zone	Watershed	Streams
1A	Laguna de Santa Rosa (Russian River)	Austin, Brush, Copeland, Laguna de Santa Rosa, Paulin, Piner, Santa Rosa, Windsor
2A	Petaluma River	Adobe, Lichau, Lynch
3A	Sonoma Creek	Nathanson, Rogers
5A	Middle Russian River	Fife
6A	Middle Russian River	West Slough

2.4. Environmental Baseline

The "environmental baseline" refers to the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultations, and the impact of State or private actions which are contemporaneous with the consultation in process. The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline (50 CFR 402.02).

The action area in the southern portion of Sonoma County experiences a Mediterranean climate characterized by cool wet winters with typically high runoff, and dry warm summers which can result in greatly reduced instream flows. Summer maximum temperatures average in the mid-80's with minimum temperatures in the 50's. Winter maximum temperatures are typically in the 50's with minimums in the 30's. Mean average precipitation for Sonoma Valley varies from 20 inches in the southern end of the valley to 45 inches in the north and 50 inches on Sonoma Mountain. Most of the precipitation falls as rain from October through April (the wet season) of each year.

High seasonal rainfall on bedrock and other geologic units with relatively low permeability, erodible soils, and steep slopes contribute to the flashy nature of these watersheds. These high natural runoff rates have been increased by road systems, urbanization, and channelization. Streams that previously migrated and deposited their materials across a broad fan or plain surface are now contained in linear channels. As a result, many river systems within the action area contain a relatively large sediment load, typically deposited throughout the lower gradient reaches of these systems.

2.4.1 Status of CCC Steelhead in the Action Area

The extensive biological monitoring conducted over the past 10 years of implementation of the SMP provides a robust dataset to assess the suitability of habitats in the SMP area for steelhead, determine their distribution, and evaluate potential effects of SMP maintenance activities on steelhead and its habitat in the action area. Table B-1 in Appendix B of the BA (SCWA 2021) lists all of the SMP reaches and habitat evaluations for steelhead. Of the 260 stream reaches totaling 472,334 linear feet of channel listed in the 2020 SMP Manual, there are approximately 79 reaches totaling 171,808 linear feet (36.4%) that are suitable habitat for steelhead that may be used for adult migration, spawning, and/or juvenile rearing habitat. However, steelhead have been only been observed in 35 reaches totaling 69,962 linear feet, which is 14.8% of the SMP area.

Table 3. Number of reaches where steelhead have been observed or where there is potential steelhead habitat throughout the SMP area since 2010.

Flood Control Zone	Steelhead Observed	Potential Habitat	Marginal/ Migration Habitat	Habitat Unlikely	Total
Number of SMP Reaches					
1A	26	4	20	137	187
2A	6	3	7	33	49
3A	3		5	8	16
4A		2		2	4
5A			1		1
6A		2			2
Total	**35**	**11**	**33**	**181**	**260**
SMP Reach Length (feet)					
1A	63,257	6,246	59,430	248,357	377,290
2A	4,490	3,151	5,212	41,524	54,377
3A	2,215		5,594	6,154	13,963
4A		9,895		3,211	13,106
5A			470		470
6A		11,848			11,848
Total	**69,962**	**31,140**	**70,706**	**300,526**	**472,334**

Historical accounts of steelhead in Sonoma Creek indicate that the watershed was a significant contributor to the regional steelhead population based on the estimated runs of 500 individual as late as 1965 (Leidy 2005). In 2002, the Sonoma Ecology Center (SEC) estimated as many as 17,000 juvenile steelhead in Sonoma Creek tributaries including: Bear, Graham, and Calabazas Creeks (SEC 2006). The report also indicated that the Sonoma Creek mainstem averaged 0.23 steelhead-per-foot versus 0.16 in sampled tributaries. There are no current estimates of steelhead densities in Rogers or Nathanson Creeks.

The limited amount of information available regarding the historical accounts of steelhead in the Petaluma River watershed indicate that few tributaries were utilized by steelhead. In a 1962 report, steelhead were described as “lightly using” the Petaluma River (Skinner 1962). Other accounts indicate that steelhead were historically found in Lichau, Adobe, and San Antonio Creeks and possibly in Lynch. Of these tributaries, Adobe Creek has had the highest reported numbers of steelhead. A 1968 survey reported an estimated abundance of 150 juvenile steelhead per 30 meters (Leidy et al. 2005). United Anglers of Casa Grande High School has monitored Adobe Creek (and other streams less frequently) in the Petaluma River Watershed since the mid-80’s. Numbers of spawners observed have ranged from a high of 60 in the mid-90’s to a low of zero from 2015-2017. Recent declining trends in abundance also mirror declines in fish abundance elsewhere in the San Francisco Bay Diversity Strata. While survey effort has varied over the years, recently surveys have been more consistent with survey and data protocols following those of CDFW and NMFS. This is the most comprehensive survey effort in the Petaluma system, and indicates that steelhead abundance is far below what was seen 20 years ago. Abundance is also far below the depensation threshold for this population (i.e., 225) and the recovery target of 2,100 spawners.

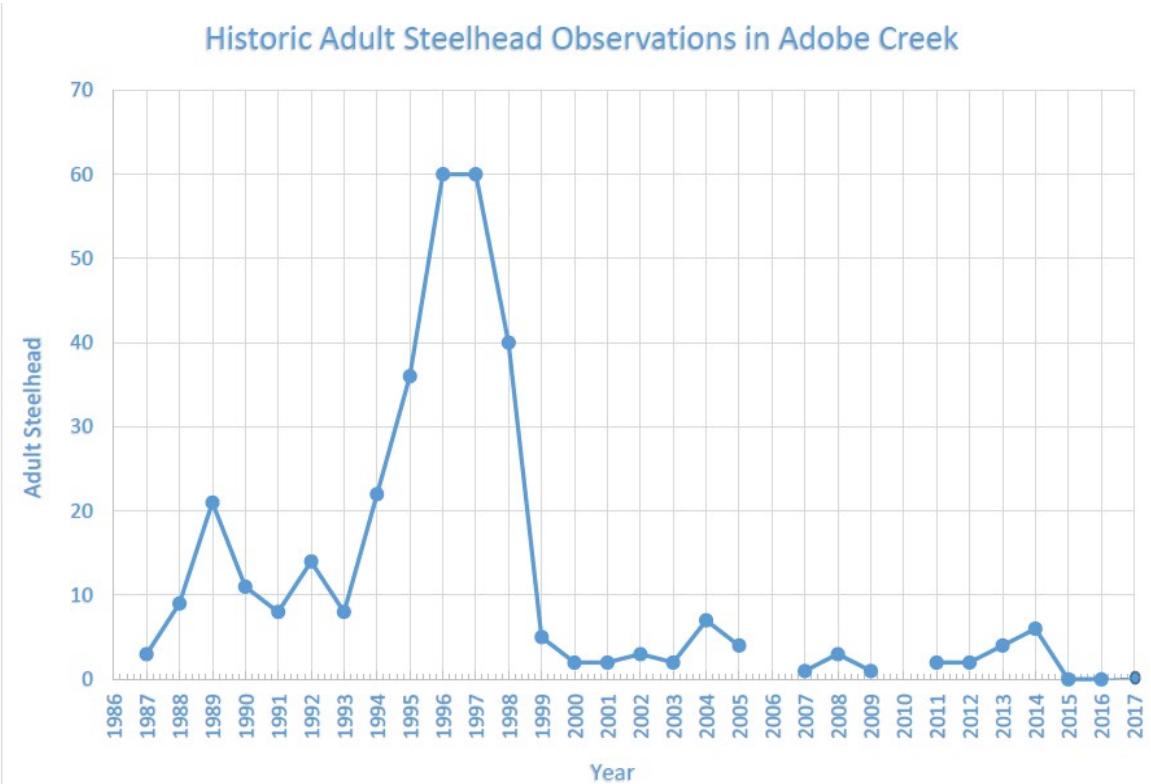

Figure 2. Adult steelhead observations in Adobe Creek from 1987 through 2017.

The Russian River Watershed covers approximately 1,485 square miles, is 110 miles long and drains directly into the Pacific Ocean. Russian River steelhead runs once ranked as the third largest in California behind the Klamath and Sacramento rivers. The Russian River was renowned as one of the world's finest steelhead rivers during the l930's and on through the 1950's (SEC 1996). SEC (1996) reported historic Russian River catch estimates for steelhead: 15,000 for the 1936 sport catch, and 25,000 for the 1956/57 sport catch. These estimates are based on best professional judgment by a CDFG employee and, for the latter estimate, a sportswriter. Other estimates include one of 57,000 steelhead made in 1957 (SEC 1996). Since the mid-20th Century, Russian River steelhead populations have declined. Estimates based on best professional judgment infer a wild run of 1,750 to 7,000 fish near the end of the 20th Century (Busby 1996). Hatchery returns averaged 6,760 fish for the period 1992/93 to 2006/07, and ranged from 2,200 to 11,828 fish. Though there were challenges with sampling conditions, SCWA's estimate for the 2019/20 spawner season was 1,606 redds in the Russian River basin (SCWA 2020). The information available suggests that recent basin-wide abundance of wild steelhead has declined considerably from historic levels. A limited catch-and-release hatchery sport fishery still offers a fishing season for hatchery steelhead in the Russian River.

Hatchery practices have also impacted steelhead populations within the Russian River Basin. Since the 1870's, millions of hatchery-reared salmonids have been released. The combination of planting out-of-basin stocks, hatchery selecting processes, and inter-breeding have led to a decrease in salmonid genetic diversity and loss of local adaptations (SEC 1996). The Coyote Valley Fish Facility, located in the upper Russian River primarily produces and releases steelhead which have the potential to effect naturally-produced steelhead within the action area. Despite declines in abundance, steelhead remain widely distributed within the basin (NMFS 2005). The primary exceptions to this are the barriers to anadromy caused by the Coyote Valley Dam and Warm Springs Dam. The Coyote Valley Dam has blocked approximately 21 percent of the historical habitat of the Upper Russian River population, and the Warm Springs Dam has blocked approximately 56 percent of the Dry Creek population's historical habitat (Spence 2006).

While the steelhead population has declined dramatically in the action area over the past several decades, current numbers, distribution, and diverse use of habitat will likely provide some level of resistance to environmental and anthropogenic disturbance. However, no information exists that demonstrates that the decline in the CCC steelhead population has stabilized.

Status of Critical Habitat in the Action Area

There are approximately 32 SMP reaches totaling 35,133 feet along 12 creeks within the action area that are designated as critical habitat for CCC steelhead (see Appendix B, Table B-1 of the BA (SCWA 2021)). Reaches within the Laguna de Santa Rosa and Santa Rosa Creek are also designated as critical habitat for CCC coho salmon. The functioning of critical habitat within the action area has been compromised largely by urban development and agriculture. Rearing habitat is marginal; primarily due to elevated stream temperatures, fine sediment loading, and the abundance of warm-water predator fish species. Overwinter and outmigration habitat conditions are also poor because many of these engineered stream channels lack habitat complexity and velocity refuge and carry a high level of fine sediment (Ritter and Brown 1971, COE 1982, Beach 1996, CDFG 2001). Substrate in the action area lacks clean, loosely compacted, gravel in cool water with highly dissolved oxygen and an inter-gravel flow necessary for spawning. Lack of clean gravel and high water temperatures are two of the factors that make most of the habitat within the action area unsuitable for spawning. However, several reaches may be used by steelhead as a migration corridor to better suited spawning habitat.

The Sonoma Creek Watershed covers about 170 square miles and drains into San Pablo Bay. Sonoma Creek was listed as impaired due to excessive fine sediment in 1996, and the 2006 Limiting Factors Analysis identified channel erosion as the main source of fine sediment (SEC 2006). Channel erosion was also found to be degrading the in-channel habitat for salmonid spawning and rearing, while fish migration barriers and lack of cold water during the summer were found to be impacting summer rearing by steelhead. Historically, Sonoma Creek received cool groundwater and seepage from wetlands through much of the year, but now flows drop earlier in the year due to channel incision and groundwater pumping. Lower summer baseflows, combined with in-channel structures, create barriers to fish movement. As reaches dry out during the summer, even small barriers may prevent juvenile steelhead from moving upstream to seek more wetted habitat.

The Laguna de Santa Rosa is a 22-mile long wetland complex that drains a 254-sqare-mile watershed encompassing most of the Santa Rosa Plain. The Laguna de Santa Rosa, the principal tributary of Mark West Creek, is considered one of largest remaining freshwater wetlands in coastal Northern California and supports many rare and endangered species. From about 1870 to 1990, water quality and biota deteriorated in the Laguna due to urban development and agricultural encroachment into the floodplain. In the 1990s, the trend began to reverse, but the watercourse is still listed as impaired under the federal Clean Water Act for sediment, nitrogen, phosphorus, temperature, mercury, and dissolved oxygen levels. The SMP reaches of Santa Rosa Creek, although considered critical habitat for coho salmon, run through the highly developed urban areas of the city of Santa Rosa (including an underground stretch through downtown). Neither the Laguna or Santa Rosa Creek currently contain the PBFs necessary to support spawning, growth , or development for CCC coho salmon.

The Petaluma River Watershed, with the city of Petaluma at its center, occupies 146 square miles and the lower river flows through 12 miles of tidal wetlands before emptying into San Pablo Bay. Despite its problematic sediment load, the Petaluma River has a long been used as a source of transportation for commercial goods to San Francisco. The mainstem has been straightened, widened, and dredged several times. The problems of siltation and flooding recognized over a century ago still exist today. Since the 1880's the COE has improved and maintained the Petaluma River for navigation. The first dredging project, completed in 1933, provided for a 200-foot wide, 8-foot deep channel across the mudflats in San Pablo Bay to the mouth of the Petaluma River. The channel upstream to Western Avenue in the City of Petaluma, was widened 100 feet and deepened 8 feet. Dredging is a continuing project and under present scheduling, the COE maintains the San Pablo Bay Channel on a 144-month cycle and the Upper River channel on a 48-month cycle. According to COE, an average of 60,000 cubic yards of material is deposited in the river each year (SCWA, 1986).

Although there are no dams in the Petaluma River Watershed, there are several passage concerns for steelhead in the tributaries. There is a fish ladder in disrepair on Adobe Creek that is not functioning due to erosion and sediment accumulation and blocks juvenile salmonid passage during low flows. Several potential passage barriers have been identified on Lynch Creek, starting at the mouth and all the way up to the upper crossing at Sonoma Mountain Road. The habitat in San Antonio Creek suffers from intensive cattle usage and would benefit from cattle exclusion fencing and revegetation/erosion control. Fish rescues occur often in these tributaries due to stream drying during the summer months which causes pools to be disconnected and fish to be stranded or exposed to lethal temperatures.

The Russian River was included on the 2013 CWA section 303(d) list of water quality limited segments. The pollution factors for the Russian River vary by sub-watershed, but commonly include sediment, temperature, dissolved oxygen, various nutrients, and many chemical pollutants and pathogens. Forestry, agriculture, dams with flow regulation, urban and land development, and nonpoint sources are listed as the potential sources for these factors. Lake Sonoma, a reservoir impounded by Warm Springs Dam, is included on the section 303(d) list because of elevated levels of mercury associated with historic mining. Since 2015, NOAA has been working with partners to evaluate the viability of Forecast- Informed Reservoir Operations (FIRO) in achieving improved flood management, water supply, and environmental flows associated with the operations of Lake Mendocino, the reservoir created by the Coyote Valley Dam. The FIRO program, authorized by the COE, allows reservoir operators to use forecasts to inform the storage and release of water in the portion of the flood control pool. If effective, FIRO will provide several benefits for listed salmonids, including: increased cold-water pool availability, more reliable and higher minimum in-stream flows, and better water quality conditions.

Improving riparian habitat conditions for steelhead in the Petaluma River Watershed has been identified as a priority action in NMFS Recovery Plan (NMFS 2016). Since implementing the SMP, the degree of canopy cover over the engineered flood control channels has increased significantly. Between 2009-2010, SCWA conducted Tier 1 restoration projects resulting in a total of 99,044 linear feet of channel plantings, 7,016 trees planted, and 2,609 shrubs planted. Since 2009 SCWA's SMP mitigation program has implemented forty habitat restoration, erosion control, and water quality improvement projects in the action area, restoring approximately 68 acres of habitat. At the onset of the SMP, most of the engineered channels supported less than 25% canopy cover. As of 2013, a majority of engineered channels supported 51-75% canopy cover. Canopy cover is expected to continue increasing under SMP operations and as newly planted trees mature.

Table 4. 2013 SMP Canopy Cover Conditions: Engineered Channels in Zones 1A, 2A, and 3A

Percent Canopy Cover	**Number of Reaches**	**Length (mi)**
up to 25	38	33.20
26-50	68	48.03
51-75	78	59.19
>75	38	16.44
Total	**222**	**156.86**

While not necessarily considered a mitigation action, SCWA also removes trash twice per week along and within channels. Removing trash generally helps improve water quality and aquatic habitat for plant and terrestrial species. Since 2010, SCWA has removed approximately 250,600 pounds of trash. In the last few years (between 2017 and 2019) in which more trash removal data has been collected, SCWA has removed on average 72,100 pounds of trash per year.

We rely on information from section 2.2.5 with respect to the broader climatic variables influencing the current condition of habitat in the action area. Variables such as air temperature, wind patterns, and precipitation are likely influencing localized environmental conditions, such as water temperature, stream flow, and food availability. These local environmental conditions can affect the biology of listed species and the functioning of critical habitat and its value for conservation. The combination of climate change effects and effects of past and current human activities on local environmental conditions further reduce the current condition of available habitat for listed species in the action area.

Other Recovery Efforts in the Petaluma Watershed

From 2019 through 2022, the Sonoma Resource Conservation District led a Petaluma River Watershed Consortium effort which formed a collaborative group of stakeholders to revise and finalize the Petaluma Watershed Enhancement Plan and develop an action plan to prioritize critical projects for watershed sustainability. NMFS has actively engaged in this effort and continued collaboration is expected.

NMFS is currently working to issue a Section 10(a)(1)(A) research and enhancement permit to the United Anglers of Casa Grande for their Rescue and Rearing Management Plan (RRMP) for Petaluma River Steelhead. The primary objective of the RRMP is to assist in the restoration, conservation, and maintenance of the Petaluma River steelhead population to viable levels in the Petaluma River watershed. Fish rescue and relocation, as well as temporary rearing of some rescued fish will occur at the UACG Hatchery and will be run by Casa Grande High School located in Petaluma.

The rescue component of the program will occur in the late spring or early summer, when stream flows in most Petaluma River tributaries decrease to levels that result in CCC steelhead being trapped in primarily pool habitat. As the summer progresses, these pools may dry up or water temperatures increase to levels unsuitable for rearing and may result in near 100 percent mortality for juvenile steelhead. To increase the survival rate of trapped steelhead, the program will collect (rescue) some of these fish (fry, fingerling, and 1+smolts) from the streams then transport and release them to areas where habitat conditions are better suited to produce juvenile steelhead (perennial flow and stream temperatures < 20 degrees C). The rearing component will entail randomly collecting fry (<60 mm) from all accessible stream habitat before these areas become dewatered (early spring) or stream temperatures reach levels that are lethal to juvenile steelhead. Up to 5,945 juvenile steelhead will be collected, transported to the UACG Hatchery, and reared to the smolt stage. Because survival from fry to smolt is expected to be higher in the hatchery than in the natural environment, hatchery rearing is expected to result in an increase in total adult steelhead production for these streams.

2.5. Effects of the Action

Under the ESA, "effects of the action" are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action (see 50 CFR 402.02). A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (see 50 CFR 402.17). In our analysis, which describes the effects of the proposed action, we considered the factors set forth in 50 CFR 402.17(a) and (b).

The implementation of the SMP flood control maintenance activities including: 1) sediment management; 2) bank stabilization; and 3) vegetation management may cause a number of negative effects on CCC steelhead and their habitat throughout engineered stream channels in Zones 1A, 2A, 3A, 5A, and 6A in Sonoma County. These SMP activities may also adversely impact critical habitat for CCC coho salmon in Zone 1A in SMP reaches of the Laguna de Santa Rosa and Santa Rosa Creek. The effects usually result from: dewatering streams and relocation of fish, disruption of fluvial processes, vegetation removal, heavy equipment operation, exposure to toxic materials and herbicides, and site restoration. The categories of actions proposed all have predictable effects regardless of where in the action area they are implemented. This assessment is based on 10 years of program implementation and monitoring results. The effects occur through pathways including:

- Dewatering and fish handling,
- Changes in stream form and function,
- Elevated suspended sediment,
- Riparian and streambank disturbance,
- Small spills or leaks from construction equipment,
- Herbicide use adjacent to streams,
- Fish displacement,
- Temporary reduction in aquatic invertebrate prey in dewatered isolation areas.

Habitat improvement projects implemented consistently with the proposed action, are also expected to have long-term beneficial effects to steelhead and their habitat. These beneficial effects may improve steelhead VSP parameters, abundance, productivity, and spatial structure. Habitat improvement projects carried out in critical habitat will improve the conservation value of the essential and biological features of habitat at the site and watershed scales.

Although the total numbers of SMP activities described in Appendix A represent the amount of such activities expected to occur within the action area, there is no specific information on how many of the activities are expected to occur within or nearby streams containing CCC steelhead, critical habitat for steelhead or coho salmon. Nor is there any aspect of the proposed action that would focus all of the activities into areas where effects to listed steelhead or critical habitat are likely. Thus, for purposes of analyzing the effects of those activities, NMFS assumes that all of the activities could occur within or near streams or waterbodies containing listed steelhead, their critical habitat, or both. Only activities in Zone 1A will affect CCC coho salmon critical habitat. While this will likely overestimate beneficial impacts, it will also likely overestimate adverse effects to the same degree, because not all of these activities will occur in or near streams containing listed steelhead or critical habitat.

Dewatering and Fish Relocation

All in-water work will be restricted to the low-flow season when many of the stream reaches are dry. Steelhead discovered in wetted stream channels during sediment removal activities will be removed and relocated by a qualified biologist to an appropriate stream reach that will minimize impacts to captured fish as well as fish that are residing at the release site.

Fish relocation activities may injure or kill rearing juvenile steelhead because of the associated risk that collecting poses to fish, including stress, disease transmission, injury, or death (Hayes

1996). The amount of injury and mortality attributable to fish capture varies widely depending on the method used, the ambient conditions, and the expertise and experience of the field crew. The effects of seining and dip-netting on juvenile fish include stress, scale loss, physical damage, suffocation, and desiccation. Electrofishing can kill juvenile fish, and researchers have found serious sub-lethal effects including spinal injuries (Nielsen 1998, Nordwall 1999). Although sites selected for relocating fish will likely have similar water temperature as the capture site and should have ample habitat, in some instances relocated fish may endure short-term stress from crowding at the relocation sites. Relocated fish may also have to compete with other native and non-native fishes for available resources such as food and habitat. Some of the fish at the relocation sites may move and reside in areas that have more suitable habitat and lower fish densities. As each fish moves, competition is expected to remain localized to a small area or quickly diminish as fish disperse.

Most of the impacts to steelhead associated with fish relocation is anticipated to be non-lethal, however, a very low number of rearing juveniles (mostly young of the year) captured may be injured or die. The number of fish affected by increased competition is not expected to be significant at most fish relocation sites, based upon the suspected low number of relocated fish inhabiting the project areas. Harmful effects of fish relocation activities are expected to be significantly reduced by implementing measures to reduce stress and potential for injury or death. Fish relocation activities will occur during the summer low-flow period after most of the emigrating smolts have left the proposed project site and before adult fish travel upstream in the late fall. Therefore, the majority of the steelhead that may be captured will be juveniles, generally young of the year and one-year age classes. Based on prior experience with current relocation techniques and protocols likely to be used to conduct the fish relocation, unintentional mortality of steelhead expected from capture and handling procedures is not likely to exceed three percent. Mortality from these activities can be reduced to near one percent with increased skill and experience of the operator, and field crew conducting the work.

From 2010 to 2019, there were 59 SMP activities completed along 8 creeks within steelhead critical habitat. These activities occurred in three Zones including: Zone 1A (Windsor Creek); Zone 2A (Adobe, Lichau, Lynch, and San Antonio creeks), and Zone 3A (Nathanson and Rodgers creeks). Vegetation management was completed at 42 SMP reaches totaling 9,100 linear feet. Sediment removal was completed at 17 SMP reaches totaling 9,939 linear feet. During that 10-year period, very few steelhead were observed or relocated. Fish rescues were necessary in 7 creeks during 15 sediment removal activities totaling 11,032 linear feet of disturbance (Table 5). All of these fish rescues were conducted in urbanized areas in lowland engineered channels with marginal and degraded habitat. This equates to an average of 1.5 fish rescues/year and an average disturbance of 1,103 linear feet/year. Steelhead were only captured on 2 occasions in Lichau and Austin creeks, which is a detection rate of 13.3 percent. A total of 47 steelhead were captured (4.7 fish/year) and 5 juvenile steelhead mortalities were recorded, which is a mortality rate of 0.5 fish/year.

A couple of unique steelhead rescue/mortality events occurred in 2020 that are not included in the following tables. These events were likely the result of extenuating climate circumstances as Sonoma County (and its waterways) experienced extreme drought conditions in 2020. In Reach 4 of Copeland Creek, a pool in a previously excavated area became re-watered after sediment removal was completed and one dead steelhead was found. The next day, SCWA rescued one adult and one juvenile steelhead from the pool and relocated them to a downstream shaded pool. Another fish rescue occurred just downstream of a sediment removal project reach in Reach 2 of Adobe Creek. Four steelhead parr were relocated upstream to a pool at Sartori Drive, which appeared to be the only suitable pool remaining in lower Adobe Creek at the time. Water quality at the release site was measured after the steelhead were released and revealed that the pool's dissolved oxygen level was low at 1.4 mg/L (1.4 ppm). Recapturing with dip nets was not effective and use of an electrofisher was not feasible due to high conductivity (692 µS/cm). All four steelhead parr died shortly after release, likely due to stress experienced from poor water quality conditions prior to capture.

Table 5. Fish rescues conducted within steelhead habitat during SMP sediment removal activities from 2010-2019.

Year	Zone	SMP Reach	Channel Type/ Land Use	Steelhead Critical Habitat	Channel Disturbance (linear feet)	Steelhead Relocated	Steelhead Mortality
2012	1A	Copeland4, Copeland5	Engineered/ Urban		205	0	--
2012	1A	Laguna1	Engineered/ Agriculture		1,800	0	--
2012	1A	Windsor1B	Engineered/ Urban	Yes	455	0	--
2013	2A	Lichau4, Lichau5	Engineered/ Urban	Yes	210	4	0
2014	1A	Copeland2	Engineered/ Urban		141	0	--
2014	1A	Copeland3, Copeland4	Engineered/ Urban		189	0	--
2015	1A	Copeland4, Copeland5	Engineered/ Urban		230	0	--
2016	1A	Austin1, Brush2B	Engineered/ Urban		185	0	--
2016	1A	Copeland3, Copeland4	Engineered/ Urban		310	0	--
2017	1A	Copeland2	Engineered/ Urban		3,771	0	--
2017	1A	Copeland4, Copeland5	Engineered/ Urban		370	0	--
2018	1A	Copeland3	Engineered/ Urban		896	0	--
2018	6A	WestSlough1	Engineered/ Hwy 101 and Vineyard		400	0	--
2019	1A	Austin2	Engineered/ Urban		1,470	43	5
2019	6A	WestSlough1	Engineered/ Hwy 101 and Vineyard		400	0	--
				TOTAL	**11,032**	**47**	**5**

Table 6. Total number of SMP activities, linear feet of stream disturbance and fish rescues conducted from 2010-2019.

Maintenance Activity Type	Number of Maintenance Activity Events	Reach Disturbance (feet)	Fish Rescue Needed and Conducted
Bank Repair	4	580	0
Sediment Removal	64	52,068	15
Vegetation Management	188	129,680	0
Total	**256**	**182,328**	**15**

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

Water Quality

It is anticipated that steelhead (juveniles and smolts) within the action area may be exposed to small, short-term, pulses of turbidity. These pulses may occur either: 1) when previously armored sediment in a dry channel is mobilized as the action area re-waters the following fall; or 2) immediately during construction activities that require dewatering. Turbidity is the degree to which water loses its transparency due to the presence of suspended sediment. A turbidity level greater than five nephelometric turbidity units (NTU) is considered visible turbidity and turbidity levels above 25 NTU have been shown to cause reductions in salmonid growth (Sigler *et al.* 1984). Deposition of fine sediments can reduce incubation success (Bell 1991), interfere with primary and secondary productivity (Spence *et al.* 1996), and degrade cover for juvenile salmonids (Bjornn and Reiser 1991). Chronic, moderate turbidity can harm newly-emerged salmonid fry, juveniles, and even adults by causing physiological stress that reduces feeding and growth and increases basal metabolic requirements (Bjornn and Reiser 1991, Servizi and Martens 1991, Spence *et al.* 1996).

A study by LaChance et al. (2008) determined that the level of sediment accumulation within a streambed returned to control levels between 358 to 1,442 meters downstream of a culvert replacement. Downstream sediment effects from the proposed SMP activities are expected to extend downstream for a distance much lower than the range presented by LaChance *et al.* (2008), likely no further than a few hundred feet below the project site. Considering the anticipated separation between projects in a given season, sediment impacts from individual projects are not expected to combine. These temporary pulses of turbidity may cause steelhead to move laterally and downstream of the project area (McLeay *et al.* 1984, 1987, Sigler *et al.* 1984, Lloyd 1987, Servizi and Martens 1991). This avoidance behavior is not anticipated to reach lethal levels, but may result in less fitness of individual fish due to occupation of less suitable habitat, reduced feeding, and greater intra and interspecific competition which, along with increased predation risks. However, salmonids have evolved in systems that periodically experience short-term pulses (days to weeks) of high suspended sediment loads, often associated with flood events, and it may be assumed are adapted to such high pulse exposures. SMP activities are proposed to occur during work windows that coincide with the lowest flows of the year. Conducting work during these times results in less mobilization of fine sediments, because during low water velocity associated with low flows, the stream has less ability to mobilize fine sediments. NMFS, therefore, expects that any exposure to temporary turbidity pulses will result in a very minor reduction in survival rates.

Construction operations in, over, and near surface water have the potential to release contaminants into surface waters. The use of heavy equipment creates a risk of accidental spills of fuel, lubricants, hydraulic fluid, coolants, and other contaminants. Petroleum-based contaminants, such as fuel, oil, and some hydraulic fluids, contain polycyclic aromatic hydrocarbons, which can be acutely toxic to salmonid fish and other aquatic organisms at high levels of exposure and can cause sublethal adverse effects to aquatic organisms at lower concentrations (Heintz et al. 1999; Incardona et al. 2005; Incardona et al. 2004; Incardona et al. 2006).

To minimize the risk of contamination from accidental spills or leaks, all ground-disturbing, in-channel SMP activities will take place during the low-flow period, between June 15 and October 31. All maintenance equipment and materials will be staged within existing service roads, paved roads, or other pre-determined staging areas away from steelhead-bearing streams. No runoff from the staging areas may be allowed to enter waters of the State, including the creek channel or storm drains, without being subjected to adequate filtration (e.g., vegetated buffer, hay wattles or bales, silt screens). Due to these measures combined with the extensive list of other BMPs (See Table 1 of the BA (SCWA 2021), conveyance of toxic chemicals into waters from projects implemented under the SMP is not expected, and the potential for toxic materials from projects to degrade salmonid critical habitat is considered to be negligible.

SCWA uses herbicides sparingly as part of the SMP. Glyphosate-based products approved for use around aquatic environments (Round-up Pro, Aquamaster, or similar), as well as a pre-emergent (Semera) herbicide, and surfactants (AgriDex and Dyne-Amic) are used to manage Himalayan blackberry and trees in the flood control channel, and along gravel access roads as described in the project description. Approximately 5-10 gallons of herbicides are applied per month during the dry season (June-October) throughout the SMP area. More specifically, in 2017 SCWA used one gallon of AquaMaster for stump treatment, 2 gallons for access road maintenance, and 21.5 gallons for invasive species control. The SMP does not include application of herbicides directly to water bodies and aerial spraying of herbicides is not included in the proposed action.

These chemicals could enter the aquatic environment via a number of pathways, including unintentional spray drift, accidental spills, or chemical transport by erosion and sediment transport, runoff, or soil percolation. Any herbicides reaching surface waters may result in mortality to fish during incubation, or lead to altered development of embryos. Stehr et al. (2009) found that the low levels of herbicide delivered to surface waters are unlikely to be toxic to the embryos of ESA-listed salmon, steelhead and trout. However, mortality or sub-lethal effects such as reduced growth and development, decreased predator avoidance, or modified behavior may occur. Herbicides are likely to also adversely affect the food base for listed salmonids and other fish, which includes terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish.

The active ingredients of herbicides (and surfactants) proposed for use in the SMP are approved by the EPA for aquatic use and are considered only slightly toxic or practically non-toxic to fish as defined by EPA (i.e., having an EC50 or LC50 of >10-100 parts per million (ppm), and >100 ppm, respectively; a LC50 is the dose that is acutely lethal to 50 percent of the test subject population while an EC50 is the dose that produces an acute effect in 50 percent of the test population). NMFS has previously analyzed the effects of these activities using the similar active ingredients and project design criteria for the Habitat Improvement Program conducted by the Bonneville Power Administration (BPA) (NMFS 2020). In this most recent analysis, BPA analyzed the aquatic toxicity of numerous herbicides using EPA's GENEEC modeling software to produce generic estimated environmental concentrations (EECs) assuming direct application of the active ingredient to a one-acre pond that is one foot deep. These EECs were compared to adverse effect thresholds for listed salmonids defined as either 1/20th of the LC50 value or the lowest acute or chronic "no observable effect concentration", whichever was lower. The Glyphosate-based products proposed for use in the SMP underwent this comparison (see below) and were found to be of "low concern", for having a risk of adversely affecting listed salmonids (NMFS 2020).

> Glyphosate – is the most commonly used herbicide in the world. It is moderately persistent in soil, with an estimated average half-life of 47 days (range 1-174 days). Glyphosate is relatively non-toxic for fish. There is a low potential for the compound to build up in the tissues of aquatic invertebrates. In resident freshwater fish, toxicity appears to increase with increasing temperature and pH. The U.S. Forest Service and Bureau of Land Management looked at the exposure of ESA-listed fish from the treatment of emergent knotweed with glyphosate. They found that potential for exposure varied with application rates, and that there was a potential for adverse effects at the higher application rate with all three application methods. They concluded, however, that adverse effects were not likely to occur with the stem injection methods because only a few milliliters of glyphosate would be injected per stem, and it is unlikely that enough stems would be broken to result is instream concentrations exceeding the salmonid effects threshold.

The more extensive examination done recently by BPA and NMFS (2020), informed by modeling of exposure and including additional and more stringent management controls, still determined that some herbicides are likely to enter streams through drift, attached to eroded sediments or dissolved in runoff from treated areas. This is due to the uncertainties associated with the effectiveness of the conservation measures. Therefore, despite the inclusion of buffers and restricted application methods, we expect that over the 10-year period of SMP actions covered by this consultation that it is reasonably likely that herbicides, alone or in combination with other herbicides and the proposed adjuvant, will reach streams with listed steelhead and that this may result in some sublethal adverse effects as described above.

Habitat and Cover

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

Localized sediment management may include targeted geomorphic shaping and minor contouring of existing channel features. Geomorphic shaping activities maintain the low-flow channel and other features in their basic form but may alter their alignment to reduce the bank erosion potential. Geomorphic shaping activities are focused on realigning the low-flow channel and adjacent bars more than increasing channel capacity. During sediment management activities SCWA will also often develop a low-flow channel along the thalweg that can successfully transport sediment under lower flow conditions. The goal is to reduce sediment deposition in certain channel reaches which can improve water quality, habitat conditions, and fish passage during summer flows. The habitat and fish migration benefits of low-flow channels are described in the Russian River Biological Opinion (NMFS 2008). The use of low-flow channels is a specifically mentioned terms of that opinion’s Reasonable and Prudent Measures, where low-flow channels will be constructed and monitored at least twice between large storms during the winter to assess their function as migration corridors and the possible effects of the low-flow channel on overall channel conditions. The SMP approach is consistent with the terms and conditions of the opinion, and the SMP will comply with those terms.

The proposed project will also alter existing physical habitat along streambanks. However, these alterations will likely improve habitat function for the most part, as explained below. Based upon the past frequency of bank stabilization projects occurring within the action area, we estimate that up to 20 individual bio-engineered bank stabilization projects and supplemental conservation measures (combined) may occur under the proposed action each year. Bank stabilization impacts the physical habitat in two general ways – by changing a dynamic, unrestrained stream that constantly evolves via hydrologic and geomorphic processes into a fixed, simplified channel, and by altering the physical land/water interface (i.e. streambank) that provides shelter, food, and other ecosystem benefits to aquatic species, including juvenile salmonids. Unlike the common, favored approach of lining the entire streambank with rock rip rap that results in a habitat interface lacking suitable juvenile fish habitat (Schmetterling *et al.* 2001), the proposed bio-engineering methods will instead utilize natural material (e.g., use of engineered back filled soils, erosion control fabric, and live native plantings) to craft a streambank that will resist lateral erosion while providing complex rearing, feeding and sheltering habitat. Also, projects carried out under the proposed action will be limited to those that protect critical infrastructure or property, or streambanks that have previously been stabilized, suggesting that work sites will largely occur in urban areas where streambank habitat is currently degraded following decades of urban encroachment and stream channelization. Replacing this poor habitat with bio-engineered stabilization and riparian planting will likely improve existing habitat at project sites, improving salmonid growth and survival (Zika and Peter 2002).

While the bio-engineered bank stabilization projects carried out under the proposed action will benefit degraded salmonid habitat by manually improving it, the achieved habitat quality and persistence will likely fall short of that achieved naturally through dynamic channel processes. Because of the perpetual nature of most bank stabilization structures, any impacts experienced by species with typically short life-spans will likely manifest as a continued depression in juvenile carrying capacity at the site level. However, as noted above, the proposed bio-engineered approach will improve habitat condition relative to what currently exists within the channelized action area (Zika and Peter 2002). We expect substantially more juvenile fish will be able to successfully rear in these areas after bio-engineering bank stabilization improves habitat conditions. Successful rearing includes a likelihood of returning to spawn relatively similar to fish rearing in other areas of the watersheds where these bank stabilization projects occur. This improvement does not fully counter-balance the ongoing impact on habitat function and carrying capacity caused by extending channelization into the foreseeable future, but instead compensates for it to a fair degree at the site level. Nevertheless, some loss of juvenile steelhead will result from the continued depression of juvenile carrying capacity at the site level. NMFS expects the amount of loss will be very low due to the habitat improvement work proposed.

Cover is an important habitat component for juvenile salmonids and smolts, both as velocity refuge and as a means of avoiding predation (Shirvell 1990, Meehan and Bjornn 1991, Moyle 2002). Salmonid juveniles will balance their use of cover and foraging habitats based on their competing needs for energy acquisition and safety (Bradford and Higgins 2001). Critical forms of cover include submerged vegetation, woody debris, and the interstitial spaces of stream bed gravel substrate (Raleigh *et al*. 1984). Juveniles will respond to threats of predation, including overhead motions, by huddling together and/or fleeing to nearby cover (Bugert and Bjornn 1991). Few young-of-the-year are found more than one meter from cover (Raleigh *et al*. 1984). Juvenile steelhead, particularly the younger, smaller individuals, have a notable response to disturbance; they rely on nearby substrate particles (i.e., gravel) for cover more so than other salmonids (Chapman and Bjornn 1969, Everest and Chapman 1972).

As part of the proposed action, up to 100 feet of contiguous woody vegetation may be removed in any given engineered channel reach. However, SCWA's ongoing SMP mitigation program has improved shade and cover conditions throughout the action area. Between 2009-2010, SCWA conducted habitat restoration projects resulting in a total of 99,044 linear feet (approximately 68 acres) of channel plantings, including 7,016 trees and 2,609 shrubs. Planting new trees or enabling natural recruitment of native vegetation along reaches where vegetation was removed helps mitigate the temporary impacts of SMP activities. As these planted or recruited trees mature, they provide shade to the active channel, provide foraging habitat, moderate water temperature, and help reduce the need for future sediment management as the shade discourages cattail establishment which in turn traps sediment. In addition, increased vegetation along the streambanks improves water quality through shading the stream and cooling water temperatures, and through filtering runoff entering the creek. While the constraints of an urban system (where the majority of SCWA's engineered maintenance, reaches are located) may limit the degree to which water quality is improved, even small improvements may provide a more hospitable environment for steelhead and their aquatic invertebrate food source.

Food Availability

Benthic (bottom-dwelling) aquatic macroinvertebrates within the project site may be killed or their abundance reduced during SMP activities. Localized losses in benthic macroinvertebrate abundance are expected when substrates are modified (Thomas 1985; Harvey 1986). Juvenile salmonids rely on a mixture of terrestrial and aquatic invertebrates (Rundio and Lindley 2008; Grunblatt *et al*. 2019). These organisms are consumed by salmonids, and may represent a substantial portion of their diet at various times of the year.

The effect of aquatic macroinvertebrate loss on steelhead will be temporary because construction activities will be relatively short lived. Stream reaches where sediment management and dewatering will be relatively small when compared to the action area and even smaller when considering the entire steelhead DPS. 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 steelhead is likely to be negligible because food from upstream sources (via drift) would be available downstream of dewatered areas since stream flow will be bypassed around project work sites. SCWA's bio-engineered bank stabilization approach combined with intensive vegetation planting as part of their mitigation program will increase the overall condition of the riparian habitat, leading to an increase in food production. Since impacts to the substrate will be temporary and localized to a small area within the watershed, and the habitat in the action area is not considered highly productive for juvenile rearing, steelhead 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 SMP activities.

Frequency and Duration of Effects

SCWA expects that reach scale projects where sediment is removed from an entire stream reach averages 1,000-3,000 feet long removing between 2,000 and 7,500 cubic yards of sediment. Localized projects are typically less than 400 feet long at culverted crossings, and 400-1,000 feet long with 500-1,000 cubic yards of sediment removed at other locations for geomorphic channel shaping, individual bar grading, and sediment basin management. The number of these projects and quantity of sediment removed is dependent on weather and hydrologic conditions as well as the frequency and extent of past maintenance activities. Reach-scale projects may be revisited every 5-7 years, whereas localized sediment removal projects are typically revisited every 1-3 years. The combined average length of channel for both intermediate and reach scale sediment maintenance is expected to be approximately 3,500 linear feet, with a 35,000 linear-feet maximum across the entire SMP plan area over the 10-year permit period. No more than 100 feet of contiguous woody vegetation will be removed in any given engineered channel reach. These totals will likely be even less for projects conducted specifically in steelhead streams as those are a subset of the entire SMP plan area.

The effects of construction such as elevated suspended sediment and increased risk of injury or death from dewatering and fish handling will remain while construction is underway. This can vary from a few hours to a few months depending on the scale of the project. For most projects, the construction phase lasts for a few weeks. Most projects involve a single construction phase. Some projects require an initial construction phase followed by periodic maintenance. Most projects that require in-water work will be done in the dry, which will avoid extended periods of elevated suspended sediment. In these cases, the risk would be highest as areas are being re-watered. The indirect effects of construction such as riparian, streambank, and channel disturbance typically last for a year or two until the project site recovers from the disturbance. During this time, habitat quality for steelhead will remain impaired to some extent.

2.6. Cumulative Effects

"Cumulative effects" are those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation [50 CFR 402.02 and 402.17(a)]. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

Actions occurring outside of the action area may affect the action area. For example, a new water diversion upstream may affect flows in the action area. Therefore, future actions occurring in the watershed may be considered cumulative effects, depending upon their specific location and impact. Future Federal actions, including the ongoing operation of dams, hatcheries, fisheries, water withdrawals, and land management activities will be reviewed through separate ESA section 7 consultation processes and are not considered here.

Additional development, tourism, and accompanying infrastructure construction is expected to occur in the affected watersheds based on the general and specific plans of local communities and Sonoma County. Additional development is likely to lead to increasing water demands, which may impact stream flows if current allocations are not being fully utilized. Agricultural activities surrounding the action area are primarily the cultivation of crops, mainly viticulture. The impacts of this land use on aquatic species include decreased bank stability, loss of shade and cover-producing riparian vegetation, increased sediment inputs, decreased ground and surface water supply, and elevated coliform bacteria levels. Vineyard development and management will continue to impact salmonid habitat by increasing sediment delivery to streams, diverting and decreasing stream flow, and encroaching on riparian habitat.

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

2.7. Integration and Synthesis

The Integration and Synthesis section is the final step in assessing the risk that the proposed action poses to species and critical habitat. In this section, we add the effects of the action (Section 2.5) to the environmental baseline (Section 2.4) and the cumulative effects (Section 2.6), taking into account the status of the species and critical habitat (Section 2.2), to formulate the agency's biological opinion as to whether the proposed action is likely to: (1) reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing its numbers, reproduction, or distribution; or (2) appreciably diminish the value of designated or proposed critical habitat as a whole for the conservation of the species.

Of the proposed SMP activities, riparian habitat restoration occurring outside of the wetted channel are expected to have mostly beneficial effects to CCC steelhead and the designated critical habitat for CCC steelhead and CCC coho salmon. All other actions (sediment and vegetation management, and bank stabilization) likely cause a low level of temporary or long-term adverse effects to steelhead. Despite the different scope, size, intensity, and location of these proposed actions, the potential adverse effects to listed steelhead and their habitat result from dewatering, fish relocation, increased sediment, streambed and bank alteration, and herbicide use. Dewatering and fish relocation will result in direct effects to steelhead, where a small percentage of juveniles are expected to be injured or killed. Implementing actions associated with streambank stabilization and sediment management has the potential to result in longer-term adverse effects to designated habitat. The effects from increased sediment, contaminants, or herbicides into streams are usually indirect effects, where the effects to habitat, individuals, or both, are reasonably certain to occur and are later in time.

SCWA has implemented the SMP with proven success since 2006. SCWA has consistently engaged with an inter-agency working group, including representatives from NMFS, CDFW, COE, RWQCB, and USFWS, during the development and adaptive management of the SMP. SCWA hosts annual site visits with the working group to go over proposed projects for each upcoming season and punctually provides comprehensive annual reports. In 2019, SCWA developed a comprehensive SMP Database to assist with monitoring program activities, permitting compliance, and tracking habitat and canopy development. Together, this collaborative approach has allowed the SMP to operate while employing avoidance and minimization measures that reduce effects to CCC steelhead and their critical habitat to the maximum extent practicable. SCWA will ensure the appropriate design criteria are incorporated into all phases of design for each authorized project and that any unique project or site constraint related to site suitability or special maintenance needs are resolved as the project is being designed. SCWA will continue to coordinate with the working group on complicated projects or areas that are outside the scope of the proposed action. This level of program administration is necessary to ensure that projects are being implemented consistently with project design measures and program intent, thus ensuring that the effects are consistent with the analysis in this opinion.

Overall, the SMP has had a very low impact on steelhead since the SMP began in 2010. SMP ground disturbance activities that required fish rescues for steelhead occurred in degraded engineered channels in mainly urban areas with an average annual temporary disturbance of 1,103 linear feet/year. Also, there has been an infrequent need to conduct fish rescues within steelhead habitat at 1.5 fish rescues/year. In addition, the impact on juvenile steelhead has been low at an average capture rate of 4.7 fish/year and a mortality. rate of 0.5 fish/year. This low abundance of steelhead is largely due to 1) the location of most SMP reaches in lowland and low-gradient stream sections, 2) degraded rearing habitat, including elevated summer temperatures, present in SMP channels, and 3) low-flow summer timing of SMP maintenance that avoids adult migration during winter and spring. Though the reported mortality rate has been higher than the expected 3 percent of those handled, several of these were likely due to circumstances beyond SCWA’s control and not due to negligence or improper implementation of conservation measures.

The action area within the Petaluma River and Sonoma Creek watersheds as well as the few Russian River tributaries are primarily confined and surrounded by urbanized and agriculture areas. The existing riparian corridor is extremely narrow and a small remnant of its former extent. These factors have led to a reduction in the native riparian vegetation, the introduction of non-native plants, increased straightening and engineered channelization for flood control purposes, increased erosion and sedimentation, loss of habitat complexity, increased urban run-off, water diversions, and increased fish passage impediments during low and high flow periods. Furthermore, the hydrology and natural geomorphic processes have been severely altered and non-point sources of pollution, such as urban and agricultural runoff, continue to contribute to the degradation of water quality within the action area. Due to these factors and the factors listed above, NMFS believes that the ability for CCC steelhead to occupy the action area has declined and that critical habitat within the action area is degraded.

There is limited population data for CCC steelhead in the Petaluma River and Sonoma Creek watersheds or in the few tributaries of the Russian River that are covered under this opinion. What little data exists includes multiple age classes of steelhead, which indicates spawning success in multiple years. The Petaluma River steelhead population is probably smaller than the Sonoma Creek population, as described above in the Environmental Baseline section. NMFS believes that it is very unlikely that more than a few juvenile steelhead will be encountered during a single dewatering event due to the poor habitat conditions in engineered channels of the Petaluma River. There is a high likelihood that most rearing juvenile steelhead are outside the action area, higher up in tributaries where cooler water and sufficient habitat is available. Based on this inference, it is most likely that adults returning to the action area are derived from juvenile steelhead reared in locations outside the action area and not the few individuals that may have reared in stressful habitat conditions lower in the watersheds and within the action area.

As independent populations, federally threatened CCC steelhead within the included watersheds, are important to the recovery of the DPS. The steelhead populations that use the action area, while substantially reduced from historical numbers, appear to be relatively stable. These populations are likely to persist with enough resiliency to rebound from limited impacts for the foreseeable future. However, due to their low numbers, the continuation of impacts from current baseline conditions to the population's numbers, distribution, or reproduction could limit their chance of survival and recovery. The recovery of these populations will therefore depend upon programs that protect and restore aquatic habitats in watersheds and the continued reduction of impacts from land use and water withdrawal.

The action area represents a relatively small portion of the overall CCC steelhead geographic range. Small populations are more vulnerable to demographic and environmental fluctuations than are larger populations (Gilpin and Soule 1986, Pimm *et at.* 1988), while each small population also acts as a buffer against extinction of the species. The species' relatively broad distribution throughout the species' ranges is a positive indicator because species with broad distributions may allow a species to avoid environmental fluctuations and stochastic events as a whole (Pimm *et al.* 1988), even if they suffer local extirpation. However, the value of these watersheds to steelhead remains significant given the current degraded condition of habitat throughout the ESUs and DPS. Because degraded habitat conditions, and thus lowered carrying capacity, throughout the species' range are not expected to improve dramatically in the near future, remaining areas of habitat which appear to support relatively large sub-populations are judged highly important.

Global climate change presents another real threat to the long-term persistence of listed salmonids, 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. However, extrapolating these general forecasts to the smaller action area is difficult, given local nuances in geography and other weather-influencing factors. The risk of increased water temperatures, wildfires, and drought will persist in the action area due to climate change over the next several decades, reinforcing the likelihood of reduced carrying capacity in the action area due to loss of habitat.

Increases in turbidity and degraded water quality may result in behavior modifications that result in short-term behavioral changes of individual fish. The behavioral modifications of steelhead which may result from project impacts, (i.e., reduced feeding rates, occupation of less suitable habitat, and potentially greater intra and/or inter-species competition), will likely result in less fitness of individual fish. Reduced fitness of individual fish, along with potentially increased predation risks, may result in a minor reduction in survival rates. The ultimate effect of changes in the distribution and productivity of salmon and steelhead due to project impacts will vary with life stage, the duration and severity of the stressor, the frequency of stressful situations, the number and temporal separation between exposures, and the number of contemporaneous stressors experienced (Newcombe and Jensen 1996; Shreck 2000). Overall, the action area is very small compared to the total number of miles of critical habitat available in each species' recovery domain. The number of individual steelhead that may be adversely affected or killed during proposed action activities is expected to make up a very small portion of the individuals within the action area, a smaller portion individual watershed populations, and subsequently an even smaller portion of the overall DPS. Because the quality of habitat in and around the action area is adequate to support rearing steelhead, NMFS expects fish will be able to find food and cover in the vicinity of the project site as needed during construction activities.

It is unlikely that the small loss of steelhead from freshwater life history stages resulting from this proposed action, would impact future adult returns such that impacts would occur to the populations' resilience and persistence over time. As noted in the effects section, effects from the proposed action are likely to be limited to small areas within the action area. In addition, given the small reduction in the growth and survival of fish that will be directly affected, primarily at the fry, parr, and smolt life stages, the relatively low intensity and severity of that reduction at the population level, any adverse effects to fish growth and survival are likely to be inconsequential to the populations inhabiting the action area. Moreover, the restoration component of the proposed action is also reasonably certain to lead to some degree of population enhancement within the vicinity of the action area, including more normal growth and development and improved survival. Thus, likely having long-term beneficial effects on population structure.

The adverse effects of the proposed action will be too short-term, and limited to harm or kill no more than a small number of juvenile fish across the range of a single population. Thus, it is unlikely that the small losses of steelhead resulting from this proposed action would impact future adult returns. The resilience and persistence of these populations, their numbers, reproduction, and distribution, are unlikely to be meaningfully reduced by the proposed action. Habitat changes resulting from this project is limited to a very small area. Consequently, we do not expect that implementation of the proposed action is likely to reduce appreciably the likelihood of both the survival and recovery of the CCC steelhead DPS in the wild by reducing their numbers, reproduction, or distribution. The SMP is also not likely to diminish the value of designated critical habitat for CCC steelhead or CCC coho salmon in the action area.

The effects of the proposed action, when added to the environmental baseline, cumulative effects, and species status, are not expected to appreciably reduce the quality and function of critical habitat at the larger DPS or ESU level, given: 1) the temporary duration of many of the effects, 2) the small areas within the action area experiencing longer term adverse effects, and 3) the size of these areas compared to the quality and quantity of habitat within the entire action area. While the environmental baseline remains in degraded condition due to urban development, historical agricultural practices (channelization, etc.) and other impacts, SCWA has taken steps described above in the environmental baseline to help restore some channel functions and reduce impacts on aquatic habitat that are already providing improved habitat conditions. These habitat enhancement actions are expected to continue during the period of the proposed action, and habitat quality is expected to continue to improve in many portions of the action area. Thus, although the proposed action will continue some degradation of critical habitat into the future, the proposed action helps begin the process of restoring habitat processes important to salmonids in the engineered channels. The proposed action will not restore these habitat processes, but will instead artificially create and maintain many instream habitat components important to salmonid habitat at each site while not precluding additional restoration work in the future. Therefore, the ability of critical habitat to play its intended conservation role of supporting populations of CCC steelhead and CCC coho salmon as a whole will not be appreciably reduced.

2.8. Conclusion

After reviewing and analyzing the current status of the listed species and critical habitat, the environmental baseline within the action area, the effects of the proposed action, the effects of other activities caused by the proposed action, and the cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of CCC steelhead or destroy or adversely modify designated critical habitat for CCC steelhead or CCC coho salmon.

2.9. Incidental Take Statement

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

2.9.1. Amount or Extent of Take

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

In this opinion, NMFS determined that a low-level of incidental take of juvenile CCC steelhead in the form of injury, harm, or mortality is reasonably certain to occur as follows during dewatering and fish relocation events that occur during the implementation of sediment management or bank stabilization activities:

> As described in the preceding opinion, based on prior experience with current relocation techniques and protocols likely to be used to conduct the dewatering and fish relocation, unintentional mortality of listed salmonids expected from capturing and handling fish is not likely to exceed three percent of the total CCC steelhead handled over the 10-year plan. The amount of incidental take during dewatering and fish relocation will be considered exceeded if more than three percent of the total fish handled are injured or killed during any dewatering and fish relocation.

In this opinion, NMFS also determined that a low-level of incidental take in the form of harm to juvenile CCC steelhead from habitat-related impacts (altered stream hydrology/morphology, impaired water quality, and degraded riparian habitat conditions) due to the implementation of SMP activities. NMFS expects this incidental take be mostly localized and occur within the action areas. The precise number of these listed steelhead that are expected to be incidentally taken resulting from these habitat-related impacts cannot be accurately quantified because: 1) these species are relatively small (especially as eggs, alevins, and juveniles); 2) these species live in aquatic environments where visibility is often low, hiding cover is often available, and predators feed; 3) exactly how many adults that will migrate through the action area will experience delays or behavioral modifications is unknown; and 4) we cannot precisely predict where and when habitat impacts may affect these species later in their life cycles. NMFS will, therefore, use the following incidental take surrogates pursuant to 50 CFR 402.14(i)(1)(i).

The following programmatic surrogate for the amount or extent of such incidental take is the best currently available indicator that is proportional to those effects. This is because all habitat pathways of incidental take will vary in proportion to altered stream hydrology/morphology, impaired water quality, and degraded riparian habitat conditions.

> The extent of incidental take will, therefore, be considered exceeded if the total number of SMP activities implemented under the proposed action within the action area over the 10-year term of the plan exceed the numbers listed in the table in Appendix A. As described in the Effects of the Action section of this opinion, although the totals in Appendix A represent the amount of such activities expected to occur in streams that either support CCC steelhead, are considered designated critical habitat for steelhead or coho salmon, or both. There is no specific information on exactly how many of the activities are expected to occur within areas occupied by CCC steelhead, nor is there any aspect of the proposed action that would limit all of the activities from occurring in steelhead streams. Thus, for purposes of analyzing the adverse effects of such activities that may occur in the action area as a result of the proposed action, NMFS is assuming that all of the activities are likely to occur within the streams identified in Tables 1 and 2 that are either known to support or have the potential to support CCC steelhead, and are reasonably certain to result in incidental take of this listed species.

2.9.2. Effect of the Take

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

2.9.3. Reasonable and Prudent Measures

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

1. Measures shall be taken to minimize the amount or extent of incidental take due to the implementation of SMP activities (sediment and vegetation management and bank stabilization).

2. Measures shall be taken to protect essential habitat features on steelhead streams during SMP activities on these streams

3. Measures shall be taken to monitor the amount and extent of incidental take by reporting the results of fish relocation activities as well as other project details.

2.9.4. Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, SCWA must comply with the following terms and conditions. SCWA 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 terms and condition, protective coverage for the proposed action would likely lapse.

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

1. SCWA shall ensure that all sprayers are set to apply at the maximum recommended droplet size and lowest pressure setting recommended to the herbicide.

2. SCWA shall ensure that no more than three herbicides are mixed in a tank mixture in order to prevent potential additive toxicity in the event that non-targeted areas are exposed.

3. SCWA shall retain a qualified biologist with expertise in the areas of salmonid and steelhead biology, behavior, habitat relationships; and biological monitoring. SCWA shall ensure that all fisheries biologists working on this project be qualified to monitor fish presence and behavior in a manner which minimizes all potential risks to ESA-listed steelhead.

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

5. The biologist shall be on-site during all construction events to ensure that all ESA-listed fish are avoided to the maximum extent practicable and any use of seining or block-nets is in accordance with BMPs developed to minimize potential harmful effects or mortality.

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

1. A worker education program shall be implemented for SCWA’s SMP employees and contractors working at SMP project sites on steelhead streams. The goal of the education program shall be to education SCWA’s employees and contractors on the potential for steelhead in SMP project areas, how they should respond if they encounter steelhead, and the importance of protecting stream habitat. Employees shall receive instruction regarding construction impact minimization methods, including all appropriate SMP conservation measures, and the Terms and Conditions presented in this Incidental Take Statement.

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

1. SCWA will submit a Post-Maintenance Summary Report following SMP activities to NMFS each year. It is understood that since the introduction of the SMP database in 2020, this annual report may be condensed and much of the information referenced in the database. The report should include the following:

    a. **Sediment and Vegetation Management Activities.** The report shall include the dates these SMP activities began and were completed, photographs taken before, during, and after the activity from photo reference points, a discussion of any unanticipated effects or unanticipated levels of effects on steelhead and their habitat, a description of an and all measures taken to minimize those unanticipated effects and a statement as to whether or not the unanticipated effects had any affect on ESA-listed fish or designated critical habitat and the number of steelhead killed or injured.
    b. **Revegetation.** The report shall include a description of the locations planted or seeded, the area (m^2) revegetated, a plant palette, planting or seeding methods, the efforts taken to ensure success of new plantings, performance or success criteria, and pre- and pots-planting color photographs of the revegetated area.
    c. **Dewatering.** The report shall include a list of creeks and length of reaches where dewatering was required
    d. **Fish Relocation.** The report shall include a description from which fish were removed and the release site including photographs; the date and time of the relocation effort; a description of water quality at release sites at the time of release, including, a minimum, water temperature and dissolved oxygen levels; a description of the equipment and methods used to collect, hold, and transport salmonids; if an electro-shocker was used for fish collection, the number of fish relocated by species; the number of fish injured or killed by species and a brief narrative of the circumstances surrounding any steelhead injuries or mortalities; and a description of any problems which may have arisen during the relocation activities and a statement as to whether or not the activities had any unforeseen effects.
    e. **A list of all herbicides and surfactants** used and applicable mitigation measures that were implemented. In addition, NMFS will review any new chemicals proposed for use to ensure that reinitiation of ESA section 7 consultation or separate section 7 consultation is not needed.

2. SCWA will prepare an annual work plan and coordinate an annual pre-implementation field tour with the regulatory agencies to review and discuss each year's planned activities.

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

4. Any steelhead mortalities must be retained, placed in an appropriately sized whirl-pack or zip-lock bag, labeled with the date and time of collection, fork length, location of capture, and frozen as soon as possible. Frozen samples must be retained until specific instructions are provided by NMFS.

2.10. Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Specifically, "conservation recommendations" are suggestions regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information (50 CFR 402.02).

1. SCWA is encouraged to coordinate closely with the UACGH when conducting fish removal activities prior to sediment removal activities, such that UACGH may rescue and rear these fish temporarily via their RRMP, for later release as smolts thereby improving steelhead survival and contributing to Petaluma River recovery efforts.
2. SCWA is encouraged to provide support and funding to enhance UACGH monitoring efforts on the Petaluma River, and conduct Sonoma Creek steelhead monitoring to establish more comprehensive, long-term data which informs population trends and distribution.
3. SCWA should provide support and funding for the removal or repair of the Adobe Creek culvert under Old Adobe Road, and the Adobe Creek fish ladder in disrepair, to enhance volitional passage for migrating steelhead during critical times of the year.
4. SCWA should provide support and funding for a basin-wide sediment source analysis in the Petaluma River watershed to help identify ways to mitigate erosion and high sediment deposition rates (e.g., livestock fencing, riparian planting, culvert removal).

2.11. Reinitiation of Consultation

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

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

Section 305(b) of the MSA directs Federal agencies to consult with NMFS on all actions or proposed actions that may adversely affect EFH. Under the MSA, this consultation is intended to promote the conservation of EFH as necessary to support sustainable fisheries and the managed species' contribution to a healthy ecosystem. For the purposes of the MSA, EFH means "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity", and includes the physical, biological, and chemical properties that are used by fish (50 CFR 600.10). Adverse effect means any impact that reduces quality or quantity of EFH, and may include direct or indirect physical, chemical, or biological alteration of the waters or substrate and loss of (or injury to) benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects on EFH may result from actions occurring within EFH or outside of it and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) of the MSA also requires NMFS to recommend measures that can be taken by the action agency to conserve EFH. Such recommendations may include measures to avoid, minimize, mitigate, or otherwise offset the adverse effects of the action on EFH [CFR 600.905(b)].

This analysis is based, in part, on the EFH assessment provided by SCWA and descriptions of EFH for Pacific Coast salmon (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

Pacific coast salmon EFH may be adversely affected by the proposed action.

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 disturbance of the channel bed and banks, temporary loss of wetted habitat, and temporary loss of riparian vegetation. Therefore, the effects of the project on ESA-listed species are anticipated to be the same as the effects to EFH in the action area.

3.3. Essential Fish Habitat Conservation Recommendations

Section 305(b)(4)(A) of the MSA authorizes NMFS to provide EFH Conservation Recommendations that will minimize adverse effects of an activity on EFH. Although temporary potential adverse effects are anticipated as a result of the project activities, the proposed minimization and avoidance measures, and BMPs in the accompanying biological opinion are sufficient to avoid, minimize, and/or mitigate for the anticipated effects. Therefore, no additional EFH Conservation Recommendations are necessary at this time that would otherwise offset the adverse effects to EFH.

3.4. Supplemental Consultation

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

4. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

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

4.1. Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended users of this opinion are Caltrans and the County of Sonoma. Individual copies of this opinion were provided to these agencies. The document will be available within 2 weeks at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. The format and naming adhere to conventional standards for style.

4.2. Integrity

This consultation was completed on a computer system managed by NMFS in accordance with relevant information technology security policies and standards set out in Appendix III, 'Security of Automated Information Resources,' Office of Management and Budget Circular A-130; the Computer Security Act; and the Government Information Security Reform Act.

4.3. Objectivity

Information Product Category: Natural Resource Plan

Standards: This consultation and supporting documents are clear, concise, complete, and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including the NMFS ESA Consultation Handbook, ESA regulations, 50 CFR 402.01 et seq., and the MSA implementing regulations regarding EFH, 50 CFR part 600.

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

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

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

5. References

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6. APPENDIX A. Extent and Frequency of SMP Activities over the proposed 10-year permit term.

Flood Zone	Creek	Number of Stream Reaches	Total Distance (feet) of SMP Activities	Steelhead Presence[1]	Anticipated Distance Limit for In-stream Sediment Basins[2]	Anticipated Distance Limit for Reach and Localized Sediment and Bank Repair Projects[3]	Combined Limit of SMP Activity (feet)(10 years)[4]
Zone 1A	Austin	3	6,574	O (M/R)	600	4,000	4,600
	Middle Brush	2	3,928	M/R	2,000		2,000
	Brush	5	8,587	O (M/R)	800	6,000	6,800
	BrushTrib10	1	389	O (SN)	1,000		
	Copeland	5	11,684	O (M/R)	7,200	10,000	17,200
	Laguna De Santa Rosa	3	22,131	M	1,200	10,000	
	Paulin	9	11,921	O (M)	4,000		4,000
	Piner	4	9,974	O (M)	3,600		3,600
	Santa Rosa	10	41,643	O (M/R)	15,000		15,000
	Santa Rosa Creek Diversion	2	3,671	O (M/R)	4,000		4,000
	Windsor	2	4,277	O (M/R)	6,000		6,000
Zone 2A	Adobe	5	5,102	O (M/R)	7,200	2,700	9,900
	Lichau	5	4,004	O (M)	3,500		3,500
	Lynch	3	2,414	O (M)	3,000		3,000
Zone 3A	Rogers	2	4,019	M	2,000		2,000
	Nathanson	2	1,606	O (M)	1,000		1,000
Zone 5A	Fife	2	1,300	O (M/R)	4,800	0	4,800
Zone 6A	West Slough	2	11,848	P	4,200		4,200

[1]Steelhead presence is based on current (February 22, 2022) SMP Database information. Assume potential for steelhead take using the following reach designations:

- O - Observed
- P - Potential Habitat
- M – marginal habitat
- R – rearing
- SN (presumed Potential Habitat)

[2] In-stream sediment basins can fill up annually depending on storm frequency and intensity. These basins typically need to be serviced between 1 and 3 years. Distances included here are based on anticipated frequency of clearance needed based on work needs established between 2010 and 2021. The distance indicated is a conservative estimate based on the anticipated frequency of the work need.

[3] Reach and localized sediment management are minimized by servicing in-stream sediment basins. Distances included here are based on work needs established between 2010 and 2021. The distance indicated for reach and localized removals as well as bank repairs is a conservative estimate based on the anticipated frequency of the work need.

[4]SMP activities are defined as sediment management and bank repairs. The two types of sediment removal projects include: 1) reach scale projects where sediment is removed from an entire stream reach (typically 1,000-3,000 feet long removing between 2,000 and 7,500 cubic yards of sediment); and 2) localized projects that are typically less than 400 feet long at culverted crossings, and 400-1,000 feet long with 500-1,000 cubic yards of sediment removed at other locations for geomorphic channel shaping, individual bar grading, and sediment basin management. The number of these projects and quantity of sediment removed is dependent on weather and hydrologic conditions as well as the frequency and extent of past maintenance activities. Reach-scale projects may be revisited every 5-7 years, whereas localized sediment removal projects are typically revisited every 1-3 years. The combined average (ANNUAL?) length of channel for both intermediate and reach scale sediment maintenance is expected to be approximately 3,500 linear feet, with a 35,000 linear-feet maximum over the 10-year period. No more than 100 feet of contiguous woody vegetation will be removed in any given engineered channel reach.