UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802

May 29, 2025

Refer to NMFS No: WCRO-2024-02447
FERC Docket P-5737-032

Debbie-Anne A. Reese, Secretary
Office of the Secretary
Federal Energy Regulatory Commission
888 First Street, NE, Room 1A
Washington, D.C. 20426

James Mazza Regulatory
Division Chief, U.S. Department of the Army
Corps of Engineers, San Francisco District
450 Golden Gate Avenue
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 Santa Clara Valley Water District's Anderson Dam Hydroelectric Project (FERC Project No. 5737-032)

Dear Secretary Reese and Mr. Mazza:

Thank you for your letter of September 10, 2024, requesting initiation of formal consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act of 1973 (ESA) (16 U.S.C. 1531 et seq.) for the Santa Clara Valley Water District's (Valley Water) Anderson Dam Hydroelectric Project. The Federal Energy Regulatory Commission (FERC) refers to the proposed action as the Anderson Dam Hydroelectric Project No. 5737 and what Valley Water's biological assessment and this biological opinion refer to as the Anderson Dam Program (ADP).

The enclosed biological opinion is based on our review of the proposed activities that would be authorized by the FERC and U.S. Army Corps of Engineers (USACE), and describes NMFS' analysis of potential effects on threatened Central California Coast (CCC) steelhead (*Oncorhynchus mykiss*) and designated critical habitat in accordance with section 7 of the ESA. In the enclosed biological opinion, we conclude that the proposed action will not jeopardize the continued existence of threatened CCC steelhead, and is also not likely to result in the destruction or adverse modification of designated critical habitat for CCC steelhead. NMFS anticipates that incidental take of CCC steelhead is reasonably certain to occur as a result of the proposed action, thus an incidental take statement with terms and conditions is included with the enclosed biological opinion. NMFS has also found that the proposed project may affect, but is not likely to adversely affect Southern Distinct Population Segment green sturgeon (*Acipenser medirostris*) or its designated critical habitat in accordance with section 7 of the ESA.

Thank you also for your request for essential fish habitat (EFH) consultation. NMFS reviewed the proposed action for potential effects on EFH pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), implementing regulations at 50 CFR 600.920, and agency guidance for use of the ESA consultation process to complete EFH consultation. We have concluded that the action would adversely affect EFH designated under the Pacific Coast Salmon, Pacific Coast Groundfish, and Coastal Pelagic Species Fishery Management Plans (FMPs). EFH Conservation Recommendations are included with the enclosed EFH consultation, including guidance regarding federal action agency response requirements.

We look forward to your response and appreciate the ongoing coordination for implementation of the ADP. Please contact Darren Howe, San Francisco Bay Branch Supervisor of the North Central Coast Office in Santa Rosa, California at 707-575-3152 or darren.howe@noaa.gov if you have any questions concerning this consultation, or if you require additional information.

Sincerely,

Penny Ruvelas
Assistant Regional Administrator
California Coastal Office

Enclosure

cc: Jot Splenda, FERC (via e-filing)
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Copy to e-file FRN 151422WCR2020SR00062

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

Santa Clara Valley Water District's Anderson Dam Hydroelectric Project

NMFS Consultation Number: WCRO-2024-02447
Action Agencies: Federal Energy Regulatory Commission (FERC) and
U.S. Army Corps of Engineers (USACE)

Affected Species and NMFS' Determinations:

ESA-Listed Species	**Status**	**Is Action Likely to Adversely Affect Species?**	**If likely to adversely affect, Is Action Likely to Jeopardize the Species?**	**Is Action Likely to Adversely Affect Critical Habitat?**	**If likely to adversely affect, is Action Likely to Destroy or Adversely Modify Critical Habitat?**
Central California Coast (CCC) DPS of steelhead (*Oncorhynchus mykiss*)	Threatened	Yes	No	Yes	No
Southern DPS of North American green sturgeon (*Acipenser medirostris*)	Threatened	No	NA	No	NA

Fishery Management Plan That Identifies EFH in the Project Area	**Does Action Have an Adverse Effect on EFH?**	**Are EFH Conservation Recommendations Provided?**
Pacific Coast Salmon	Yes	Yes
Pacific Coast Groundfish	Yes	Yes
Coastal Pelagic Species	Yes	Yes

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

Issued By: Penny Ruvelas
Penny Ruvelas
West Coast Region
National Marine Fisheries Service

Date: May 29, 2025

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Acronym or Abbreviation	Definition
ADSRP	Anderson Dam Seismic Retrofit Project; includes Seismic Retrofit Improvements and associated Conservation Measures
ADT	Anderson Dam Tunnel
ADTP	Anderson Dam Tunnel Project
AF	acre-feet
AMP	Adaptive Management Program
AMT	Adaptive Management Team
Anderson Dam Program (ADP)	Overall Program that includes FOCP, ADSRP, and Post-construction Operations
BA	Biological Assessment - Note: The Biological Evaluation (BE) prepared by Valley Water serves as the Biological Assessment (hereafter BA).
BE	Biological Evaluation (BE) that was prepared by Valley Water and which serves as the Biological Assessment for the proposed actions
BMI	benthic macroinvertebrate
BMPs	Best Management Practices
C	Celsius
CCC	Central California Coast
CDFW	California Department of Fish and Wildlife
CDL	Coyote Discharge Line
cfs	cubic feet per second
CM(s)	Conservation Measure(s)
CVP	Cross Valley Pipeline
CVPE	Cross Valley Pipeline Extension
CWMZ	cold water management zone
cy	cubic yards
Deadpool	Reservoir water storage condition that occurs when water levels in a reservoir are so low that they are at or below outlet facilities, and water cannot flow downstream past or through the dam. Also identified elsewhere as "dead pool".
DO	dissolved oxygen
DPS	Distinct Population Segment
eDNA	environmental DNA

Acronym or Abbreviation	Definition
EFH	Essential Fish Habitat
USEPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FAHCE	Fish and Aquatic Habitat Collaborative Effort
FCV	fixed cone valve
FCWMZ	Functional Cold-Water Management Zone
FERC	Federal Energy Regulatory Commission
FOCP	FERC Order Compliance Project including activities associated with FERC IRRM order compliance, ADTP, and associated Conservation Measures
HLOW	high-level outlet works
HLOT	high-level outlet tunnel
IRRM	Interim Risk Reduction Measure
FL	fork length
LLOW	low-level outlet works
LLOT	low-level outlet tunnel
LSAA	Lake and Streambed Alteration Agreement
mg/L	milligrams per liter
MSA	Magnuson-Stevens Fishery Conservation and Management Act
NAVD88	North American Datum of 1988
NMFS	National Marine Fisheries Service
NTU	Nephelometric Turbidity Units
OWG	Operations Working Group
PBFs	Physical and Biological Features
PFMC	Pacific Fishery Management Council
PIT	passive integrated transponder
RWQCB	Regional Water Quality Control Board
sDPS	southern Distinct Population Segment
SEV	severity of ill effect
SSC	suspended sediment concentrations
TWG	Fisheries Technical Working Group

Acronym or Abbreviation	Definition
USACE	U. S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
Vaki	Vaki Riverwatcher
Valley Water	Santa Clara Valley Water District
SWRCB	State Water Resource Control Board
WEAP	Water Evaluation and Planning
YOY	young-of-the-year

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 two weeks at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. A complete record of this consultation is on file at the NMFS North-Central Coast Office in Santa Rosa, California.

1.2. Consultation History

Updates to the regulations governing interagency consultation (50 CFR Part 402) were effective on May 6, 2024 (89 Fed. Reg. 24268). We are applying the updated regulations to this consultation. The 2024 regulatory changes, like those from 2019, were intended to improve and clarify the consultation process, and, with one exception from 2024 (offsetting reasonable and prudent measures), were not intended to result in changes to the Services' existing practice in implementing section 7(a)(2) of the Act. 89 Fed. Reg. at 24268; 84 Fed. Reg. at 45015. We have considered the prior rules and affirm that the substantive analysis and conclusions articulated in this biological opinion and incidental take statement would not have been different under the 2019 regulations or pre-2019 regulations.

On February 20, 2020, the Federal Energy Regulatory Commission Division of Dam Safety and Inspections (FERC) ordered Santa Clara Valley Water District (Valley Water) to implement interim risk reduction measures at Anderson Dam, including maintenance of Anderson Reservoir at reduced storage conditions and construction of a temporary diversion system in advance of Valley Water's developing future Anderson Dam Anderson Dam Seismic Retrofit Project (ADSRP).

On March 16, 2020, by letter to NMFS, FERC requested emergency consultation with NMFS pursuant to the Endangered Species Act (ESA) and the Magnuson-Stevens Fishery Conservation and Management Act (MSA) for FERC's February 20, 2020 directive to Valley Water and associated actions.

On July 27, 2020, in response to FERC's February 20, 2020 directive, Valley Water filed a Reservoir Drawdown and Operations Plan with FERC. The Reservoir Drawdown and Operations Plan actions, as well as related actions developed by Valley Water in response to the February 20, 2020 directive and related FERC directives, are referred to by Valley Water collectively as the FERC Order Compliance Project (FOCP).

By letters to FERC dated August 14 and 31, 2020, NMFS confirmed use of ESA emergency consultation procedures for FERC's February 20, 2020 directive to Valley Water, and provided recommendations to minimize the effects of Valley Water's proposed FOCP actions on Central California Coast (CCC) steelhead (*Oncorhynchus mykiss*) and their critical habitat.

By letter to FERC dated September 15, 2020, NMFS confirmed use of MSA emergency consultation procedures for FERC's February 20, 2020 directive to Valley Water; notified FERC that recommendations to minimize the effects of VW's proposed FOCP actions on CCC steelhead and their critical habitat included in our August 31, 2020 letter also apply to potential effects to essential fish habitat (EFH) for Pacific salmon designated under the MSA; and requested that FERC direct Valley Water to also apply these recommendations during FOCP implementation to minimize impacts to EFH.

By letter to NMFS on September 10, 2024, FERC requested formal consultation under the ESA and consultation under the MSA for FERC's proposed approval of Valley Water's proposed retrofit and surrender of exemption for Anderson Dam. FERC's September 10, 2024 letter also notified NMFS of the availability of the Biological Assessment (BA) (Valley Water 2024g)[1] for the proposed action, identified the U.S. Army Corps of Engineers (USACE) as a consulting federal agency for the ESA and MSA consultations (i.e., USACE is a non-lead federal action agency that has requested and is participating in this consultation with NMFS and FERC), notified NMFS that FERC is the lead federal action agency for the ESA and MSA consultations, and notified NMFS of federal authorities relating to FERC's and USACE's proposed federal actions.

By letter to FERC on October 4, 2024, NMFS acknowledged FERC's September 10, 2024 consultation request, confirmed our understanding that FERC and the USACE are co-action agencies for the ESA and EFH consultations, with FERC serving as the lead federal action agency, acknowledged FERC's identification of federal authorities relating to FERC and USACE federal actions, and identified September 10, 2024 as the consultation initiation date.

By letter to FERC on January 14, 2025, NMFS provided questions regarding Valley Water's proposed action, and requested a 90-day extension of the consultation period (to April 23, 2025) in accordance with 50 CFR section 402.14(e). By letter to NMFS on February 4, 2025, FERC notified NMFS that Valley Water had agreed to the consultation extension request on January

[1] The May 20, 2024, Biological Evaluation prepared by Valley Water (Valley Water and Stillwater Sciences 2024g) was adopted by FERC and the USACE as the Biological Assessment (BA) for what FERC refers to as the Anderson Dam Hydroelectric Project No. 5737 and what the BA and this biological opinion refer to as the Anderson Dam Program (ADP).

22, 2025, and that FERC agreed to the consultation extension request; establishing April 23, 2025 as the new consultation due date.

By letter to FERC on February 5, 2025, Valley Water provided additional information and analysis regarding Valley Water's revisions to the proposed ADSRP construction schedule.

By letter to FERC on February 7, 2025, Valley Water transmitted responses to the questions NMFS provided on January 14, 2025.

On March 13, 2025, NMFS provided the draft proposed federal action section of the draft biological opinion to FERC, USACE, and Valley Water for review.

On March 14, 2025, NMFS met with FERC, USACE, and Valley Water to discuss the draft proposed federal action section of the draft biological opinion. During this March 14, 2025 meeting Valley Water requested that the ongoing emergency action (i.e., FOCP implementation) be included in the proposed federal action portion of the consultation.

NMFS subsequently reviewed the BA and the supplemental materials provided by Valley Water via letters to FERC on February 5 and 7, 2025, and discussed inclusion of the FOCP in the consultation with Valley Water (March 21, March 27, and April 9, 2025) and FERC (March 25, and April 8 and 11, 2025). Our review of the BA and supplemental materials confirmed that the BA and supplemental materials provided sufficient information to include the FOCP in the consultation, and during the April 2025 discussions, FERC confirmed their agreement, per Valley Water's request, to include the FOCP in the proposed federal action. Also, during the April 8, 9, and 11, 2025 discussions with Valley Water and FERC, an extension of the consultation due date, to the end of May 2025, was agreed to, to provide time for inclusion of the FOCP in the consultation. By email to FERC and Valley Water on April 18, 2025, NMFS confirmed that the FOCP will be included in the consultation, and confirmed our understanding that consultation duration will be extended to the end of May 2025, and by letter to FERC on April 25, 2025, we requested that the consultation due date be extended to May 30, 2025. FERC responded via letter to NMFS on April 29, 2025; establishing May 30, 2025 as the new consultation due date. Additional communications to clarify details of the ADP project description occurred between NMFS and Valley Water by phone and email between April 29, 2025 and May 24, 2025, and by hybrid meeting with NMFS, FERC, USACE, and Valley Water on May 27, 2025.

Additional coordination history relevant to this consultation includes pre-consultation technical assistance, which began in 2018 and continued until consultation was initiated in October 2024, and emergency project (FOCP) implementation coordination that also occurred during this time and is ongoing at the time of this consultation. Technical assistance and emergency project implementation coordination includes, but is not limited to: review and comment of Valley Water's proposed FOCP implementation measures (e.g., fish rescue and relocation plans, monitoring plans, and infrastructure design plans), review and comment of FOCP monitoring reports, review and comment of Valley Water's draft proposed ADSRP and Post-ADSRP actions, letter exchanges, approximately twice-monthly multi-agency meetings, as-needed technical meetings (e.g., FOCP component and operations meetings, ADSRP/Post-ADSRP project description development meetings, Fisheries Technical Working Group [TWG] meetings), executive coordination meetings (e.g., meetings between Valley Water, FERC, USACE, and NMFS leadership), and telephone and email communications. Meetings with NMFS were held variously in-person, by conference call, and by virtual/hybrid format and variously included FERC, USACE, other resource agency personnel, and Valley Water.

1.3. Proposed Federal Action

Under the ESA, "action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by federal agencies (see 50 CFR 402.02). Under the MSA, "federal action" means any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken by a federal agency (see 50 CFR 600.910). The FERC and USACE are co-action agencies for this consultation, with FERC serving as lead action agency. Proposed activities are described in the May 20, 2024, Biological Evaluation prepared by the Santa Clara Valley Water District (Valley Water 2024g), which FERC and the USACE have adopted as the Biological Assessment (hereafter BA) for what FERC refers to as the Anderson Dam Hydroelectric Project No. 5737 and what the BA and this biological opinion refer to as the Anderson Dam Program (ADP). Additional clarifications to the project description provided by Valley Water to NMFS, FERC, and USACE during consultation have also been incorporated into this consultation.

Pursuant to 18 C.F.R. § 4.102 (2023), FERC proposes to approve Valley Water's application to surrender their Anderson Dam hydroelectric license exemption conditioned upon Valley Water's implementation of the Anderson Dam Program (ADP), a program consisting of two large sub-projects: the FERC Order Compliance Project (FOCP), and the Anderson Dam Seismic Retrofit Project (ADSRP). Similarly, pursuant to Section 404 of the Clean Water Act of 1972 as amended (33 U.S.C. 1344), the USACE proposes to authorize Valley Water to implement the ADP. Of the two primary components included in the ADP, NMFS previously performed early emergency consultation with FERC and USACE for the FOCP (NMFS ECO #: INQ-2020-00037). The FOCP is an ongoing emergency action; thus, the inclusion of FOCP in this consultation also completes emergency consultation for the FOCP components of the ADP.

The following describes the ADP actions included in this biological opinion and as described in the revised May 20, 2024, Biological Evaluation prepared by Valley Water, which serves as the project's Biological Assessment (hereafter BA) for the Santa Clara Valley Water Anderson Dam Program (Valley Water and Stillwater Sciences 2024). Specifically, this biological opinion includes the FOCP, Anderson Dam Seismic Retrofit Project (ADSRP), Post-ADSRP Operations and Maintenance, and Conservation Measures (CMs), Monitoring, and Adaptive Management that will be implemented during FOCP, ADSRP, and Post-ADSRP periods of the ADP.

1.3.1 ANDERSON DAM SEISMIC RETROFIT PROJECT (ADSRP)

The Anderson Dam Seismic Retrofit Project (ADSRP) is the seismic retrofit construction component of the Anderson Dam Program (ADP). This component involves drawing down Anderson Reservoir (Figure 1) to perform a seismic retrofit of the dam and associated facilities. Seismic retrofit activities include deconstructing the existing Anderson Dam and replacing it with a new dam. ADSRP also includes construction activities on the downstream Coyote

Percolation Dam to complete the Phase 2 Coyote Percolation Fish Passage Enhancement Project. The following describes these two components of the ADSRP.

Figure 1. Aerial imagery of existing Anderson Dam before ADP activities began (BA).

1.3.1.1 Deconstruction and Replacement of Anderson Dam

This component would include removing the majority of Anderson Dam in stages, then replacing and upgrading Anderson Dam and its associated facilities. As conditions of FERC approval to decommission and surrender the license exemption for the hydroelectric facility, this component will involve the removal and replacement of the existing dam embankment, dam crest, spillway, outlet works along the northern dam abutment and southern side of the spillway, realignment of connections to existing Anderson Force Main and Main Avenue pipelines, installation of fiber optic communications lines, and temporary and permanent roadway modifications. Over the span of seven years, ADSRP elements will include:

- Drawdown to and maintenance (to the extent feasible) of Anderson Reservoir at minimum elevation 450 feet NAVD88 (below deadpool[2]). Anderson Reservoir is planned to be completely dewatered during a 2.5-year period;
- Reservoir rim stabilization and removal of all liquefiable materials from the existing dam embankment;
- Removal and replacement of the existing spillway;

[2] "Deadpool" occurs when water levels in a reservoir are so low that they cannot flow downstream past a dam or through outlet facilities.

- Removal of the existing earthen dam down to a small remnant core;
- Construction of a new dam and associated components (e.g., spillway) to withstand the maximum credible earthquakes on the Calaveras and Coyote Creek Faults;
- Construction of a new high-level outlet used for dam releases that exceeds the capacity of the low-level outlet, up to the maximum flow capacity of 5,300 cubic feet per second (cfs), to accommodate an emergency drawdown (e.g., in advance of or in response to a large storm);
- Construction of a low-level outlet works with three screened intake ports that can release up to 1,485 cfs when the reservoir is full;
- Decommissioning of the hydroelectric power plant in accordance with FERC's approval of Valley Water's surrender of the FERC hydropower exemption (to a license) for Anderson Dam, dependent on seismic retrofit improvements being completed to FERC requirements; and
- Construction period CMs.

The following describes the ADSRP construction actions that will occur in each year. CMs, including best management practices (BMPs) that will occur during ADSRP are described in Section 1.3.3 (Conservation Measures).

1.3.1.1.1 ADSRP Construction Year 1

The first year of ADSRP construction will include initiating the dewatering of the reservoir from the existing condition of deadpool down to the target elevation 450 feet (full dewatering will be complete during year 2 ADSRP). Year 1 also includes initiation of the Stage 2 diversion system construction; mobilization and site preparation of staging areas, stockpile areas, access and haul roads, and borrow sites; as well as dredging of the upstream toe and initiation of tunneling for the low-level outlet works (LLOW).

Bypass Flows and Releases

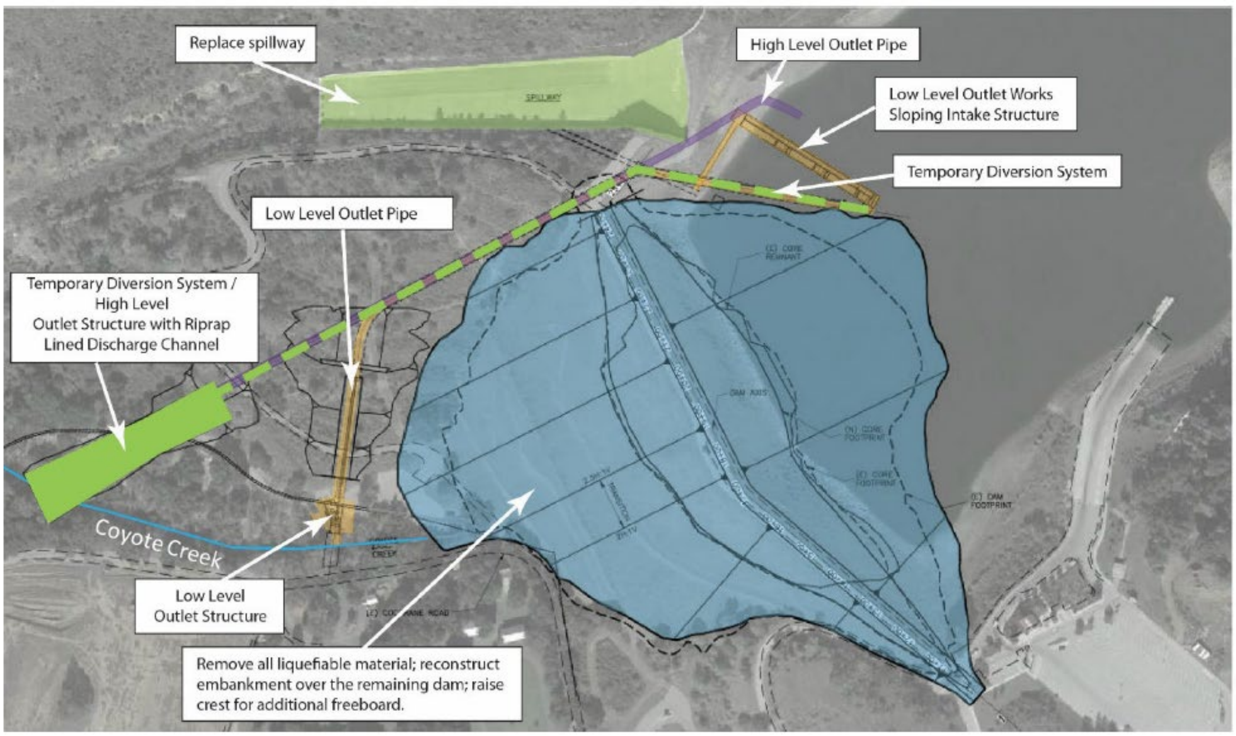
Bypass flows from the reservoir to Coyote Creek will be made through the existing outlet works (up to 500 cfs) with the valve completely open. During the summer months, flows will be less than 5 cfs depending on normal summer releases from Coyote Reservoir. During winter of year 1 and year 2 of construction, the reservoir will fluctuate depending on normal releases from Coyote Reservoir and inflows due to precipitation. Depending on seasonal inflow to the reservoir and releases from Coyote Reservoir, bypass and release flows could range from as low as 1 cfs to as high as 2,500 cfs.

1.3.1.1.2 ADSRP Construction Year 2

The second year of ADSRP construction will include: completing the full dewatering of the reservoir to elevation 450 feet (ADSRP Drawdown); cofferdam and extension pipe construction; conversion of existing Stage 1 diversion system into Stage 2 diversion system; Stage 1a excavation of the dam to achieve an interim dam with crest elevation of 565 feet; and initial construction of the high-level outlet works (HLOW).

Full dewatering of the reservoir will be completed through the Stage 1 diversion system. The Stage 2 diversion system includes various components, including an extension pipe connecting from upstream of the cofferdam to the intake structure, a diversion intake structure, a horseshoe tunnel, and a lined tunnel that connects to the low-level outlet tunnel (LLOT) from the Stage 1 diversion system, and has a maximum capacity of 6,000 cfs. To support dewatering, a cofferdam will be constructed upstream of the existing dam at the beginning of the construction season, and pumps and temporary piping will be installed to bypass water from the upstream end of the cofferdam to the Stage 1 diversion system (Figure 2). Natural inflows to the reservoir will be passed through as they are received until the cofferdam and temporary bypass pumping system are in place. After the cofferdam is in place, flows will be pumped into the bypass pipe during low flows. During high flows, the cofferdam will be overtopped, and flows will be released directly into the diversion structure. Construction of the Stage 2 diversion system will occur during operation of the Stage 1 diversion system. Once the Stage 2 diversion system is completed, the Stage 1 diversion system will be converted into the Stage 2 diversion system.

Figure 2. ADSRP plan view of Anderson Dam components being constructed during ADSRP (BA Figure 3-2).



Diversion operations include operation of diversion structures to seasonally manage outflows. At the beginning of each construction season in April, a 10-foot gate at the diversion intake structure will be opened. This will dewater the work area and direct flows into the diversion system. At the end of each construction season in December the diversion gate will be closed so that winter inflows will fill the cofferdam forebay to the reservoir and pass directly through the top of the diversion intake structure and will be released through the Stage 2 diversion system. Flows released through the Stage 2 diversion system will vary during the winter season depending on precipitation events and could range from as low as 3 cfs to as high as 6,000 cfs or greater.

Full reservoir dewatering will expose approximately 1,080,000 cubic yards of sediment in the reservoir (URS 2020b) that could erode and be carried through the diversion system. Valley Water conducted assessments to identify measures to minimize downstream impacts from the flushing of sediment from the reservoir including settlement ponds, retaining sediment in place; treatment systems; dredging; and filter and capture. All options were found to be not practicable. Instead, Valley Water will conduct sediment monitoring before and after drawdown and will conduct monitoring in Coyote Creek to assess habitat impacts of sediment releases through the Stage 1 and Stage 2 diversion systems and will implement habitat restoration CMs (see Section 1.3.3) to address any fine sediment that is released through the diversion systems to Coyote Creek.

Dam Excavation

This first stage of dam excavation will start at the beginning of the dry season to remove the crest of the dam down to elevation 565 feet and the outer portion of the downstream shell down to elevation 530 feet. The resulting interim dam would have a crest width of approximately 150 feet and a crest length of about 960 feet.

High-Level Outlet Works

Initial work to construct the HLOW is expected to begin in Year 2. The HLOW will be built to support long-term Post-ADSRP operations of Anderson Dam but, once built, may also be used as a temporary diversion system in future ADSRP construction years to support release of reservoir inflows of up to 6,000 cfs downstream to Coyote Creek in the wet season if needed in the latter years of ADSRP Construction (e.g., Year 6 and Year 7). At the end of ADSRP, the new high-level outlet will be able to accommodate a flow capacity of up to 5,300 cfs for use during emergency situations. Year 2 work on the HLOW will include excavation to support placement of the high-level outlet tunnel (HLOT), which will be elevated approximately 50 feet above the LLOT (see ADSRP Year 3 for the LLOT). Material excavated from the HLOT would be hauled to the reservoir disposal area.

1.3.1.1.3 ADSRP Construction Year 3

The third year will include diversion of inflows, dam excavation to achieve an interim dam with crest elevation 556 feet, construction of the HLOW, demolition of the existing spillway, and partial construction of the new spillway. Anderson Reservoir will be at elevation 467 feet, and a small reservoir pool may persist during wet season months.

Diversion Inflows

At the start of the construction season, the gate at the diversion intake structure will be opened to allow inflows to pass through the extension pipe into the Stage 2 diversion system. The water downstream of the cofferdam will be released through the Stage 2 diversion system to allow the reservoir to be drawn down to elevation 467feet.

At the end of each construction season, the gate will be closed and the space between the cofferdam and remaining portion of Anderson Dam will be filled to the diversion intake structure crest (elevation 467 feet). As with the previous construction year, winter inflows to the reservoir will then pass directly through the top of the diversion intake structure and inflows to the reservoir would be released through the Stage 2 diversion system with fixed cone valves (FCVs) fully opened during the winter.

Dam Excavation

The second stage of dam excavation will occur in the dry season and involve removal of the outer portion of the upstream shell and underlying alluvium down to the valley bottom and lowering of the interim dam crest to elevation 546 feet. The Stage 1b interim dam will have a crest width of about 40 feet and a crest length of about 970 feet. Just prior to the wet season, a sheet pile wall would be placed across the interim dam crest to provide 10 feet of freeboard, bringing the Stage 1b interim dam crest level to elevation 556 feet.

High-Level Outlet Works

HLOW construction will continue in Year 3 and will include: completion of the high-level outlet tunnel; excavation and support of the upstream portals for the high-level outlet tunnel, the 14-foot-diameter access tunnel, the 18.5-foot-diameter high-level outlet tunnel; installation of final linings in the HLOT and access tunnel; construction of the HLOW intake structure; and installation of the final lining of the HLOW gate shaft; and partial demolition of the existing spillway.

Spillway Demolition and Partial Reconstruction

Demolition of the existing spillway is expected to begin at the beginning of the Year 3 construction season and is estimated to continue into the later part of year 3. The spillway will be demolished using excavators with hoe rams or hydraulic shears. Approximately 12,500 cubic yards of concrete will be removed and hauled to a concrete recycling facility.

Once the existing spillway has been demolished, construction of the new spillway will begin. The replacement spillway structure will have the same spillway crest elevation as the existing spillway (elevation 627.9 feet), will be located within the same general footprint as the existing spillway, and will have the same general length and shape of the existing spillway. Year 3 spillway construction is likely to include excavation of trenches for the drainage system under the spillway, drilling and grouting of rock anchors, and construction of the gravity wall that will function as the left training wall for the spillway and the right abutment of the top 40 feet of the dam. Additional construction of the new spillway will continue in Year 4.

1.3.1.1.4 ADSRP Construction Year 4

The fourth year will include dam excavation to bring the existing dam structure down to the remnant core, initial dam reconstruction to achieve an interim dam with crest elevation of 556 feet, and spillway construction. Anderson Reservoir will be at elevation 467 feet and a small reservoir pool may persist during wet season months.

Diversion

Diversion will be the same as year 3.

Dam Excavation

The third and final stage of dam excavation will occur in the first half of Year 4 construction. The remaining shell, underlying alluvium, and a portion of the core will be removed. The remnant core will extend approximately 500 feet across the valley floor, have a width of about 10 feet at its crest, and be about 50 feet tall at elevation 455 feet. A geomembrane will be temporarily placed and secured over the remnant core to protect it until new core material is placed against it.

Dam Reconstruction

Once excavation is complete, the inner portions of the upstream and downstream rocky earth fill shells, filter and drain materials, and the dam core would begin to be placed. At the end of this dam construction season, the dam will have an interim elevation of 556 feet.

Spillway

Year 4 spillway construction is likely to include construction of the spillway invert slab, right training wall, right chute wall. The spillway invert will be constructed from 4-foot thick reinforced concrete anchored to the foundation using vertical rock anchors placed 8 feet apart in each direction and underlain by gravel and perforated pipe drains. The invert will narrow to approximately 150 feet, extending from the upstream edge of the dam crest to a point approximately 180 feet downstream.

1.3.1.1.5 ADSRP Construction Year 5

The fifth year will include fill to bring the dam to an interim crest elevation of 565 feet, and continue construction of the spillway and low-level outlet structure. Anderson Reservoir will be at elevation 467 feet and a small reservoir pool may persist during wet season months.

Diversion

Diversion will be the same as described for Year 3.

Dam Reconstruction

The second stage of dam fill will involve placement of portions of the upstream and downstream rocky earth fill shells, the filter and drain materials, and the dam core. Shell and core materials will come from in-reservoir stockpile areas. At the end of this construction season, the dam will have an interim elevation of 565 feet.

Spillway

Construction of the right and left spillway chute walls will occur through the end of year 5. At the end of Year 5, the right and left chute walls will be between 20 and 31 feet tall.

Low-Level Outlet Works

During Year 5, construction of the LLOW will include trench excavation to uncover the downstream end of LLOT and expose the outlet structure foundation, construction of the reinforced concrete tunnel, construction of the mass concrete thrust block and low-level outlet structure foundation, construction of the low-level outlet control structure, and construction of the LLOW discharge outlet (including associated energy dissipation structures). The LLOW discharge outlet will be located approximately 200 feet downstream of the current outlet to Coyote Creek) and will include an energy dissipation chamber, stilling basin, and riprap slope on the north bank of Coyote Creek to reduce the velocity of the released water. The LLOW will include a 33-inch bypass line for making cold water releases of up to 90 cfs to Coyote Creek. Releases to Coyote Creek will occur through the same concrete-enclosed dissipation chamber and stilling basin described above. Operation of the LLOW will begin at the end of Construction Year 6.

1.3.1.1.6 ADSRP Construction Year 6

The sixth year will include Stage 3b fill to a new dam crest elevation of 657 feet, completion of the low-level outlet works including the tower intake structure and outlet structure, and completion of the spillway including the unlined chute. Anderson Reservoir will be at elevation 467 feet and a small reservoir pool may persist during wet season months. During year 6 Anderson Reservoir will begin to be refilled to a target elevation 627 feet.

Diversion

At the start of the construction season, the 10-foot gate at the diversion intake structure will be opened to allow inflows to pass through the 10-foot extension pipe into the Stage 2 diversion system. The water downstream of the cofferdam will be released through the Stage 2 diversion system to allow Anderson Reservoir to be drawn down to elevation 453 feet. Reservoir inflows will be pumped from upstream of the cofferdam up to the high-level intake structure allowing the Stage 2 diversion system to be decommissioned to complete the low-level outlet works.

Dam Fill

The final stage of dam construction will occur in year 6 of construction and will include placement of the remaining portions of the upstream and downstream rocky earth fill shells, filter and drain materials, and dam core. At the end of this construction season, the dam crest would be at its final design elevation of 656 feet. This will be approximately 9 feet higher than the existing dam. The dam crest will retain the current width (approximately 40 feet) and will be paved for vehicular access as it is now. Vehicular access along the crest will be restricted to Valley Water and Santa Clara County personnel and pedestrian recreational access will continue.

Spillway

Work on the unlined spillway chute will occur in year 6. The chute will be 860-feet-long, 60-feet wide, 25- to 40-feet-deep, and will include materials and structures (e.g., rock slope protection and concrete) sufficient to contain and direct flows up to the probable maximum flood event (estimated 95,800 cfs).

Low-Level Outlet Works

Year 6 will include installation of pipe supports, pipelines, and mechanical, electrical, and testing and/or commissioning work to make the LLOW operational.

The LLOW will support releases of 10-225 cfs through the 42-inch diameter sleeve valve, and 200-660 cfs through the FCVs.

Reservoir Filling

Following completion of ADSRP, and with the approval of the dam safety regulatory agencies, the reservoir will be filled to support post-ADSRP operations of Anderson Dam (Section 1.3.2.1).

1.3.1.1.7 ADSRP Construction Year 7

During the final year of construction, work will include installing permanent roadways and conducting site restoration. Anderson Reservoir will be at elevation 627.8 feet.

1.3.1.2 Construction of the Phase 2 Coyote Percolation Dam Fish Passage Enhancements

Coyote Percolation Dam modifications during Phase 2 are expected to include construction of a roughened channel to provide fish passage over the bladder dam foundation and apron, and necessary alterations to provide adequate flow depth and velocity across the apron and deflated bladder dam. The area of the roughened channel will be about 0.7 acres and will be within the channel below the ordinary high-water mark. To the maximum extent feasible, the roughened channel will be composed of engineered streambed material with boulders providing hydraulic roughness, flow diversity, and high-flow stability. Smaller material including cobbles, gravels, sands, and silts will fill voids in the boulders and control porosity and subsurface flow. Valley Water will continue to engage with the TWG, which includes NMFS, to progress from conceptual design to final design and implementation. Construction is expected to begin in 2026 and be completed by the end of 2027, concurrent with ADSRP construction described above.

Construction

During Phase 2 construction, creek flow will be diverted into pipes, conveyed around the construction area, and released back to the creek downstream of the construction area. Installation of sumps and/or temporary wells may be necessary to control groundwater seepage at the construction area. The existing grouted rock slope protection would be removed and replaced with the roughened channel.

To construct the roughened channel, the creek bed will be excavated to a depth of about 6 feet. About 3,200 cubic yards of cut material will be produced. The roughened channel will be composed of large (approximately 4-foot diameter) angular rocks spanning the bed of the creek at about 40-foot intervals from the downstream limit of work up to the concrete slab at the dam. The approximate volume of large rock material is about 2,400 cubic yards. Additionally, about 6,400 cubic yards of engineered fill, including reused native material, will be placed. The total amount of fill would be approximately 8,800 cubic yards. The volume of imported material would be about 6,400 cubic yards.

Biological monitoring, fish relocation, and invasive species management will occur during drawdown of Coyote Creek within the work area. All diversion pump inlets and outlets will be screened. Water quality monitoring of temperature, total dissolved solids, and suspended sediment concentrations (SSC) will be undertaken throughout project implementation.

Construction Schedule

Phase 2 Coyote Percolation Dam improvements will be constructed during the dry season(s). Valley Water's proposed schedule is to begin construction in 2026 and complete construction by the end of 2027.

1.3.2 POST - ANDERSON DAM SEISMIC RETROFIT PROJECT ACTIONS (Post-ADSRP)

Following ADSRP, Valley Water will implement: operations of Anderson Dam and Reservoir and associated facilities, construction and operation of the Phase 2 Coyote Percolation Dam Fish Passage Enhancements Project, and maintenance of Anderson Dam and Reservoir and associated facilities. The following describes these actions.

1.3.2.1 Operations of Anderson Dam and Reservoir and associated facilities

The Post-ADSRP operations at Anderson Dam and Reservoir and associated facilities will center around water storage and discharge. The following section describes these components.

1.3.2.1.1 Water Storage

Water from upstream sources (natural inflow) and imported out-of-basin sources (imported water) will be stored in and discharged from Anderson Reservoir and associated facilities.

Natural inflow into Anderson Reservoir comes from tributaries surrounding Anderson Reservoir (such as Packwood Creek and Las Animas Creek), or controlled releases from Coyote Reservoir, which is located on Coyote Creek approximately 2 miles upstream of Anderson Reservoir and receives water from Coyote Creek and tributaries to Coyote Creek. In normal water years, monthly natural inflow to Anderson Reservoir results in a volume ranging from 8 acre-feet in the late summer (September) to 2,489 acre-feet in the winter (February). In wet water years, monthly natural inflow ranges from 129 acre-feet in the late summer to 11,070 acre-feet in the winter. In dry water years, monthly inflow ranges from 0 acre-feet in the early fall to 215 acre-feet in the early spring (April).

Imported water stored in Anderson Reservoir from the Central Valley Project will come from the United States Bureau of Reclamation's San Felipe Division via the San Luis Reservoir, the Pacheco Pumping Plant, the Santa Clara Conduit, and the Cross Valley Pipeline. Imported water can also be released directly to Coyote Creek through the Coyote Discharge Line. Imported water may be used to supplement reservoir releases, or may be used in lieu of reservoir releases, in order to preserve the cold water pool in Anderson reservoir, supplement groundwater recharge operations, or maintain habitat within Coyote Creek downstream of Anderson Dam. Imported water will be released into Anderson Reservoir in late winter and spring, while the temperature of the water is still cold enough to increase the volume of cold water in Anderson Reservoir. During drought emergencies, this action is suspended. Water that is imported and released for storage in Anderson Reservoir will be placed into the reservoir through the multi-port outlet in a manner that does not negatively impact the volume of cold water available for release to Coyote Creek.

Imported water placed in the reservoir will mix with the water stored in the reservoir from upstream, natural inflow sources and will be released through normal operational releases to maintain adherence to the flow plan (see 1.3.2.1.2 Water Discharges).

1.3.2.1.2 Water Discharges

ADP water releases from Anderson Reservoir include normal operational releases (including conservation measure releases), controlled emergency releases, and uncontrolled emergency releases. Releases would occur via the LLOW, HLOW, spillway, Cross Valley Pipeline (CVP), and Cross Valley Pipeline Extension (CVPE) (see section 1.3.5.3.2 FOCP Surface Water Releases to Coyote Creek for CVPE details) raw water distribution system, the existing Main Avenue Pipeline, or through a combination of these facilities. ADP water releases to Coyote Creek will follow rule curves and conservation measures, and will be implemented by Valley Water in coordination with resource agencies, including NMFS, via multi-agency implementation teams. The ADP Operations Working Group (OWG; Section 1.3.2.1.2.5) will provide coordination on the implementation of FAHCE-Plus Modified Rule Curves and operations (described below), and support implementation of ADP conservation measures (Section 1.3.3). Long-term modifications to water discharge would be made in coordination with the ADP Adaptive Management Team (Section 1.3.4.2).

1.3.2.1.2.1 Normal Operational Releases

Normal operational water releases may be made to Coyote Creek via the LLOW, HLOW, CVP, and CVPE. Normal operational water releases to Coyote Creek from Anderson Reservoir will follow rule curves. Normal operational water releases will also include imported water discharges. The following describes the rule curves and imported water releases.

Rule Curves

Following the completion of ADSRP, Valley Water will implement the Anderson Dam post-ADSRP operational releases per the reservoir release rule curves established for post-ADSRP operations. These rule curves, shown in Figures 3-6 and 3-7 of the BA, are a refinement of the Coyote Creek rule curves initially developed for the Fish and Aquatic Habitat Collaborative Effort (FAHCE) program (see 1.2 Consultation History), and are identified as the FAHCE-Plus

Modified Rule Curves.[3] The FAHCE-Plus Modified Rule Curves include summer period (May 1 - October 31) baseflows, winter period (November 1 through April 30) baseflows, and migration pulse flows, and are prescribed based on the combined storage of Anderson and Coyote reservoirs during the winter period (including pulses). The summer period flows are prescribed based on the volume of cold water in Anderson Reservoir. These flows will be implemented by Valley Water in coordination with the OWG.

Monitoring will be implemented (see 1.3.4 Monitoring). Storage of local water in excess of the requirements outlined above may be released to Coyote Creek or the raw water distribution system. This may be necessary to exercise Anderson Reservoir's two water rights, draw down the reservoir storage prior to the following rainy season, or provide water supply during a planned shutdown or an unplanned outage of the San Felipe Division system of the Central Valley Project. Implementation of the FAHCE-Plus Modified Rule Curves will allow for building a larger cold water pool in the reservoir for later use in warm months for management of cold water releases in Coyote Creek.

Summer Period Base Flows (May 1 through October 31) – Summer period baseflows will be implemented in two phases: an initial phase, which will occur between the time that Anderson Dam is rebuilt and the reservoir is refilled, and a secondary phase, which will begin after the Ogier Ponds Restoration is completed and persist for the duration of post-ADSRP operations (see 1.3.3 Conservation Measures). Based on the proposed schedule for Ogier Ponds Restoration, this initial phase is expected to persist for two summer periods following the completion and refilling of Anderson Dam and Reservoir. During this initial period, Valley Water proposes to release flows through the Anderson Reservoir outlet at a rate sufficient to provide a continuous flow of water and maintain a minimum flow rate of 1 cfs and a daily average temperature not to exceed 18 degrees C (64.4 degrees F) in the section of the cold water management zone (CWMZ) between Anderson Dam and the upstream end of the Ogier Ponds complex at Tomcat Way (i.e., the "Functional Cold water management zone" [FCWMZ].[4] When the Ogier Pond CM has been completed (see Section 3.7.7.1), Valley Water will shift the temperature and flow objectives to the CWMZ at Golf Course Drive. This minimum compliance streamflow and temperature are based on a calculation of the 90-percent exceedance probability calculated from

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[3] The Fish and Aquatic Habitat Collaborative Effort (FAHCE) is an existing, long-term program that Valley Water implements in coordination with NMFS, CDFW, USFWS, and a group of nongovernmental environmental organizations to improve salmonid spawning habitat, rearing habitat, and passage in Coyote Creek, Stevens Creek, and the Guadalupe River (BA Section 1.8). The FAHCE program is not included in the Proposed Federal Action and is thus not included in this biological opinion. However, some ADP measures and actions were developed by Valley Water to be either consistent with the FAHCE program, or were based on FAHCE program actions supporting salmonids, including salmonids in Coyote Creek. In such cases, Valley Water has included "FAHCE" in ADP action titles to indicate consistency with the FAHCE program (e.g., reservoir releases identified as the *FAHCE-Plus Modified Rule Curves*).

[4] The full cold water management zone (CWMZ) extends from Anderson Dam downstream to the Golf Course Road crossing of Coyote Creek, and includes an approximately one-mile-long reach of Coyote Creek occupied by the Ogier Ponds complex. Because the Ogier Ponds complex interrupts streamflow and exposes surface waters to greater solar radiation, surface waters are warmed as they flow through the Ogier Ponds. Because of this condition, Valley Water targets the portion of the CWMZ upstream of Ogier Ponds for cold water management, and identifies this portion of the CWMZ as the functional cold water management zone (FCWMZ). The restoration of a riverine reach of Coyote Creek through the Ogier Ponds complex is included in the ADP conservation measures. Once the Ogier Ponds are separated from the channel, temperature management through the full CWMZ will be applied.

Valley Water's long-term collection of hydrological data in Coyote Creek. If there is not sufficient storage to satisfy the 1 cfs and 18 degrees C downstream flow condition, then the reservoir release rate from May 1 through October 31 will be equal to or less than the total available cold water storage (AF) less estimated evaporation divided by 184 days (BA Figure 2-14). During this initial phase, imported water from the Santa Clara Conduit is also proposed to be used to help meet flow and temperature targets at the upstream end of the Ogier Ponds complex. If imported water is used, it will be discharged from the Coyote Discharge Line (CDL) only if the imported water temperature is 14 degrees C (57.2 degrees F) or less and the combined storage in Anderson and Coyote reservoirs is adequate for summer releases. Storage in excess of the requirements may be released to Coyote Creek.

Between April 15 and April 30 of each year, Valley Water will perform a thermal profile survey of Anderson Reservoir to determine the volume of the hypolimnion that is at or below 14 degrees C (57.2 degrees F) using the depth to cold water and a rating curve to calculate the size of the cold water pool in acre feet. If required, additional reservoir temperature profiles will be established on a monthly basis from June through October and releases adjusted to correspond to changes in the measured hypolimnetic volume.

Winter Period Base Flows (November 1 through April 30) - The winter period base flow rule curves include five tiers of release rates: 5 cfs, 10 cfs, 15 cfs, 23 cfs, and 26 cfs or more (depending on the amount necessary for managed recharge and environmental release).[5] These curves are based on combined Anderson Reservoir and Coyote Reservoir storage thresholds minus imported water temporarily stored in Anderson Reservoir from November 1 through/including April 30 (Table 1). The specific flow rate of the FAHCE-Plus Modified Rule Curves will depend on the combined storage of Anderson and Coyote reservoirs and where that storage volume falls within the range of the graduated curves (see BA Figures 3-6 and 3-7). For example, combined storage in November must exceed 20,886 acre-feet to initiate baseflow releases of 5 cfs. The highest winter base flow rule curve (26 cfs or above) would be implemented when combined storage exceeds 31,050 acre-feet.

[5] Deviations from Valley Water-proposed flow release rates and amounts may occur due to minor imprecision of flow release equipment that will be installed at Anderson Dam.

Table 1. Winter base flows that will occur in each month from November 1 through May 31 are conditional on the amount of combined storage in Anderson and Coyote reservoirs (Table is a duplicate of Table 3-11 from BA Section 3.6.3.2).

Begin month storage (AF)	Release for recharge/ Minimum 26 cfs	23 cfs	15 cfs	10 cfs	5 cfs
November 1	31,050	29,173	26,411	23,648	20,886
December 1	31,050	29,173	26,411	23,648	20,886
January 1	31,050	29,216	26,454	23,691	20,929
February 1	31,050	29,495	26,733	23,970	21,208
March 1	31,050	30,316	27,554	24,791	22,029
April 1	31,050	30,842	28,080	25,317	22,555
May 1	31,050	31,050	28,288	25,525	22,763

Regarding the Coyote Percolation Dam, when the bladder dam is inflated Valley Water will release flows sufficient to maintain a minimum bypass flow rate of 7.5 cfs at Coyote Percolation Pond and a minimum of 2.5 cfs at Valley Water streamflow station 5058 (Coyote Creek at Edenvale; located 4.5 miles downstream of the Coyote Percolation Dam). This flow measure will be implemented by Valley Water year-round to ensure compliance with their California Department of Fish and Wildlife (CDFW) Lake and Streambed Alteration Agreement (LSAA) for the Coyote Percolation Dam.[6] The bladder dam will be deflated when Coyote Creek flows arriving at the Coyote Percolation Dam are greater than 275 cfs. When the bladder dam is deflated, upstream passage will be provided by the constructed roughened channel. Table 3-7 in the BA includes additional details.

The release may be made from Anderson Reservoir (typically from the Bypass Pipeline, but higher releases can be made from LLOW or HLOW depending on temperature of the reservoir), the CDL (which connects the Santa Clara Conduit to Coyote Creek), or some combination of the two provided the total required release is made. The temperature of both Anderson Reservoir releases and imported water releases is typically 14 degrees C (57.2 degrees F) or less during the period of November 1 through April 30. During the summer rearing period, imported water will only be released from the CDL to Coyote Creek if the temperature of the released water is 14 degrees C (57.2 degrees F) or less. Winter period base flow releases to the raw water distribution system are also allowed when the combined reservoir storage is in this zone.

Migration Pulse Flows - Steelhead migration pulse flows will occur as described by the FAHCE-Plus Modified Rule Curves in both the winter period and the spring period, will be implemented by Valley Water in coordination with the OWG, monitored and "ramped-down" per the established ramping schedule (see below). The following describes the pulse flows, which are summarized below in (Table 2).

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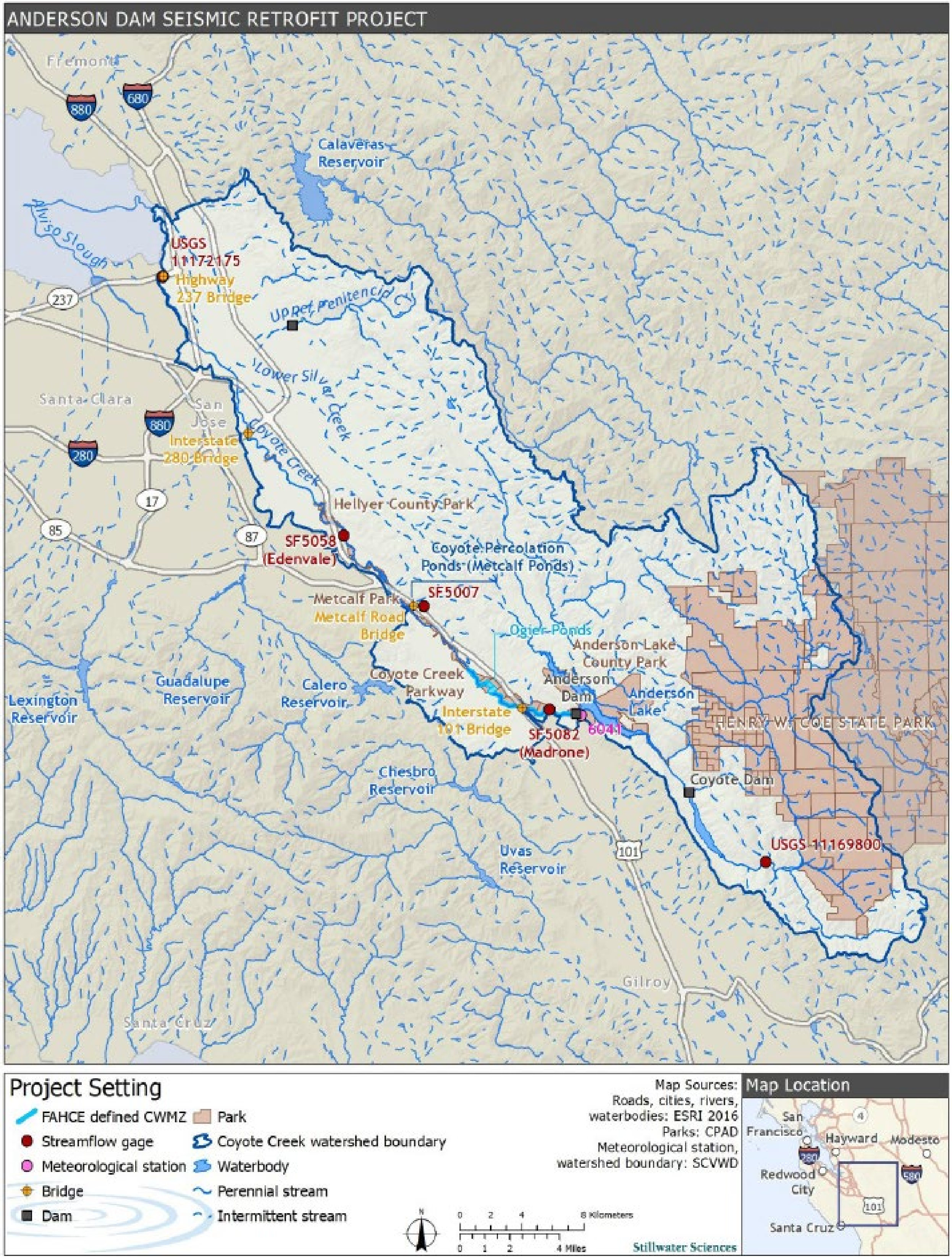
[6] Under the terms of the Fish and Game Code section 1600 Lake and Streambed Alteration Agreement Notification 1600-2009-0411-R3 issued by CDFW.

Primary Attraction Pulse Flows (Adult Attraction / Juvenile Outmigration Pulse Flows) - Primary Attraction Pulse Flows will be triggered when combined reservoir storage (i.e., the combined storage of Anderson Reservoir and Coyote Reservoir) minus imported water temporarily stored in Anderson Reservoir is equal to or greater than 80,000 acre-feet and it is safe to do so. The default implementation rate and timing of these pulse flows will be 90 cfs for 10 days, between December 1 through April 1, with up to two pulses per month, except for April, which will have a maximum of one pulse flow (Figure 3-6 and 3-7 in the BA). Releases will be monitored at streamflow station 5082/USGS 11170000 or outlet meter(s) at Anderson Dam (Figure 1). These flows are primarily timed to support upmigrating adult steelhead, but are also expected to benefit juvenile outmigration.

All pulse flow releases, including the Primary Attraction Pulse Flows will be implemented by Valley Water in coordination with the OWG, and the release of the total volume of water budgeted for each pulse flow may be "shaped" within the planned release period/frequency to best support steelhead migration. For example, for Primary Winter Attraction Period Pulse Flows, the volume of water associated with each 10-day-long 90-cfs release (i.e., approximately 1,785 acre-feet) may be "shaped" to provide a shorter pulse flow of greater magnitude, or a longer pulse flow of lesser magnitude, or some combination thereof.

Additionally, flood releases and spill events in excess of 90 cfs for 10 consecutive days will also be considered a pulse flow event, and back-to-back pulse events are possible. See below for ramping down operations for pulse flows.

Figure 3. Overview map of key locations and streamgage locations (BA Figure 1-1).



Safeguard Attraction Pulse Flows (Adult Attraction / Juvenile Outmigration Pulse Flows) - Safeguard Attraction Pulse Flows will be initiated between January 15 and March 30 if:

- no previous attraction adult steelhead upmigration pulse has occurred since December 1 (Figure 3-6 and 3-7 in the BA),
- combined reservoir storage (i.e., the combined storage of Anderson Reservoir and Coyote Reservoir) minus imported water temporarily stored in Anderson Reservoir is equal to or greater than 55,000 acre-feet,
- flow at USGS gage 5058 is at least 30 cfs for two consecutive days, and
- it is safe to release a pulse flow. If triggered, Safeguard Attraction Pulse Flows will be 90 cfs for 5 days, with a maximum of two events per year within the period from January 15 through March 30.

After the end of the first pulse, there will be a 7-day pause before another pulse can be released. If the 30 cfs trigger is not met by March 1, and storage is over 55,000 acre-feet, a 90 cfs pulse flow will be released for 10 days. If reservoir storage increases during this period such that a Primary Attraction Pulse Flow is initiated, Safeguard Attraction Pulse Flows will not be initiated. Similarly, if reservoir storage increases *during* a Safeguard Attraction Pulse Flow such that the Primary Attraction Pulse Flow triggers are met, the pulse flow initiated as a Safeguard Attraction Pulse Flow will be extended to result in one 10-day-long pulse flow (effectively resulting in the implementation of a Primary Attraction Pulse Flow).

Safeguard Attraction Pulse Flows may be "shaped" as described above (see Primary Attraction Pulse Flows), and will be monitored and ramped as described below.

Outmigration Pulse Flows – Outmigration Pulse Flows will be triggered when,

- Combined storage equals 45,000 acre-feet,
- Flow at USGS gage 11170000 (ALERT 5058) is at least 10 cfs for two consecutive days, and
- It is safe to release a pulse flow (Figure 3-6 and 3-7 in the BA).

When triggered, these pulses will be 60 cfs for 3 days, and will occur between April 1 through May 30. There will be a maximum of two of these pulse flows per year, and at the end of the first pulse there will be a seven-day pause prior to a second pulse. If the 10 cfs trigger is not met by May 15, and storage is over 45,000 acre-feet, a 7-day-long pulse flow will be released. Outmigration Pulse Flows may be "shaped" as described above (see Primary Attraction Pulse Flows), and will be monitored and ramped as described below.

Security Pulse Flows – Security Pulse Flows are intended to support adult steelhead upmigration and juvenile steelhead outmigration if no previous Primary or Safeguard pulse flow has occurred by March 1 (Figures 3-6 and 3-7 in the BA). If a Security Pulse Flow is triggered, a 4-day-long 90-cfs pulse flow will be released. There will be a maximum of one event per year. Releases will be monitored at streamflow station 5082/USGS 11170000. This pulse flow will not occur under any of the following scenarios:

- If combined storage is not greater than 20,000 acre-feet, or will not remain so after the completion of the pulse,

- If streamflow is not connected to the San Francisco Bay,
- If Valley water is pursuing, receiving, or planning to receive emergency water supply allocations from the State Water Project or the Central Valley Project during the current water year, or
- If local inflows into Anderson and Coyote reservoir for the current water year are less than the 90 percent exceedance probability.

If a Security Pulse Flow is triggered and the above restrictions are not occurring, the OWG will decide if and when to release the security pulse and decide the shape of the pulse. The pulse flow volume will be equal to or less than the volume required to release 90 cfs for 4 days (i.e., approximately 710 acre-feet).

Security Pulse Flows may be "shaped" as described above (see Primary Attraction Pulse Flows), and will be monitored and ramped as described below.

Table 2. FAHCE-plus modified pulse flow operations (BA Table 3-12).

Time Period	**Anderson-Coyote Combined Reservoir Storage Threshold (acre-feet)**	**Pulse Type**	**Pulse Magnitude and Duration**	**Number of Pulses**	**Guidelines**
December 1–April 1	80,000	Primary Attraction Pulse Flows	90 cfs for 10 days	Up to two per month during December through March, then up to one on April 1	
January 15–March 31	55,000	Safeguard adult steelhead upmigration/ juvenile steelhead outmigration passage	90 cfs for 5 days	Two	If 30 cfs trigger is not met by March 1 and storage is over 55,000 AF, release 10-day pulse

Time Period	Anderson-Coyote Combined Reservoir Storage Threshold (acre-feet)	Pulse Type	Pulse Magnitude and Duration	Number of Pulses	Guidelines
Timing will be determined by OWG if conditions are met	20,000	Security adult steelhead upmigration/ juvenile steelhead outmigration passage	90 cfs for 4 days	One	If by March 1 a pulse flow has not occurred, there is streamflow connection to SF Bay, storage is greater than 20,000 acre-feet, inflows have been greater than a 90 percent exceedance year, and Valley Water is not receiving or pursuing emergency water supply allocations
April 1–May 31	45,000	Steelhead outmigration passage	60 cfs for 3 days	Two	If 10 cfs trigger is not met by May 15 and storage is over 45,000 acre-feet, release 7-day pulse

Ramp Down Criteria for Instream Flows

Ramping down of flow decreases will occur as follows:

- For total flow decreases greater than 50 cfs (from start to finish), flow is reduced by no more than approximately 50 percent per step over a maximum of seven equally spaced steps in 72 hours or less.
- For flow decreases less than or equal to 50 cfs, flow is reduced no more than approximately 50 percent per step over a maximum of four equally spaced steps in 36 hours or less. The minimum reduction in flow during each ramping step will be 2 cfs.

Imported Water Releases

As part of normal operational releases, imported water may be released to Coyote Creek at the CDL and CVPE discharge locations. During the summer flow period, imported water may be used if the temperatures of released imported water (and any reservoir water with which it is mixed) are below 14 degrees C (57.2 degrees F). During the winter period, the temperature of imported water is not expected to exceed temperatures suitable for steelhead; thus, winter period releases of imported water do not have a temperature criterion.

If stream flow from Anderson Dam does not reach the CVPE outfall and a dry back is present downstream of the CVPE outfall, Valley Water may release imported water to Coyote Creek from the CVPE for managed groundwater recharge and to maintain a wetted channel downstream of the release point with no temperature limitation. Releases from the CVPE will be conducted according to Table 3. Post-construction imported water releases from the CDL and CVPE below. Releases will not be made from CVPE from November 1 to April 30 in all years and the channel upstream of the CVPE must also be dry to discharge from the CVPE from May 1 to October 31.

Table 3. Post-construction imported water releases from the CDL and CVPE.

Imported Water Release near the base of Anderson Dam (CDL)		**Imported Water Release Downstream of Ogier Ponds (CVPE)**	
Summer (May 1 to October 31)	*Winter (November 1 to April 30)*	*Summer (May 1 to October 31)*	*Winter (November 1 to April 30)*
As needed for beneficial use, 0 to 50 cfs with water temperatures 14 degrees C or less to maintain cold water management zone	As needed for beneficial use, 0 to 35 cfs	As needed for recharge and to meet LSAA requirement of daily average flow minimum of 2.5 cfs at streamflow station 5058 when the bladder dam is inflated	As needed for recharge and to meet LSAA requirement of daily average flow minimum of 2.5 cfs at streamflow station 5058 when the bladder dam is inflated

1.3.2.1.2.2 Geomorphic Flows

Valley Water will prepare a geomorphic flows plan and provide it to the resource agencies (including NMFS) no later than two years prior to Valley Water's planned completion of the ADSRP (i.e., within year 5 of the start of ADSRP construction). Valley Water will also consult with the TWG (see Section 1.3.3.6 below) on development of the Geomorphic Flows Plan. This plan will inform management of Coyote Creek downstream of Anderson Dam for critical ecological functions and stream processes for steelhead critical habitat, and will identify flow releases from Anderson Dam that will support biological features of steelhead critical habitat which are maintained by periodic high flows capable of inundating the floodplain, scouring substrate, mobilizing gravel, and supporting channel migration. The ADP geomorphic flow releases that will be included in the plan will be designed to mobilize the substrate, scour and transport fine sediments, maintain unembedded gravel, support gravel bar formation, reduce riparian vegetation encroachment, support formation of inset benches and floodplains, increase channel migration and bank erosion, and create and maintain wider active channel and topographic diversity. These flows will meet the frequency, magnitude, and duration of geomorphic flow releases necessary to achieve floodplain inundation flows, spawning gravel maintenance flows, and channel forming flows. Following implementation, the AMT will oversee adaptive management, as identified in the ADP Adaptive Management Program (AMP; Section 1.3.4.2 below). The Geomorphic Flows Plan will include specific measurable criteria to ensure effectiveness, such as duration of floodplain inundation, volume of gravel mobilized, and transport of sediment, included below.

- *Floodplain Inundation Flows* - The Geomorphic Flows Plan will identify floodplain elevations and tailor the flows to channel geometry. Current observations show that at flows greater than 55 cfs, inset benches and floodplain habitat begin to become inundated. Floodplain inundation flows will be initially planned for greater than 65 cfs for at least 7 days every year.
- *Spawning Gravel Maintenance Flows* - To improve spawning gravel quality for steelhead spawning, moderately frequent flows sufficient to mobilize gravel and transport silt and clay will be implemented. Spawning gravel maintenance flows will be implemented in coordination with conservation measures (e.g., habitat restoration and sediment augmentation actions) and will initially be implemented every three years for a duration and flow rate of 24-hours and 250-cfs.
- *Channel Forming Flows* - Infrequent flows sufficient to scour sediment, erode banks, scour vegetation, and result in channel migration and formation in localized areas will be intended to inundate active channels, will not flood infrastructure, and will be selected in consideration with the sediment augmentation program described in Conservation Measure 8 (Section #). Channel forming flows will initially be planned for 1,000 cfs for 24 hours, every 7 years.

Additional details on the Geomorphic Flows Plan can be found in Section 3.6.3.3 of the BA.

1.3.2.1.2.3 Controlled Emergency Releases

To help reduce the potential for an uncontrolled release via the spillway (see uncontrolled releases below), reservoir storage may be reduced by releasing controlled emergency releases through the HLOW and the LLOW. During wet years, the reservoir may fill faster than the LLOW can release water. To prevent the reservoir from overtopping and resulting in uncontrolled releases to Coyote Creek, the HLOW would make controlled emergency releases. In an event when an emergency drawdown is warranted, as directed by FERC or the California Department of Water Resources Division of Safety of Dams, the LLOW and/or the HLOW could be used to rapidly draw down the reservoir. Combined, a controlled emergency release may be up to 5,300 cfs, with up to 1,485 cfs being released from the LLOW and up to 3,815 cfs being released from the HLOW.

1.3.2.1.2.4 Uncontrolled Releases

In the event that reservoir inflow is greater than controlled emergency releases, and reservoir storage exceeds the spillway crest, uncontrolled releases from Anderson Reservoir to Coyote Creek would occur via the spillway. To minimize the severity and duration of uncontrolled spillway releases, controlled releases will occur simultaneously with uncontrolled releases (i.e., the controlled releases will be ongoing, but spillway activation may occur). Depending on the rate of inflow, uncontrolled spill events may range from very short events that are only a slightly greater release rate than the 5,300 cfs controlled emergency releases, to longer duration events that are significantly greater in release rate than the controlled emergency releases. Historically, Anderson Reservoir fills and spills about every 10 years, which has resulted in releases of approximately 7,400 cfs. Reservoir spills are expected to occur less frequently after completion of ADSRP; however, uncontrolled releases from the spillway would likely continue in wet years, approximately every 20–25 years.

*North and South Channels Weir Operation and Split Flow Managemen*t

To prevent damage to the South Channel and protect steelhead and habitat, flows will be managed via weirs (constructed during FOCP) in the North and South channels (one weir in each channel). Construction of the weirs began in June 2024 and is in progress, with expected completion in October 2025. The weirs will be operated together. The south channel weir is designed to enable flexible operations via a 'U' shaped channel invert weir with slots for stop logs. Operations will be implemented by Valley Water in coordination with the Anderson Dam Operations Work Group (OWG) (see OWG description in Section 1.3.2.1.2.1 of this document). Lower flows will be released to the south channel, and the north channel will only become activated at higher flows or when the south channel weir is adjusted to direct more flow to the North Channel. When the stop logs are absent (default mode) only flows exceeding 230 cfs will activate the North Channel. Alternatively, if desired to protect fish located in the South Channel, the stop logs can be installed, which would cause the North Channel to activate when flows exceed 100 cfs rather than 230 cfs.

1.3.2.1.2.5 Operations Working Group

Valley Water will establish an Anderson Dam Operations Work Group (OWG) to discuss and provide updates on FAHCE-Plus Modified Rule Curves and operations. The OWG will include representatives from NMFS, if available to attend, and other resource agencies, will consider steelhead life history needs when evaluating operational adjustments, and will ensure agreement on proposed actions is reached by participating members. An annual coordination meeting will be scheduled, frequent operational updates will be provided, and additional coordination will occur as needed during dry or low storage years. One meeting will be scheduled to occur annually, no later than February 15 of each year, with a focus on potential modifications to operations based on current conditions in the watershed and projections of 90-percent historical flow exceedance for the remainder of the water year. More frequent coordination will occur as needed in low storage and/or dry and very dry years, which could include monthly meetings. The Valley Water operations team will provide updates to the OWG via email as changes occur associated with winter baseflows and when pulse flow triggers occur. The purpose of the coordination meetings will be:

- Review, discuss, and provide input on pulse flows (including variability in the pulse), winter baseflows, and implementation of the security pulse flow; and
- Discuss any in-season changes to modify program actions based on hydrologic conditions such as drought, low storage, or other hydrologic factors.

It is not expected that changes to winter baseflows and pulse flows would be needed in most years. The OWG will be used to make in-season flow release adjustments to benefit fish and minimize harm as different conditions arise, specifically during low storage and dry years. Any long-term changes associated with operations will occur through the AMT (Section 1.3.4.2).

1.3.2.3 Operation of the Phase 2 Coyote Percolation Dam Fish Passage Enhancements Project

Within 13 months of completion and approval of Phase 2 designs, Valley Water will have a completed preliminary Phase 2 operations plan, which may be modified depending on the outcomes of outmigration studies (see 1.3.3 Conservation Measures for outmigration studies and potential adaptive management of Coyote Percolation Dam operations).

Key elements of the operations plan will include:

- Operational flexibility including the ability to temporarily drain the Coyote Percolation Pond when practicable given water supply demands and appropriate in terms of habitat management to protect steelhead and other listed and sensitive aquatic and riparian species.
- Upstream fish passage through the Coyote Creek Percolation Dam Facility when flows are between 2.5 cfs and 320 cfs.
- Bladder dam in the inflated position when flows arriving at the dam are less than 275 cfs and upstream passage will be provided through the fish ladder.
- Use of the new bypass overshot weir to release flows between October 16th through June 14th and flows are above 25 cfs (and less than 275 cfs)
- Possible raising of the weir gates in the fish ladder to cut off flows to the fish ladder during summer periods (June 15th through October 15th) outside of the steelhead migration season to allow for inspection and maintenance activities. Valley Water will maintain the minimum required flows per the LSAA to Coyote Creek (Section 1.3.1.1).
- Bladder dam in the deflated position when Coyote Creek flows arriving at the dam are greater than 275 cfs. When flows are in this range and the bladder dam is in this condition, upstream passage will be provided by the constructed roughened channel.
- When the dam is deflated, Coyote Creek flows greater than 275 cfs arriving at the dam will go over the deflated dam. A portion of this flow will go into the roughened channel to provide upstream passage.

1.3.2.4 Post-ADSRP Maintenance of Anderson Dam and Reservoir and Associated Facilities

North Channel Extension Maintenance

Maintenance activities of the North Channel would include maintaining the constructed wetland bench, maintaining design flow capacity through the North Channel, and replacing restoration plantings, as needed. Native trees and vegetation would be planted as necessary during ADP along the banks of the channel to support effective revegetation of the channel.

Following large flow events, including releases from the spillway, Valley Water will monitor the North Channel to ensure that the channel maintains a positive draining gradient, and that debris is not accumulating within the channel. If channel conditions were negatively impacted by a large flow event, the North Channel would be inspected to determine the required actions necessary to restore the flow capacity of the channel. Actions may include debris and/or vegetation removal from the channel or, if regrading is required, dewatering of the channel to provide a dry area where the regrading of the channel bottom may occur to maintain a positive draining gradient. The channel will also be assessed to ensure that large pools or irregular backwaters are not forming that could result in fish stranding as waters recede within the North Channel.

Coyote Percolation Dam

Maintenance activities at the Coyote Percolation Dam would include periodic removal of accumulated sediment, vegetation management, and repair of the roughened channel. Accumulated sediment would be removed from the pond reach (i.e., the reach between the Coyote Percolation Dam and upstream Metcalf Road) to maintain channel capacity, geomorphic stability, and aquatic habitat. Similarly, vegetation maintenance would be implemented to remove and/or trim invasive plants which compete with native plants and/or impair channel capacity. For the roughened channel replacement of roughness elements and/or repair in-channel bioengineered habitat enhancements (e.g., rootwads, stream barbs, overhanging banks), and rock slope protection will be replaced as needed to maintain channel function and maintain fish passage conditions.

1.3.3 Conservation Measures

The ADP includes 10 CMs designed to minimize impacts of the program.[7] For description and analysis in this biological opinion, CMs or portions thereof have been integrated into the ADSRP, Post-ADSRP, Monitoring and Adaptive Management, and FOCP sections of the Proposed Federal Action. The following provides additional CM descriptions.

1.3.3.1 Coyote Discharge Line Chillers

Valley Water will install and operate Coyote Discharge Line chillers during FOCP to decrease the temperature of imported water prior to discharge to Coyote Creek (see Section 1.3.5.3.2). These chillers will remain in operation through ADSRP. During chiller operations, up to 10 cfs of CVP water will be reduced by up to 7 degrees Celsius (C) (12.6 degrees Fahrenheit [F]). Through the use of these chillers during imported water discharges to Coyote Creek, water temperature in the FCWMZ up to Tomcat Way (approximately 2,000 feet upstream of Ogier Ponds) is estimated to be maintained at approximately 16 degrees C (60.8 degrees F) (BA

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[7] CM-1 Flow Measures; CM-2 North Channel Extension; CM-3 Imported Water Releases, Cross Valley Pipeline Extension, and Chillers; CM-4 Fish Rescue and Relocation; CM-5 Fish Passage; CM-6 Monitoring and Adaptive Management; CM-7 Habitat Restoration; CM-8 Sediment Augmentation Program; CM-9 Interagency Workgroup; and CM-10 Best Management Practices.

Section 6.2.1.4; Table 6-1), which is below the target temperature of 18 degrees C (64.4 degrees F).

1.3.3.2 Fish Rescue and Relocation

During FOCP and ADSRP construction, Valley Water will monitor water temperature, DO, and steelhead presence within the FCWMZ and, if steelhead are documented to occur and conditions within the FCWMZ appear unsuitable (temperature greater than 24 degrees C [75 degrees F] or DO less than 7.0 mg/L), then fish rescue and relocation efforts may be conducted in coordination with the TWG.

Additionally, fish relocation may be needed during localized construction and maintenance activities requiring dewatering. See Section 3.7.7.1 of the BA for construction details.

During fish relocation, backpack electrofishing will be used to capture fish. Rescue and relocation efforts will be conducted as early in the day as feasible to reduce exposure to high water temperatures. Battery operated backpack electrofishers will be used at all sites with a minimum of two netters per electrofisher. Prior to each electrofishing session, stream conductivity and temperature measurements will be taken and the electrofisher unit settings will be adjusted accordingly to minimize damage or mortality to fish encountered. Stunned fish will be placed in an aerated holding tank and be allowed to recover from electrofishing effects. Electrofishing will be conducted in an upstream manner at each site. Seine netting may be used to capture fish if electrofishing is not feasible. Nets up to 30 feet in length with 0.25-inch or less delta mesh may also be used.

Captured steelhead will be measured for fork-length and scanned for the presence of a passive integrated transponder (PIT) tag. If no PIT tag is detected, a subset of steelhead greater than or equal to 2.6 inches at fork-length will be PIT tagged for subsequent detection at established PIT tag reader stations in the watershed if temperatures allow. If PIT tagging occurs, fish will be anesthetized with carbon dioxide. PIT tagging will be done by staff trained in the procedure. Fish handling will be minimized to the extent feasible and crowding in holding containers will be avoided. After exposure to the anesthesia and handling, fish will be placed in an aerated live well for recovery then released. See Section 3.7.4.1 in the BA for additional details on fish rescue and relocation procedures.

1.3.3.3 Invasive Species Monitoring and Control

To reduce non-native species interactions with steelhead, Valley Water is implementing invasive species and monitoring control. The Invasive Species Monitoring and Control Plan (Valley Water 2020a) was prepared and implementation is ongoing, and will continue during ADSRP construction. Target species to be culled include non-native fish, crayfish (*Cambaridae*), American bullfrog, and red-eared sliders, as well as opportunistic removal of other non-native species. The non-native fish species that pose the most significant risk to native fish and wildlife are the predatory largemouth bass, spotted bass (*Micropterus punctulatus*), green sunfish (*Lepomis cyanellus*), bluegill (L*epomis macrochirus*), crappie (*Poxomis* spp.) and catfish (*Ictalurus* and *Ameiurus* spp.) species. Methods include:

- Multi-pass depletion electrofishing, seine nets, dipnets, and hand capture;

- Decontamination protocols to prevent the spread of amphibian chytrid fungus (*Batrachochytrium dendrobatidis*), ranavirus, other pathogens, and non-native species. Humane euthanasia of non-native aquatic species;
- Nocturnal pedestrian and/or boat surveying in summer months, consisting of spotlighting American bullfrog adults and juveniles and capture with dipnet or gig;
- Turtle traps and crayfish traps may also be deployed in summer months; and
- Preventative controls at various locations may include signage discouraging release of unwanted pets.

1.3.3.4 Habitat Restoration

Valley Water will implement several habitat restoration projects to address habitat degradation resulting from implementation of the Anderson Dam Program. The major categories of habitat restoration that will occur through the ADP include: sediment augmentation projects, reach-scale habitat enhancement projects, and assessment of reaches for restoration potential. Live Oak Restoration activities began during FOCP and are described below (Section 1.3.5.3.5).

1.3.3.4.1 Sediment Augmentation

Gravel augmentation will be included and designed to enhance spawning gravels in suitable Coyote Creek areas downstream of Anderson Dam with a focus on the FCWMZ. Channel and floodplain restoration activities will be designed to restore geomorphic processes, reconnect and reactivate flood terraces and floodplains, enhance riparian conditions, and enhance channel complexity with placement of large wood and coarse sediment. All materials used for sediment augmentation within Coyote Creek will meet requirements for use for restoration purposes.

No later than two years prior to Valley Water's planned completion of ADSRP Construction, Valley Water will, in coordination with the TWG, prepare a sediment augmentation plan. This plan will address ADP effects to sediment supply and conveyance/transport and will ensure availability of quality spawning gravel and rearing habitat. The sediment augmentation plan will identify locations, volumes, and frequencies for placement of stream quality sediment downstream of Anderson Dam within the upper portion of the CWMZ, and then monitor the rate and volume of sediment transport relative to flows. To develop the plan, Valley Water will collect data, conduct analyses, and work collaboratively with the TWG to determine the frequency of augmentation, sediment volume and composition, and monitoring methods. Sediment may be placed using a variety of methods, including trucks, conveyor belts, and standard construction equipment. At a minimum, Valley Water will ensure the sediment augmentation program includes at least 500 cubic yards of sediment placed within the Live Oak Restoration Reach within 2 years post-construction, is monitored annually, and is replenished to the initial volume at least every 5 years. Valley Water will also revise geomorphic flows to ensure sediment mobilization. Additional sediment augmentation will occur within the Live Oak restoration area and the Ogier Ponds conservation measure area. Valley Water will also consult with the TWG (see Section 1.3.3.6 below) on development and implementation of the Sediment Augmentation Program. The program will last for at least 20 years with a 5-year replenishment cycle, will be evaluated by the adaptive management team, and may be extended beyond the initial 20-year-long duration if implemented as an adaptive management measure through the AMP (Section 1.3.4.2 below).

1.3.3.4.2 Reach-Scale Habitat Enhancement Projects

Ogier Ponds Restoration

In 1984 and 1997, Coyote Creek breached a levee and flowed into the Ogier Ponds, an approximately one-mile-long series of four interconnected former mining pits and two off-channel ponds approximately four miles downstream of Anderson Dam. Since 1997, the creek has flowed through the ponds, bypassing its historical channel and altering habitat in this reach. To restore riverine conditions through this reach, Valley Water will separate the existing connection between Coyote Creek and the ponds, reconstruct the pre-1997 creek channel, and add ecological enhancements to the channel and floodplain. The restoration project will completely fill in and remove Ponds 1 and 5, partially fill Ponds 2 and 4, and construct earthen berms to separate the unfilled portions of Pond 2 from the restored channel (BA Section 3.7.7.1, Figure 3-12).

The length of the reconstructed channel will be approximately 6,500 linear feet and be designed to provide water depths and velocities suitable for fish passage. A concrete spillway will be incorporated into the new right bank, which will allow flows above 2,000 cfs to flow into Pond 2 where they will then be conveyed through the interconnected Ponds 2, 3, and 4 before being released back to Coyote Creek. A drainage structure equipped with fish screens will be constructed to release flows from Pond 4 to the creek downstream of the restoration reach. The new Coyote Creek channel alignment would reconnect with the existing Coyote Creek channel west of Pond 4. Native vegetation will be planted along the floodplain to create riparian habitat and large woody debris and boulder structures will be included within the channel and floodplain to create a diverse fish habitat and high-flow refugia while maintaining design flow capacity. The project will also include a low-flow channel designed to convey flows within Coyote Creek downstream of Anderson Dam expected during post-ADSRP operation of Anderson Reservoir. The low-flow channel substrate will consist of a mixture of sand, gravel, and boulders. The restored channel and connected floodplain will have a total width ranging from 125 to 700 feet and will be able to convey at least 1,485 cfs, which is the maximum Anderson Dam Tunnel release capacity.

This project is located within the County Parks system and recreational use will remain a permanent component of the project. To support this, the existing multi-use Coyote Creek Trail will be maintained, water-based-use enhancements may be included, an interpretive trail may be added, and unpaved multiuse trails will be incorporated into the new levees.

Construction will occur over a 3-year period, primarily during the dry season of May through October. Start of construction is expected to begin in the summer of Year 6 of ADSRP construction and end in Year 8.

Construction activities will include dewatering, diversion, groundwater control, clearing/grubbing, channel excavation and grading, filling of ponds, setting of forms and pouring of concrete, soil preparation, planting of native species and vegetation establishment activities, installation of bio-engineered slope protection, placement of rootwads and similar material in the channel, and demobilization and removal of equipment and excess materials after construction is complete. Equipment will include air compressors, backhoes, loaders, compactors, concrete pump, cranes, bulldozers, portable generators, graders, excavators, pneumatic tools, scrapers, haul rucks, and pumps. Fish rescue and relocation during dewatering will be conducted, as necessary. See Section 3.7.7.1 of the BA for construction details.

Following construction, Valley Water will maintain the restored channel, berms, and spillway structures/fish screens and make repairs, as necessary. Valley Water will also conduct maintenance of access roads that will be located along the new creek channel on the southwest left bank of Coyote Creek. This may include vegetation and sediment removal if flows in the channel are restricted, vegetation trimming, invasive plant removal, and replanting to establish native vegetation. Channel maintenance activities will be performed through Valley Water's Stream Maintenance Program. Monthly inspections will be conducted to monitor water quality within the adjacent ponds. Solar powered floating aerators will be installed to maintain or improve dissolved oxygen levels compared to baseline. Other water quality best management practices may also be used, if water quality monitoring results indicate that they are necessary (Section 1.3.4).

To monitor project effectiveness, a scale as-built map (basemap) of the restoration will be created. Biological monitoring is anticipated to include annual monitoring of design flows to determine the success of the project at achieving restoration objectives and to inform maintenance. During each monitoring event suitable fry, juvenile, and spawning habitat will be mapped on the basemap of the reach.

To support implementation of this conservation measure, Valley Water will submit an alternatives study report to NMFS for review and comment by spring 2025.

1.3.3.4.3 Assessment of Coyote Creek Reaches for Restoration Potential

Ogier Ponds to Metcalf Ponds Restoration Evaluation

Following the Ogier Ponds restoration described above and implementation of post-construction operations, a geomorphic and habitat evaluation (Restoration Study) of Coyote Creek from Ogier Ponds to Metcalf Road will be conducted to describe channel conditions and habitat suitability for steelhead. The evaluation will include a detailed evaluation of channel confinement, channel incision, floodplain condition, spawning gravel quality and deposition, water temperatures, flows, and passage within the reach from Ogier Pond to Metcalf Road. Future restoration opportunities to increase channel width, decrease pool depth, increase access to off-channel or side channel habitat, increase spawning gravel deposition and quality, and assess passage challenges for steelhead in this reach would be described in the evaluation. The evaluation will also include conceptual design opportunities in up to three key locations which may be used for future restoration projects by other Valley Water programs. This evaluation will occur as part of the AMP (Section 1.3.4.2), including NMFS, following completion of Ogier Ponds.

1.3.3.5 Interagency Technical Workgroup

An interagency technical workgroup (TWG) including Valley Water FERC staff, and resource agencies, including NMFS if available, will meet monthly or as needed to review and discuss the status of ADSRP construction, conservation measure implementation, and results of monitoring activities. The TWG will also provide guidance on appropriate actions. Following completion of ADSRP construction (i.e., at the beginning of the post-ADSRP reservoir operations period), the duties of the TWG will transfer to two groups: the OWG and the AMT (See Sections 1.3.2.1.2.5 and 1.3.4.2 for the OWG and AMT, respectively).

1.3.3.6 Best Management Practices (BMPs)

Construction BMPs included in the ADP are listed below.[8]

- Conduct work from top of bank
- Limit impact of pump and generator operations and maintenance
- Limit impacts from staging and stockpiling materials
- Stabilize construction entrances and exits
- Limit impact of concrete near waterways
- Minimize hardscape in bank protection design
- Prevent scour downstream of sediment removal
- Prevent water pollution
- Prevent stormwater pollution
- Remove temporary fills
- Restore riffle/pool configuration of channel bottom
- Minimize predator attraction
- Prevent slurry mixtures from entering waterways
- Adhere to the in-channel work window (June 15 - October 15)
- Adhere to the instream herbicide application work window
- Avoid exposing soils with high mercury levels
- Minimize the area of disturbance
- Salvage native aquatic vertebrates from dewatered channels
- Conduct employee/contractor training
- Employ erosion and sediment control measures
- Ensure proper staging and stockpiling of materials
- Minimize sediment transport
- Limit stream access routes
- Identify existing hazardous sites
- Maintain vehicles in authorized areas and ensure proper maintenance
- Fuel vehicles and equipment away from aquatic habitat
- Follow dewatering procedures and guidelines for non-tidal sites
- Maintain pumps/generators and operate them appropriately

[8] Additional details on ADP construction BMPs are presented in Appendix A Table 2-21 and Table 3.4-6, Table 3.4-7, Table 3.4-7 of Valley Water's California Environmental Quality Act Environmental Impact Report (Valley Water 2025), which was provided by Valley Water to FERC and the resource agencies, and is included in the federal record for this consultation.

- Prevent scour downstream of sediment removal
- Restore or enhance channel features
- Minimize local erosion increase from in channel vegetation removal
- Use appropriate equipment for instream removal
- Seed exposed soils with native plant species
- Treat groundwater water pumped/collected during dewatering events prior to discharge to Coyote Creek during dewatering events
- Prepare and submit a detailed dewatering and fish rescue plan to NMFS for review and comment no less than 20 calendar days prior to starting localized dewatering activities in Coyote Creek (e.g., prior to placement of a cofferdam, dike, stream bypass, dewatering pump, etc.). Temporary screening will occur according to NMFS screening guidelines (NMFS 2022).
- If steelhead rescue and relocation is needed during dewatering activities, Valley Water will utilize or hire qualified fisheries biologists that will follow NMFS electrofishing guidelines (NMFS 2000).

1.3.4 Monitoring and Adaptive Management

The ADP includes a monitoring and adaptive management program intended to minimize impacts of the project and support the steelhead population in Coyote Creek Watershed. ADP monitoring and adaptive management actions will be applied by Valley Water in coordination with the OWG (Section 1.3.2.1.2.5) and AMT (Section 1.3.4.2). The following describes the monitoring and adaptive management elements that will be implemented during ADSRP and Post-ADSRP periods. Monitoring associated with the FOCP is described separately in Section 1.3.5.3.

1.3.4.1 Monitoring

ADP monitoring will be used to:

- Ensure compliance with regulatory requirements;
- Inform ADSRP actions, Post-ADSRP actions, maintenance actions, and conservation measure implementation;
- Evaluate the effectiveness of ADP conservation measures for their support of steelhead survival and recovery in Coyote Creek; and
- Guide implementation of adaptive management actions.

1.3.4.1.1 Compliance Monitoring

Compliance monitoring will be applied to operations, maintenance, and conservation measure implementation. Valley Water will track and report to NMFS whether or not ADP actions are being implemented as described by Valley Water in the BA. For example, Valley Water will track reservoir releases for compliance with the rule curves pulse flow triggers, and ramping with stream flow gages and measurements of Anderson Reservoir and Coyote Reservoir water surface elevations. Compliance monitoring will also occur related to cold water pool calculations and flow release rates during the summer release period. Table 3-14 in the BA (copied below as Table 4) details the time, duration, and frequency of compliance monitoring. Figure 3-8 in the BA shows the locations of compliance monitoring in Coyote Creek Watershed. Compliance monitoring for non-flow CMs will be monitored and will be qualitative in nature. If compliance monitoring reveals that ADP actions are not being implemented or are not performing as planned, Valley Water will work with the ADP multi-agency group(s)/team(s) (e.g., OWG, TWG, AMT) to identify and implement corrective actions. Compliance monitoring results and triggers, including corrective actions implemented or proposed for future implementation will be provided to resource agencies, including NMFS, in annual reports.

Table 4. Monitoring components and associated AMP (Section 1.3.4.2) goals, objectives, triggers, and potential management actions (copied from BA Table 3-14 [Valley Water 2024g]).

Action (BE Section)	Goals	Objectives	Monitoring type and methods	Triggers	Potential management actions	Monitoring period and frequency
FAHCE-plus modified operating rule curves (3.6.3)	Maintain flows in Coyote Creek that support steelhead rearing habitat during the winter and spring	Maintain winter baseflow releases based on combined storage in Coyote and Anderson reservoirs at 5 cfs, 10 cfs, 15 cfs, 23 cfs, or ≥ 26 cfs at Gage No. 5082 Between Nov. 1 to Apr. 30, except for deviations during flood risk reductions releases, annually. [1] Minimum low storage release 5 cfs at Gage No. 5082 maintained when storage is below the low storage curve.	Compliance monitoring. Monitor reservoir storage level within Anderson (ALERT 4002) and Coyote (ALERT 4005) Reservoir and a 3-day rolling average of streamflow at Gage No. 5082 for compliance of storage and flow magnitude Nov. 1 to Apr. 30.	Winter baseflow curve storage met and objectives for winter baseflow releases not met[1].	ADSRP AMT evaluates annual monitoring information for a minimum of 7 years or the period necessary to obtain information about wet, normal and dry years. Based on that evaluation, VW may modify operation protocols to comply with operating rule curves to achieve objectives.	Continuous monitoring during winter baseflow release period (Nov. 1 to Apr. 30); annual reporting.
	Provide steelhead attraction flows during up and downstream migration	Pulse releases of 90 cfs for 10 days at Gage No. 5082 when combined storage in Anderson and Coyote Reservoir (minus imported water temporarily stored in Anderson) is at or above the Attraction curve from Dec. 1 to Apr. 1. Up to 9 times (no more than twice per month Dec.–Mar. and once in Apr.) during this time period if the storage threshold is met. Flood releases and spill events in excess of 90 cfs for 10 consecutive days between Dec. 1 to Apr. 1 will also be considered a pulse flow event. [1]	Compliance monitoring. Monitor reservoir storage level within Anderson (ALERT 4002) and Coyote (ALERT 4005) Reservoir and streamflow at Gage No. 5082 Dec. 1–Apr. 1.	Attraction flow curve storage met and objectives for pulse releases not met.	AMT evaluates an annual monitoring information for a minimum of 7 years or the period necessary to obtain information about wet, normal and dry years. Based on that evaluation, VW may modify operation protocols to comply with operating rule curves to achieve objectives.	Continuous monitoring during attraction flow release period (Dec. 1–Apr. 1); annual reporting.

Action (BE Section)	Goals	Objectives	Monitoring type and methods	Triggers	Potential management actions	Monitoring period and frequency
FAHCE-plus modified operating rule curves (3.6.3) (cont.)		Safeguard pulse release for attraction flow of at least 90 cfs for a duration of 5 days when combined storage in Anderson and Coyote reservoirs is at or above 55,000 AF and flow at Gage No. 5058 is at or above 30 cfs for 2 consecutive days from Jan. 15 to Mar. 31, annually, if no other pulse flow of 90 cfs or greater for 10 days or more has been released. Up to twice annually. Safeguard pulse release for attraction flow of at least 90 cfs for a duration of 10 days is triggered if no pulse has been released by Mar. 1 and storage is above the Safeguard threshold (55,000 AF).[1]	Compliance monitoring. Monitor reservoir storage level within Anderson (ALERT 4002) and Coyote (ALERT 4005) Reservoir and streamflow at Gage Nos. 5082 and 5058 Jan. 15–Mar. 31.	Safeguard storage and streamflow threshold met and objectives for safeguard pulse releases not met.	ADSRP AMT evaluates annual monitoring information for a minimum of 7 years or the period necessary to obtain information about wet, normal and dry years. Based on that evaluation, VW may modify operation protocols to comply with operating rule curves to achieve objectives.	Continuous monitoring Jan. 15–March 31; annual reporting.
		Increase in minimum number of adult upstream passage days into the CWMZ over modeled baseline. Equivalent to a minimum of 7 days per year into the CWMZ.	Effectiveness monitoring. Monitor streamflow at Gage No. 5058 Dec 1–Apr. 1.	Objectives for minimum adult passage days not met.	ADSRP AMT evaluates annual monitoring information for a minimum of 7 years or the period necessary to obtain information about wet, normal and dry years. Based on that evaluation, VW may modify storage trigger, magnitude, frequency, or duration or adjust the attraction flow releases to attain measurable objectives.	Continuous monitoring during attraction flow release period (Dec. 1–Apr. 1); annual reporting.

Action (BE Section)	Goals	Objectives	Monitoring type and methods	Triggers	Potential management actions	Monitoring period and frequency
FAHCE-plus modified operating rule curves (3.6.3) (cont.)	Provide steelhead juvenile downstream migration during spring	Pulse releases for outmigration of at least 60 cfs for a duration of at least 3 days at Gage No. 5082 is triggered when combined storage in Anderson and Coyote reservoirs is at or above the Outmigration threshold of 45,000 AF and flow at Gage No. 5058 is at or above 10 cfs for 2 consecutive days from Apr. 1 to May 31, annually. Pulse releases are to occur up to twice annually. Pulse release for outmigration flow of at least 60 cfs for a duration of 7 days is triggered if no pulse has been released by May 15 and storage is above the Safeguard threshold of 45,000 AF.	Compliance monitoring. Monitor reservoir storage level within Anderson (ALERT 4002) and Coyote (ALERT 4005) Reservoir and streamflow at Gage Nos. 5082 and 5058; Apr. 1–May 31.	Storage and streamflow threshold met and objectives for outmigration pulse releases not met.	ADSRP AMT evaluates annual monitoring information for a minimum of 7 years or the period necessary to obtain information about wet, normal and dry years. Based on that evaluation, VW may modify operation protocols to comply with operating rule curves to achieve objectives.	Continuous monitoring during outmigration release period (Apr. 1–May 31); annual reporting.
		Increase in minimum number of outmigration passage days out of the CWMZ over modeled baseline. Equivalent to a minimum of 14 days per year out of the CWMZ.	Effectiveness monitoring. Monitor streamflow at Gage No. 5082 Feb. 1–May 31, annually.	Objectives for minimum outmigration passage days not met.	ADSRP AMT evaluates annual monitoring information for a minimum of 7 years or the period necessary to obtain information about wet, normal and dry years. Based on that evaluation, VW may modify storage trigger, magnitude, frequency, or duration or adjust the outmigration flow releases to attain measurable objectives.	Continuous monitoring during outmigration flow release period (Dec 1.–May 31); annual reporting.

Action (BE Section)	Goals	Objectives	Monitoring type and methods	Triggers	Potential management actions	Monitoring period and frequency
FAHCE-plus modified operating rule curves (3.6.3) (cont.)	Provide sufficient water depth during adult migration	Pulse flow release for attraction flow (at least 90 cfs) provides water depth ≥0.7 feet over 25% of entire channel cross-section and 10% of continuous cross section at critical riffles.	Effectiveness monitoring. Following CDFW standard operating procedures at all POIs.	Adult migration water depth objectives not met during pulse flow releases of 90 cfs.	ADSRP AMT evaluates attraction flow monitoring information for Years 1, 3, 5 and 10 after implementation, and after any modification to attraction flow regime. Based on that evaluation, VW may identify refinements to attraction flow magnitude, including modifying reservoir releases for salmonid upstream migration, or modifying passage obstacles.	Within 1 year of implementation and/or when an attraction flow is released, in Years 1, 3, 5, and 10 of ADSRP and after any modification to attraction flow magnitude or duration for the duration of the Project.
	Provide sufficient water depth during smolt migration.	Pulse flow release for outmigration flow (60 cfs) provides water depth ≥0.4 feet over 25% of entire channel cross-section and 10% of continuous cross section at critical riffles. [1]	Effectiveness monitoring. Following CDFW standard operating procedures at all POIs. Repeated following channel forming flows, or other alterations to critical passage locations.	Juvenile migration water depth objectives not met during pulse flow releases of 60 cfs.	ADSRP AMT evaluates monitoring results. Based on that evaluation, VW may identify refinements to outmigration flow magnitude, including modifying reservoir releases for salmonid downstream migration, or modifying passage obstacles.	

Action (BE Section)	Goals	Objectives	Monitoring type and methods	Triggers	Potential management actions	Monitoring period and frequency
Summer post-construction operations (3.6.3)	Provide suitable water temperatures for steelhead rearing during summer within the FCWMZ.[2]	Average daily temperature not to exceed 18°C from May 1 through Oct. 31 within the FCWMZ.[2]	Compliance monitoring. Continuous monitoring of stream temperature within the CWMZ.	Average daily temperature exceeds temperature objectives in years with a cold-water program.	ADSRP AMT annual monitoring information for a minimum of 3 years after completion of Ogier Pond Restoration. Based on that evaluation, VW may identify refinements to cold water pool management (i.e., change in cold pool temperature targets or release rates) and/or extent of CWMZ or attainable water temperature measurable objectives.	Within 1 year of implementation or first year with a cold-water program. Monitoring occurs from May to Oct. for the first 10 years of the project.
FAHCE-plus modified operating rule curves (3.6.3)	Avoid stranding	For flow decreases >50 cfs, flow is reduced approximately 50% per step over a maximum of seven equally spaced steps in 72 hours or less. For flow decreases ≤50 cfs, flow is reduced approximately 50% per step over a maximum of four equally spaced steps in 36 hours or less. The minimum reduction in flow during each ramping step will be 2 cfs.	Compliance monitoring. Monitor streamflow at Gage No. 5082 at 15-minute intervals during flow recessions.	Flow recessions in excess of objectives	ADSRP AMT to evaluate flow ramping criteria annually. Based on evaluation, VW may identify and make annual refinements to ramping rate measurable objectives or implementation.	Immediately after implementation, annually for the duration of the Anderson Program during flow recessions.

Action (BE Section)	Goals	Objectives	Monitoring type and methods	Triggers	Potential management actions	Monitoring period and frequency
Phase 2 Coyote Percolation Dam Operations (3.6.5)	Provide safe, effective, and timely upstream and downstream steelhead passage	Meet NOAA fish passage criteria through the facility	Compliance monitoring. Post construction monitoring of water depth and velocity in facility at design flows.	Criteria not achieved within range of design flows	ADSRP AMT to evaluate modifications to the facility and post-construction monitoring information. Based on that evaluation, VW may change operations, to achieve measurable objectives.	Annually beginning immediately after implementation, based on availability of flows.
		Improved migration conditions including depth, velocity, and predation risk) as compared to baseline operations	Effectiveness monitoring. Detailed methods to be included in the operations plan (Section 3.6.5)	Migration conditions depth, velocity, and predation risk lower than baseline operations	ADSRP AMT evaluates monitoring data to determine if there is improved migratory conditions over a period to be specified in operations plan. Based on that evaluation, VW may develop changes to operations protocols to attain measurable objectives.	Monitoring period and frequency to be described in operations plan (Section 3.6.5)
Ogier Ponds CM (3.7.7.1)	Restore riverine function, provide fish passage, enhance rearing habitat	Restore over 6,400 ft of channel and remove all fish passage impediments. Maintain over 67,000 ft^2 of suitable juvenile rearing habitat, and over 33,000 ft^2 of shallow water for fry rearing at typical spring and summer flows (approximately 30 cfs). Over 20,000 ft^2 of suitable spawning habitat.	Effectiveness monitoring. Annual monitoring at design flows to determine the success of the project at achieving restoration objectives, and to inform maintenance.	Rearing or spawning habitat less than objectives.	ADSRP AMT to evaluate annual monitoring information for a period of at least 10 years to determine if habitat measurable objectives continue to be met. Based on evaluation, VW may implement Sediment Augmentation program or other appropriate maintenance or restoration activities to maintain habitat measurable objectives.	Annual monitoring for ten years following implementation.
Live Oak Restoration (3.7.7.2)	Increase steelhead spawning habitat, high-flow floodplain habitat, and habitat complexity	Restore over 2,800 ft of channel, create over 20,000 ft^2 of spawning habitat, over 65,000 ft^2 of suitable juvenile rearing habitat, and over 20,000 ft^2 of shallow water for fry rearing at typical spring and summer flows (approximately 30 cfs).				

Action (BE Section)	Goals	Objectives	Monitoring type and methods	Triggers	Potential management actions	Monitoring period and frequency
Sediment Augmentation (3.7.8)	Supplement sediment and spawning gravels downstream of Anderson Dam	Augment at least 500 cy of sediment within the CWMZ.	Effectiveness monitoring. Monitor augmentation location and replenish to initial volume at least every five years.	Sediment transport is occurring and volume at augmentation site is less than 500 CY or sediment transport is not occurring.	ADSRP AMT to evaluate annual monitoring information for a period of at least 5 years to determine if augmented gravel is mobilizing and being transported downstream. Based on evaluation, VW may replenish sediment to initial volume, adjust geomorphic flows, or conduct other maintenance or restoration activities to maintain the measurable objectives.	Monitored annually and replenished to initial volume at least every five years.

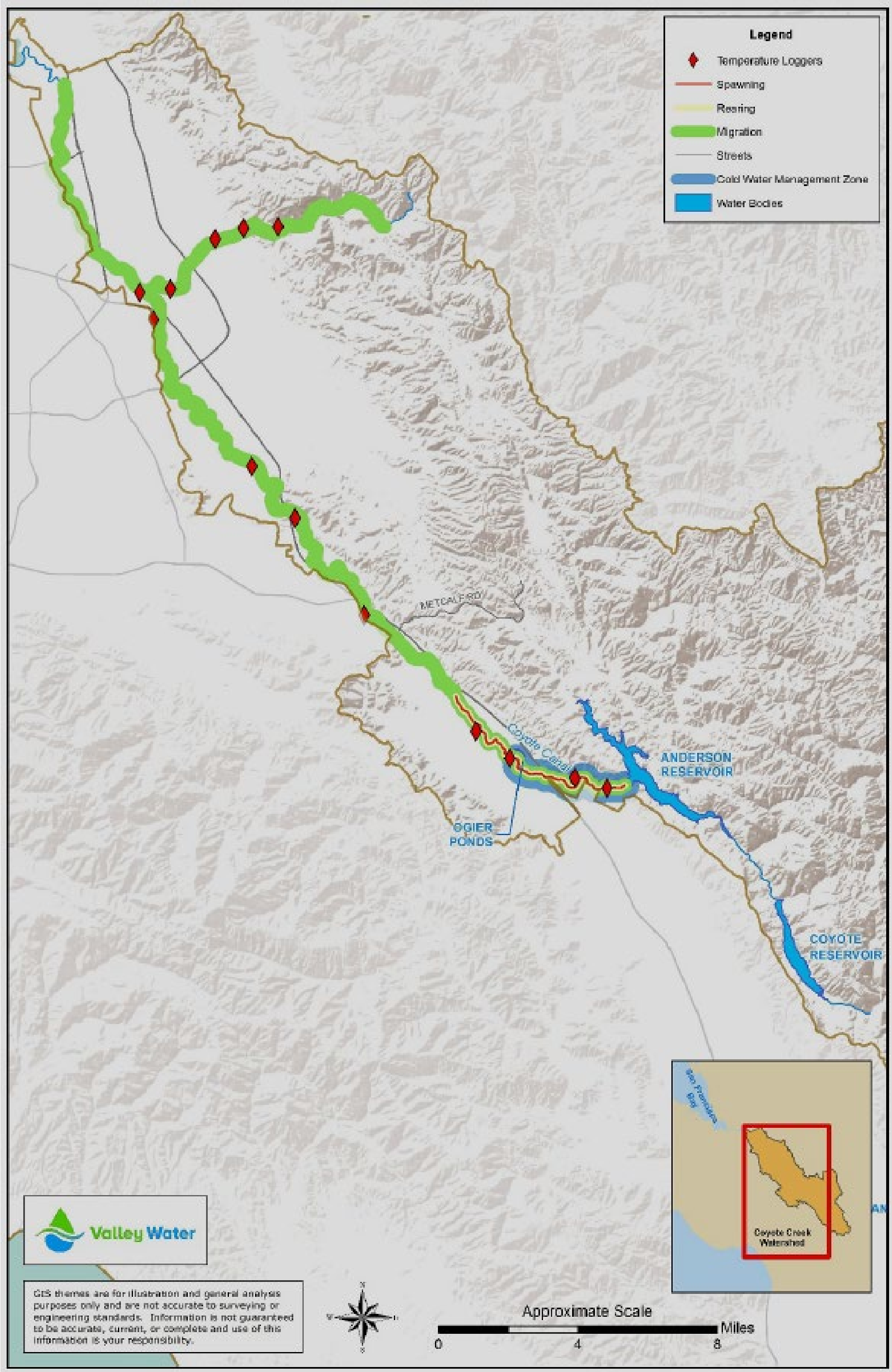
[1] The rule curves provide a target release rate. Releases from the reservoir may fluctuate slightly due to valve imprecision.

[2] Functional Cold Water Management Zone (FCWMZ) is the reach of Coyote Creek from Anderson Dam to the point at which the creek enters Ogier Ponds. The downstream extent of the cold water management zone will be set at the upstream end of Ogier Ponds until the completion of the Ogier Ponds CM at which point it will be extended to the Coyote Creek Golf Drive crossing.

1.3.4.1.2 Validation Monitoring

Valley Water will implement validation monitoring to assess the efficacy of the ADP actions, including operations, maintenance and conservation measures in supporting juvenile and adult steelhead passage, and quality habitat for all life stages of steelhead. Validation monitoring involves monitoring pulse flows for adequate depth and for salmonid migration, temperature monitoring, fish passage analysis at the Coyote Percolation Dam, gravel augmentation, and site-specific monitoring at restoration sites. Validation monitoring will occur at the locations shown in Figure 4 below. For example, to assess the relationship between reservoir releases and actual water temperatures observed in the CWMZ and other reaches of Coyote Creek and Upper Penitencia Creek, water temperature will be monitored year-round using water temperature loggers. Similarly, to verify that gravel augmentation is providing suitable substrate for steelhead spawning and rearing, gravel quality and quantity will be assessed at 5-year intervals or following channel forming flow events (e.g., bank full flows).

Figure 4. Validation monitoring in Coyote Creek Watershed (BA Figure 3-9).



1.3.4.1.3 Long-Term Trend Monitoring

Long-term trend monitoring will include evaluation of Coyote Creek ecosystem responses to management actions and/or habitat conditions. Valley Water has developed a monitoring program that is summarized below. To ensure that fisheries population status and trends can be established over time, the monitoring program includes coordination with the AMT. Table 5 (below) summarizes long-term trend monitoring components, and additional details are included in Appendix A of the BA (Valley Water 2024g, Appendix A).

Table 5. Summary of long-term trend monitoring (copied from BA, Table 3-15).

Parameters	Analysis	Monitoring Method	Timing	Reporting
Adult salmonid relative abundance	Occurrence and trend analysis	Vaki Riverwatcher or other fixed station monitoring / PIT tag detectors at downstream locations	Fall–Winter	10-year trend data as available input to inform adaptive management decisions
Juvenile steelhead density and condition	Occurrence, density and size distribution	Index reach electrofishing surveys, steelhead collected will be visually inspected to assess conditions in addition to a length-weight analysis	Fall	
Juvenile steelhead outmigration	Occurrence at PIT antenna stations	Stationary PIT antenna arrays to detect PIT tagged fish	Winter–Spring	

Parameters	Analysis	Monitoring Method	Timing	Reporting
Steelhead population genetics	Population diversity and genetic markers for anadromy	Tissue sampling during electrofishing and analyzing population genetics when a sufficient sample size has been collected	Fall	
Fish species composition	Baseline percentage non-native species	Index reach electrofishing surveys for species composition, relative abundance, and fish density	Fall	

1.3.4.1.3.1 Environmental DNA (eDNA) Monitoring

Environmental DNA (eDNA) sampling will be conducted to evaluate the presence of steelhead in Coyote Creek downstream of Anderson Dam during ADSRP construction. This monitoring is intended to supplement traditional methods of determining steelhead presence, persistence, and distribution in Coyote Creek (e.g., electrofishing and seining) and increase the probability of detection, which, in addition to supporting long-term trend monitoring, can also help inform construction- or maintenance-related fish rescue activities. This eDNA monitoring will be conducted within the portion of Coyote Creek downstream of Anderson Dam to Metcalf Road. Within this reach, water samples will be collected from 16 spatially distributed locations. Additionally, one location outside of the FCWMZ where steelhead is known to occur will also be sampled to serve as positive controls for eDNA detection. The positive control sampling location will be within Upper Penitencia Creek. Samples will be collected once a month from May to September during the annual monitoring season.

1.3.4.1.3.2 Adult Escapement Monitoring—Vaki Riverwatcher

Adult steelhead escapement monitoring will be conducted during ADSRP and long-term post-ADSRP ADP implementation to determine if adult steelhead are migrating upstream through the lower reaches of Coyote Creek and potentially spawning within upstream reaches. This monitoring is intended to provide an awareness of spawning adults in Coyote Creek, which can also help inform construction- or maintenance-related fish rescue activities. Adult escapement monitoring will be performed with the Vaki Riverwatcher (Vaki), a computer-based fish counter located within the Coyote Percolation Dam fish ladder. The system is designed to track adult migratory fish (greater than 1.6 inches body depth) with a clear migratory path (i.e., anadromous fish). It employs scanner plates and a digital camera to capture videos and silhouette images of fish as they pass between the plates. The speed, direction, body depth, date and time are all captured for each event. The system provides an estimate of the number of adult anadromous fish and migratory timing but cannot accurately track juvenile movement patterns. Data is downloaded from the onsite computer during weekly site visits during the period when Coyote Creek is wetted at the fish ladder. (see BA Sections 3.7.6.1).

1.3.4.1.3.3 Juvenile Rearing, Migration, Survival, and Growth

The ADP includes long-term monitoring of juvenile steelhead rearing, migration, and growth monitoring. The following describes these juvenile steelhead monitoring components.

Juvenile Rearing

Monitoring to evaluate the presence, density, movement, survival and growth of juvenile steelhead will be conducted during ADSRP and long-term post-ADSRP implementation. During ADSRP, juvenile monitoring will occur each year if a fish rescue did not occur that season. Post-ADSRP, juvenile monitoring will occur in all years. Juvenile monitoring will be conducted using an index reach sampling design and will include water quality sampling, fish processing (e.g., measuring and weighing), PIT tagging of suitably sized steelhead, and following a period of recovery, release of fish back into the reach from which they were captured.

Index reach sampling will occur during the fall. Sampling reaches will target lengths of 100 m (328 feet) and include at least two distinct habitat types. During index sampling, sampling reaches will be temporarily isolated by the placement of block nets at both the upstream and downstream end of the index reaches, and electrofishing and/or seine netting will be applied. Additional methods to be employed during juvenile rearing sampling include collection of tissue and scale samples. These samples will be collected from a subset of captured steelhead and, like other methods applied during sampling events (e.g., electrofishing, seine netting, fish processing), will apply standard practices to minimize injury and harm to individuals. Juvenile rearing monitoring methods are described further in Section 3.7.6.1of the BA. Collection by backpack electrofishing and seine netting will be used to capture fish during the June 1 through November 15 sampling window weather and stream flow permitting. Site conditions will be evaluated prior to commencement of each field sampling event to determine presence of sensitive species.

Migration

Monitoring to evaluate steelhead migration of steelhead adults into and out of Coyote Creek, and smolts out of Coyote Creek, will be conducted during ADSRP and long-term post-ADSRP implementation. To study migration, juvenile steelhead captured during juvenile rearing monitoring will be tagged with PIT tags (see Juvenile Rearing above), and at minimum, four PIT antenna stations will be operated. Three stations will be in Coyote Creek downstream of Anderson Dam: one in the City of Milpitas near the USGS stream flow gage 1172175, one upstream of Ogier Ponds, and one downstream of the Coyote Percolation Dam. A fourth station will be located in Upper Penitencia Creek near the Noble Diversion Structure. The locations of additional antenna locations, if added, would be determined in coordination with the AMT (Section 1.3.4.2). Data will be downloaded at least every two weeks from October 1 to June 30.

Growth

Valley Water will compare fish lengths and evaluate changes in length distribution across years by comparing present-year juvenile rearing capture data to previous years' data. Length distribution within cohorts will be compared to previous years' data using an appropriate statistical test to provide information on the length distribution of fish within Coyote Creek and to determine changes in size distribution between years. Additionally, recaptured fish in subsequent years of juvenile rearing sampling will be assessed for a relative yearly growth rate.

1.3.4.1.4 Habitat Monitoring

Valley Water will perform habitat monitoring, which will include Migration Flow Monitoring, Water Quality Monitoring, Suspended Sediment Monitoring, and Spawning Habitat Quality and Sediment Deposition Monitoring, and Wetland and Riparian Habitat Dryback Monitoring to monitor the condition of habitat in Coyote Creek downstream of Anderson Dam.

1.3.4.1.4.1 Migration Flow Monitoring

Flows will continue to be monitored every spring through ADSRP Completion, by evaluating stream flow gauges and comparing to minimum passage depths derived from the WEAP model or other source. Data from streamflow stations 5082/USGS 11170000, USGS 11172175, and 5058 will be evaluated at the 15-minute interval to determine the number of passage days available for both adult and juvenile steelhead. Flows will be analyzed between December 1 and April 30 for adult steelhead and between February 1 and May 31 for juvenile steelhead.

1.3.4.1.4.2 Water Quality Monitoring

Valley Water will monitor water quality in Coyote Creek downstream of Anderson Dam during ADSRP and long-term post-ADSRP implementation. Water temperature and dissolved oxygen (DO) data will be collected using DO loggers and continuous water temperature loggers. The temperature loggers have a water detection capability that records when the logger is "in" versus "out" of the water, which Valley Water personnel will use to identify when sample reaches have been dewatered and to differentiate between water temperature and air temperature data. Post-ADSRP, Anderson Reservoir monitoring will occur through vertical profiles used to calculate cold water pool volumes present within the reservoir.

1.3.4.1.4.3 Suspended Sediment Monitoring

Valley Water will continuously monitor suspended sediment discharges from Anderson Reservoir, as well as the effect of the discharges on Coyote Creek downstream of Anderson Dam during ADSRP construction. SSC monitoring will occur at five locations throughout Coyote Creek—Highway 237, Edenvale, Coyote Ranch Road, Madrone, and the Anderson Dam outlet. Suspended sediment monitoring data will be used to determine if ADSRP construction activities are resulting in elevated suspended sediment discharges to downstream reaches of Coyote Creek. This data will be coupled with sediment deposition monitoring (described below) to assess the potential effects of elevated suspended sediment discharges, if occurring, on downstream habitat.

1.3.4.1.4.4 Spawning Habitat Quality Monitoring and Sediment Deposition Monitoring

To monitor the effects of fine sediments released from Anderson Reservoir during the Anderson Reservoir drawdown and ADSRP activities (e.g., pool filling and/or spawning gravel embedding), Valley Water will monitor spawning habitat conditions and substrate conditions within Coyote Creek downstream of Anderson Dam.

Spawning habitat quality monitoring will occur annually at four monitoring locations known by Valley Water, from previous surveys, to regularly contain substrate suitable for steelhead spawning. Three of the locations are between the Anderson Reservoir outlet and Ogier Ponds, and the fourth is located downstream of Ogier Ponds, between Ogier Ponds and Metcalf Road upstream of Bailey Avenue. Each spawning habitat quality monitoring location will include five transects located within specific habitat units, consisting of: one pool depth transect at or near maximum pool depth, two pool tailout transects, one riffle crest transect, and one riffle transect. The maximum pool depth will be measured at the deepest location of the pool (the deepest pool location within each transect may change over time due to deposition and or scour), and gravel embeddedness will be measured in 1-foot increments along each of the four remaining transects.

Sediment deposition will be monitored in Coyote Creek from Anderson Dam downstream to the Ogier Ponds within three distinct study reaches. Sediment deposition monitoring will include steelhead spawning gravel and benthic macro-invertebrate (BMI) habitat suitability mapping within a total of 31 habitat units in each study reach. These 31 habitat units will comprise 15 flatwater units, 6 pool units, and 10 riffle units. During each monitoring event dominant particle size (D_{50}) and median percent embeddedness will be measured at each location, and field maps with polygons using GIS drawn from the previous year will be used to identify notable deviations between previously mapped conditions and current conditions.

1.3.4.1.4.5 Wetland and Riparian Habitat Dryback Monitoring

To monitor the effects of reservoir operations on wetland and riparian habitat during the Anderson Reservoir drawdown and ADSRP activities, Valley Water will monitor habitat conditions in Coyote Creek and within a portion of Coyote Valley to determine if there is a reduction in the surface area of wetlands and/or riparian habitats due to drawdown-related dryback. The upstream limit of these wetland and habitat dryback monitoring will be the CDL near the base of Anderson Dam and the downstream limit will be Coyote Creek streamflow gage 5058 (Edenvale gage) located 4.5 miles downstream of the Coyote Percolation Dam. Aerial imagery and ground truthing will be used to collect information on the conditions of riparian vegetation during baseline, interim, and post-drawdown periods. This information will be used by the OWG (Section 1.3.2.1.2.5), which will include NMFS, to inform ADSRP actions and, if needed, adjust operations to address effects to wetlands and riparian habitat.

1.3.4.1.5 Site-Specific Monitoring

In addition to compliance, validation, and long-term trend monitoring described above, focused monitoring will be implemented at specific sites within Coyote Creek.

1.3.4.1.5.1 Coyote Percolation Dam Fish Passage Monitoring

Juvenile outmigration studies will be performed at the Coyote Percolation Dam to assess the ability of the facility to provide safe, timely and effective downstream passage of juvenile steelhead. In coordination with the resource agencies, Valley Water will develop studies to assess conditions for juvenile outmigration within Coyote Percolation Dam. A full study plan will be finalized in the final year of Phase 2 construction, so implementation of the studies can occur once post-construction operations are implemented. Based on proposed operations of Coyote Percolation Dam during ADSRP construction, it may be determined that these studies should occur post-ADSRP construction under post-construction reservoir operations. Studies will focus on three key areas:

1. Predation (piscivorous avian and aquatic species)
2. Out-migration success and passage conditions under a variety of stream conditions
3. Periodic percolation pond draining evaluated from an ecological and water supply standpoint.

These studies will be used to develop protective measures and understand passage conditions at the facility. The results of the studies will be presented to the Adaptive Management Team (AMT; Section 1.3.4.2) of the ADP as data are available. The findings of these studies will be used by Valley Water, in coordination with the AMT, to determine if adaptive management actions are needed at the Coyote Percolation Dam to improve the facility and its operations so that it meets NMFS' fish passage guidelines and provides safe, timely, and effective passage of steelhead. The results of the studies will be presented to the AMT as data are available, and if the Coyote Percolation Dam is found to not provide safe, timely, and effective steelhead passage, Valley Water will, within 5 years after completion of the construction phase of the Coyote Percolation Dam Phase 2 Project, provide a preliminary summary report to the AMT to inform the development and implementation of adaptive management measures that will be implemented at the Coyote Percolation Dam to ensure that safe, timely, and effective steelhead passage is provided at the facility (see Section 1.3.3.4 Adaptive Management Program). Valley Water has proposed the 5-year timeframe to provide time for passage to be evaluated during a variety of flow conditions, and impacts associated with predation to be developed during a period that is reflective of long-term Post-ADSRP operations.

1.3.4.1.5.2 Live Oak Restoration Site

The Live Oak habitat restoration project is intended to increase steelhead spawning habitat, high-flow floodplain habitat, and habitat complexity. Effectiveness monitoring will inform site maintenance and, if needed, adaptive management. Section 3.7.7.2 in the BA describes the monitoring that will be implemented at this site. Habitat monitoring will be conducted at design flows of approximately 30 and 50 cfs to determine the success of the projects at achieving restoration objectives, and to inform maintenance. During each monitoring event suitable fry, juvenile, and spawning habitat will be mapped on the basemap of the reach, based on accepted habitat suitability criteria (Stillwater Sciences 2021). Monitoring will include various components and will occur for up to 10 years post-construction (additional details presented in Table 6 from the Live Oak MMP). Results will be used to inform maintenance of the project.

Table 6. Live Oak Restoration maintenance and monitoring components that will occur for up to 10 years post-construction, including frequency and timing.

Event	Maintenance Actions			Monitoring Actions					
	Spawning Gravel Replenishment	Repairs	Reconstruction	Hydrology	Topography	Tracer Rock Study	Repeat Photography	Sediment Sampling	Habitat Suitability Monitoring
Annually				X					
Pre-project					X		X	X	X
As-built					X	X	X	X	X
Three years post-implementation					X	X	X	X	
Five years post-implementation					X		X	X	X
Ten years post-implementation					X		X	X	X

Event	Maintenance Actions			Monitoring Actions					
	Spawning Gravel Replenishment	Repairs	Reconstruction	Hydrology	Topography	Tracer Rock Study	Repeat Photography	Sediment Sampling	Habitat Suitability Monitoring
Flow > 250 cfs	X				X	X	X	X	X
Flow > 1,000 cfs	X	X			X	X	X	X	X
Flow > 5,875 cfs	X	X	X		X	X	X	X	X

1.3.4.1.5.3 Ogier Ponds Restoration Site

The Ogier Ponds habitat restoration project includes effectiveness monitoring to inform site maintenance and, if needed, adaptive management. Section 3.7.7.1 in the BA describes the monitoring that will be implemented at this site. Monitoring will be conducted to ensure the project is effective at achieving restoration goals. Similar to the monitoring associated with the Live Oak Restoration Site, a scale as-built map (basemap) of the restoration will be created. Biological monitoring will be described in detail and is anticipated to include annual monitoring at design flows. During each monitoring event suitable fry, juvenile, and spawning habitat will be mapped on the basemap of the reach, based on accepted habitat suitability criteria (Stillwater Sciences 2021). Results will be used to inform maintenance of the project.

1.3.4.1.5.4 Additional Focused Monitoring Sites

Additional focused monitoring sites may be added by Valley Water if, in coordination with the associated ADP multi-agency group(s)/team(s) (e.g., OWG, TWG, AMT), additional site-specific monitoring is deemed necessary to inform implementation of the various overarching ADP project categories (e.g., ADSRP, Post-ADSRP, Conservation Measures). For example, the TWG can make recommendations during ADSRP construction and additional monitoring can occur through the AMT process (Section 1.3.4.2).

1.3.4.2 Adaptive Management

Valley Water will implement the AMP[9] to avoid, minimize, and offset ADP environmental impacts to steelhead. The ADP includes AMP Phase 1 goals described below (FAHCE-Plus Modified Rule Curves, Phase 2 Coyote Percolation Dam Operations, Ogier Ponds CM, Live Oak Restoration, Sediment Augmentation) for Post-ADSRP operations and conservation measures, and AMP Phase 2 measures that would be planned and implemented in coordination with the AMT in the event that monitoring data (10-years post-ADSRP implementation) indicates that ADP implementation has not succeeded in achieving the following AMP objective (BA Section 3.7.6.7):

> "restore and maintain a healthy[10] steelhead trout and salmon population in Coyote Creek watershed, by providing: (A) approximately five miles of spawning and rearing habitat below Anderson Dam and in Upper Penitencia Creek; and (B) adequate passage for adult

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[9] Valley Water developed the ADP adaptive management program (AMP) to assure the long-term management and effectiveness of the ADP Conservation Measures to benefit steelhead (as well as Chinook salmon and EFH). The AMP is identified in the BA as the "Post-Construction Project and FAHCE AMP," or "FAHCE and Project AMP" and will be referred to throughout this biological opinion as the AMP.

[10] Valley Water clarifies (via May 21, 2025 communications) that the term "healthy" is not a measurable objective for steelhead defined in the AMP, and the proposed ADP habitat enhancement actions to achieve (A) and (B) of this AMP management objective are measurable objectives. Valley Water uses the term "healthy" within the context of this AMP objective as it relates to Valley Water's planned implementation of ADP activities that will provide habitat for all steelhead life stages, create passage opportunities, maintain suitable temperatures, and restoration to improve conditions for steelhead.

steelhead trout and salmon to reach suitable spawning and rearing habitat, and for out-migration of juveniles."

The AMP includes the following AMP Phase 1 goals:

- For the FAHCE-Plus Modified Rule Curves:
    - Maintain flows in Coyote Creek that support steelhead rearing habitat during the winter and spring,
    - Provide steelhead attraction flows during up and downstream migration,
    - Provide steelhead juvenile downstream migration during spring,
    - Provide sufficient water depth during adult and smolt migration,
    - Avoid stranding, and
    - Provide suitable water temperatures to the extent feasible for steelhead rearing during summer within the FCWMZ until the Ogier Ponds CM is completed, then throughout the whole CWMZ as cold water pool volume allows.
- For Phase 2 Coyote Percolation Dam Operations:
    - Provide safe, effective, and timely upstream and downstream steelhead passage.
- For the Ogier Ponds Conservation Measure:
    - Restore riverine function, provide fish passage, enhance rearing habitat.
- For the Live Oak Restoration:
    - Increase steelhead spawning habitat, high-flow floodplain habitat, and habitat complexity.
- For Sediment Augmentation:
    - Supplement sediment and spawning gravels downstream of Anderson Dam.

If monitoring indicates that AMP goals and objectives for steelhead and habitat are not being met, adaptive management actions will be implemented. Additional information regarding AMP measurable objectives, monitoring methods, triggers for potential management actions, potential management actions to be considered for implementation, and monitoring period and frequency can be found in Table 3-14 of the BA (copied as Table 4 above in Section 1.3.4.1).

To support AMP implementation, Valley Water will establish a multi-agency Adaptive Management Team (AMT) composed of Valley Water, regulatory agencies, and resource agencies, including NMFS. Potential adaptive management actions will be reviewed and selected by the AMT, and selected adaptive management actions will be prioritized by the AMT for Valley Water to implement. Additionally, the AMP allows for Valley Water, with AMT coordination and approval, to develop and implement additional not-yet-described adaptive management actions, as long as they meet the overall goals of the AMP. The AMT will use monitoring data (see Section 1.3.4.1) and other best-available information to inform implementation of any AMP actions. Monitoring and implementation data will be synthesized and analyzed, ADP progress towards achieving AMP objectives and goals will be assessed, potential adaptive management actions will be developed, and a structured decision-making process for selecting and implementing adaptive actions will be applied. The AMT decision making process includes NMFS review and approval, and a process for dispute resolution among AMT members, should disputes occur. Considerations for adaptive management decision making will include inter-annual and seasonal variation in hydrologic conditions, other constraints and limiting factors affecting achievement of the overall management objectives, monitoring results of habitat enhancement measures already implemented, and opportunities for improving habitat for other fish, wildlife, plants, and overall watershed conditions. The data-informed approach (Valley Water 2023c) will be supported by data from ADP compliance, validation, and long-term trend monitoring data and reports, and additional information as available, and will be applied to help determine whether or not refinements of post-ADSRP operations and measures (e.g., reservoir releases, fish passage projects, or habitat restoration projects) are needed to improve instream fisheries habitat conditions. Valley Water will also collaborate with NMFS regarding sampling methodologies to ensure that fisheries population status and trends can be established over time and that ADP monitoring supports implementation of ADP programs, including the AMP.

Applying the AMP, including AMT coordination, AMP actions to support steelhead spawning, rearing, and migration downstream of Anderson Dam may be implemented anytime, including within the first 10 years of post-ADSRP dam operations, and additional measures (AMP Phase 2 measures), if necessary and feasible, would be implemented after the first 10 years of post-ADSRP operations. Adaptive management actions that may be implemented at the Coyote Percolation Dam (an AMP Phase 1 measure; 1.3.4.2.1, below) and Above-Reservoir Steelhead Reintroduction (an AMP Phase 2 measure; 1.3.4.2.2, below) serve as examples of how data-informed adaptive management actions will be implemented, if needed, by Valley Water.

1.3.4.2.1 Coyote Percolation Dam Adaptive Management

As described in Section 1.3.4 (Monitoring), monitoring will be performed at the Coyote Percolation Dam to assess the efficacy of Coyote Percolation Dam configuration and operations at providing safe, timely, and effective fish passage as described by NMFS (2022):

> Regarding "safe" passage, NMFS requires licensees to design and operate their fishways so that they minimize the occurrence of injury or mortality experienced by fish while attempting to utilize the fishway. Regarding "timely" passage, a fishway prescription may include provisions for reducing the time in which a fish utilizing the fishway is subjected to stressful interactions, such as time spent in a trap or in transit, or a requirement for flows which will attract fish to a passage facility. Regarding "effective" passage, NMFS typically includes provisions requiring the operator to ensure that its facility succeeds in passing as close to 100-percent of the fish attempting to migrate through the system as possible (NMFS 2022).

The findings of these studies will be used by Valley Water, in coordination with the AMT, to determine if adaptive management actions are needed at the Coyote Percolation Dam to improve the facility and its operations so that it meets NMFS fish passage guidelines and provides safe, timely, and effective passage of steelhead. The results of the studies will be presented to the AMT as data are available. If the Coyote Percolation Dam is found to not provide safe, timely, and effective steelhead passage, Valley Water will, within 5 years post construction of the Coyote Percolation Dam Phase 2 Project, provide a preliminary summary report to the AMT to inform the development and implementation of adaptive management measures that will be implemented at the Coyote Percolation Dam to ensure that safe, timely, and effective steelhead passage is provided at the facility. Valley Water has proposed the 5-year timeframe to provide time for passage to be evaluated during a variety of flow conditions, and impacts associated with predations to be developed during a period that is reflective of long-term Post-ADSRP operations. Adaptive management actions that may be implemented at the facility include, but are not limited to: operational modifications such as bladder dam lowering to drain the Coyote Percolation Pond and provide riverine conditions through this reach during the juvenile outmigration period; habitat modifications such as pond habitat enhancement to provide cover for outmigrating juveniles; and physical modifications such alterations to the fish ladder, fishway or other components of the facility.

1.3.4.2.2 Above-Reservoir Steelhead Reintroduction

If 10 years of post-ADSRP operations and monitoring have occurred and the AMT determinations that the AMP objective described above[11] is not being met, then implementation of Phase 2 measures would be triggered. The AMP (BA Section 3.7.6.7) identifies reintroduction of steelhead (i.e., restoring anadromous steelhead via trap and truck operations) above Anderson Dam as an AMP Phase 2 measure that would be implemented if deemed necessary and feasible by the AMT. Valley Water has begun implementing habitat assessments in the upper watershed and may have preliminary information as early as 2027 to help inform future AMT discussions of potential above-reservoir studies and planning. The AMT will consider during post-construction adaptive management whether and when to implement above-reservoir reintroduction studies and planning (including those described in the final Ecological Feasibility Study [Stillwater Sciences 2023]) based on ongoing evaluation of monitoring results and progress towards the AMP objective.

1.3.5 FERC Order Compliance Project (FOCP)

On February 20, 2020, FERC issued the FERC IRRM Order (FERC 2020a) which required Valley Water to immediately implement interim risk reduction measures (IRRMs) to protect the public from the risk of dam failure in the event of severe seismic activity and directed Valley Water to identify and implement necessary CMs. Valley Water developed the FOCP to address FERC's IRRM Order. FOCP construction actions include the use of standard and specialized heavy equipment, construction methods typical of work in and around water, avoidance and minimization measures (AMMs), and best management practices (BMPs) to minimize the potential for construction-related effects to species and habitat (see BA section 3.7.10 "CM-10. Best Management Practices for AMMs and BMPs). FERC requested emergency consultation on March 16, 2020, and NMFS provided emergency recommendations by letters dated March 23, 2020 (ESA recommendations) and September 15, 2020 (MSA EFH recommendations). Due to the timing of the emergency response, the FOCP includes actions that have been completed, actions that are underway, and actions that will occur in the future. The following describes key components of the FOCP: drawdown of the reservoir to deadpool; construction of flood protection along portions of Coyote Creek; upgrade of existing infrastructure to support reservoir drawdown; and implementation of monitoring and measures to minimize impacts to steelhead and habitat during FOCP.

[11] As described above, the AMP objective is to: "restore and maintain a healthy steelhead trout and salmon population in Coyote Creek watershed, by providing: (A) approximately five miles of spawning and rearing habitat below Anderson Dam and in Upper Penitencia Creek; and (B) adequate passage for adult steelhead trout and salmon to reach suitable spawning and rearing habitat, and for out-migration of juveniles."

1.3.5.1 Reservoir Drawdown to Deadpool During FOCP

Anderson Reservoir was maintained at or below elevation 565 feet between February 20, 2020, and September 30, 2020. Beginning on October 1, 2020, the maximum allowable elevation was reduced to 488 feet, and deadpool was reached in mid-December 2020. In preparation for the initial drawdown and the associated loss of cold water pool storage in Anderson Reservoir, a late season pulse flow was released in May 2020 to encourage outmigration of the remaining steelhead in Coyote Creek below Anderson Reservoir. Prior to releasing the pulse flows, Valley Water drained the Coyote Percolation Pond to clear a migratory path for outmigrating smolts. Pulse flows occurred, starting on May 11, 2020, over a five-day period beginning with an initial release of 120 cfs on the first day, ramping down to 90 cfs for 24 hours, and then ramping down to 60 cfs for 3 to 5 days. Two additional natural pulse flow events occurred during the spring of 2020 due to rain events. Additionally, Valley Water implemented a slow drawdown rate (net rate 100 cfs) during dewatering prior to FOCP to reduce landslide risk and sediment mobilization within the reservoir.

On April 4, 2024, FERC revised its previous order by adjusting the deadpool elevation from elevation 488 feet to elevation 490 feet, allowing for 2 feet of storage above deadpool for the benefit of the environment (492 feet), and approving Valley Water to leave the outlet valves fully open until the reservoir reaches an elevation 493.5 feet before beginning ramp down procedures back to elevation 492 feet (187 FERC 62,008). Valley Water proposes to continue to manage Anderson Reservoir in this way throughout the duration of the FOCP. Because inflow to the reservoir often exceeds possible outflow, the surface water elevation of the reservoir periodically temporarily exceeds the target storage elevations. When this occurs, it may take weeks or months, depending on the rate and frequency of precipitation and related reservoir inflow, for the reservoir levels to reach deadpool again.

1.3.5.2 Upgrades to Existing Infrastructure During FOCP

To support releases of higher flows from Anderson Reservoir, as needed to maintain the reservoir in a drawn down condition, and to ensure that downstream infrastructure is able to withstand higher flow releases, the FOCP includes improvements to the reservoir outlet facilities and downstream infrastructure. The following describes these infrastructure upgrades.

1.3.5.2.1 Anderson Dam Tunnel Project (ADTP)

The potential rate of inflow into Anderson Reservoir far exceeds the 500 cfs maximum release capacity of the existing outlet and the designed capacity of the South Channel. To improve the ability for Anderson Reservoir to be managed at the target deadpool elevation, Valley Water is constructing the ADTP, which includes upgrades to the Anderson Dam outlet system placed within a tunnel through Anderson Dam, South Channel improvements and habitat restoration, reopen and extend the original Coyote Creek channel (North Channel), and construct flow management weirs in both channels. Construction of the ADTP upgrades to the Anderson Dam outlet works began in 2021, are ongoing, and include construction of a tunnel through Anderson Dam (Anderson Dam Tunnel [ADT]), and expansion of Anderson Dam's outlet works. The ADT was constructed through the right (north) abutment of Anderson Dam Anderson Dam in order to house portions of the new additional outlet structure, identified as the *Stage 1 Diversion System*, associated outlet structure. The Stage 1 Diversion System includes a new 8-foot-diameter lake tap, two 11-ft-diameter steel pipelines connected to an outlet control structure housing two 132-inch-diameter FCVs placed within an energy dissipation structure, and related components. The ADTP is scheduled for completion in December 2026. Following completion, the maximum managed release rate of Anderson Dam will be 2,500 cfs. After the completion of ADTP, the existing Anderson Dam outlet valve will continue to be fully opened and the new Stage 1 Diversion System will be utilized as needed. During the wet season, inflows will be passed through the existing outlet works to maintain the reservoir at deadpool.

To accommodate the combined releases from the upgraded Anderson Dam outlet system (i.e., up to 2,500 cfs), the North Channel will be enhanced and extended, the South Channel will be enhanced, and flow control weirs will be constructed in both the North and South channels. The North Channel will be graded so that it extends and connects with the South Channel of Coyote Creek approximately 1,000 feet downstream. Grading will include a slight slope towards the center of the channel and an approximately 1 percent slope towards the mainstem of Coyote Creek to stabilize both banks, support continuous flows from the dam to where the North Channel reconnects with Coyote Creek during low-flow periods, and to remove existing holes and pools that may strand fish when waters recede.

Weirs and Split Flow Management

To prevent damage to the South Channel and protect steelhead and habitat, flows will be managed via new weirs that will be constructed in the north and south channels (one weir in each channel). Construction of the weirs began in June 2024 and is in progress, with expected completion in October 2025. The weirs will be operated together. The south channel weir is designed to enable flexible operations via a 'U' shaped channel invert weir with slots for stop logs. Operations will be implemented by Valley Water in coordination with the Anderson Dam Operations Work Group.

1.3.5.2.2 Coyote Creek Flood Protection

To address the potential for flooding within the Coyote Creek corridor that could result from ADTP releases (up to 2,500 cfs), Valley Water implemented a subset of the flood management measures listed in the Coyote Creek Flood Protection Project as a component of the FOCP (GEI Consultants 2024). The portions implemented as a component of the FOCP total approximately 8,654 linear feet, and consist of seven spans of floodwalls placed outside of the Coyote Creek channel, within developed urban and suburban portions of the Coyote Creek floodplain between Highway 280 and Oakland Road. The major flood protection measures are all in place (construction during June 2023 to October 2024) and minor work around the floodwalls is ongoing.

1.3.5.2.3 Coyote Percolation Dam Upgrades Phase 1

Upgrades to the Coyote Percolation Dam are being implemented by Valley Water to improve operational flexibility and fish passage. The improvements are being completed in two phases, with Phase 1 being implemented and operated during FOCP and Phase 2 being implemented during ADSRP and operated during ADSRP and Post ADSRP (see Section 1.3.1.2 Construction of the Phase 2 Coyote Percolation Dam Fish Passage Enhancements, and Section 1.3.2.3 Operation of the Phase 2 Coyote Percolation Dam Fish Passage Enhancements Project). Implementation of Phase 1 began in 2023 and was completed in 2024. Phase 1 construction included the following four main design elements:

1. Removal of the existing steel flashboard dam, installation of an inflatable bladder dam, and a resulting 0.8-percent longitudinal slope across the dam foundation.
2. Modification of the downstream concreted rock slope protection, including replacement of the approach channel grouted rock weirs with a V-shaped roughened approach channel.
3. Construction of an initial segment of a roughened channel along the northern bank downstream of the dam to facilitate upstream and downstream anadromous salmonid passage over the deflated bladder dam during high flows and pulse flows
4. Replacement of a portion of the weir panels within the fish ladder with motorized adjustable weirs or raiseable single steel flashboard weirs to improve operational flexibility between dam-up and dam-down configurations.
5. Creation of a 16-in-wide by 60-in-tall vertical slot side exit and associated motorized raiseable steel slide gate in the upper part of the fish ladder so flow through the fish ladder will remain below its design maximum of 25 cfs and the fish ladder will remain in operation up to 1,400 cfs when the dam is deflated.

During Coyote Percolation Dam Phase 1 operations, minimum summer (and winter releases from Anderson Dam and/or the CVP (CDL and/or CVPE) result in flows of approximately 7.5 cfs at the Coyote Percolation Pond facility. During Coyote Percolation Dam Phase 1 operations, these minimum flows, as well as higher flows, are passed through the fish ladder and radial gates, with the ladder and radial gates being adjusted as needed to ensure that flows within the ladder are optimized for fish passage and do not exceed the 25 cfs limit of the fish ladder. When large winter flows exceeding 850 cfs at the Coyote Percolation Dam are expected, the inflatable dam is deflated to pass flows safely through the facility and help prevent flooding of the adjacent neighborhood. These Phase 1 operations will continue through FOCP.

1.3.5.3 Monitoring and Measures to Minimize Impacts to Steelhead and Habitat During FOCP

Fisheries monitoring, stream flow and water quality monitoring including suspended sediment monitoring, sediment deposition monitoring, and non-native species monitoring are required by FERC (2020b) for the FOCP, are currently occurring, and will occur as needed until completion of the Seismic Retrofit Improvements, and demonstration that all ADSRP non-flow CMs have met their restoration success criteria (ADSRP Completion). Monitoring will be conducted throughout the construction elements of the Anderson Dam Program and following implementation of all measures associated with the Program. For each of the key actions and potential risks to the steelhead population, monitoring actions have been developed, and are described in the BA (Section 3.7.6 and summarized in Table 7 included here below).

Table 7. Summary of monitoring actions to address Anderson Dam program elements (copied from BA Table 3-13). Section references in the table refer to sections in the BA.

Program element description	Potential influence on steelhead	Monitoring action (section)
Altered flows during construction of FOCP and ADSRP	Altered juvenile rearing habitat and feeding opportunities	Juvenile rearing surveys and growth evaluations (Section 3.7.6.1); Wetland and riparian dryback monitoring (Section 3.7.6.6)
	Altered migration flows	Migration flow monitoring, spawning surveys, Vaki monitoring of adult migration (Section 3.7.6.1), monitoring of juvenile downstream migration with PIT tag detections at stationary antennas (Section 3.7.6.7)
	Increased water temperatures	Water temperature monitoring and forecast model (Section 3.7.6.2); Juvenile rearing surveys and growth evaluations, eDNA monitoring of persistence and distribution (Section 3.7.6.1)
Reservoir drawdown during construction of FOCP and ADSRP	Increased sediment transport to downstream rearing and spawning habitat	Monitor suspended sediment downstream of Anderson Dam (Section 3.7.6.3); Monitor sediment deposition on spawning gravel, BMI habitat, and juvenile rearing habitat (Section 3.7.6.4); Juvenile rearing surveys and growth evaluations, eDNA monitoring of persistence and distribution (Section 3.7.6.1)
	Increased migration of resident *O. mykiss* and non-native species downstream out of Anderson Reservoir during FOCP	Fyke trap monitoring migration of fish downstream from Anderson Reservoir (Section 3.7.6.1); Non-native invasive species monitoring (Section 3.7.6.5)
Use of electric chillers	Reduced water temperatures	Water temperature monitoring and forecast model (Section 3.7.6.2); Juvenile rearing surveys and growth evaluations, eDNA monitoring of persistence and distribution (Section 3.7.6.1)

Program element description	Potential influence on steelhead	Monitoring action (section)
Construction of Ogier Ponds CM	Increased spawning and rearing habitat, improved adult upstream passage, reduced habitat for non-native fish, improved smolt migration conditions	Monitoring juvenile rearing habitat area and spawning habitat, passage criteria, and migration conditions (Section 3.7.7.1), monitoring of juvenile downstream migration through former ponds with PIT tag detections at stationary antennas (Section 3.7.6.7)
Construction of Live Oak Reach Restoration Project	Increased spawning and rearing habitat	Monitoring spawning and rearing habitat area (Section 3.7.7.2)
Coyote Percolation Dam Phase 1	Improved upstream and downstream fish passage conditions	Migration flow monitoring, spawning surveys, Vaki River Watcher monitoring of adult migration (Section 3.7.6.1), monitoring of juvenile downstream migration with PIT tag detections at stationary antennas (Section 3.7.6.7)
Coyote Percolation Dam Phase 2	Improved upstream and downstream fish passage conditions	
Post ADSRP operation of Anderson Dam, including revised flow releases, gravel augmentation, increased cold water pool, etc.	Disrupted sediment transport downstream of Anderson Dam and gravel augmentation program	Monitor substrate composition and volume of transported sediment relative to flows in sediment augmentation program (Section 3.7.8)
	Restricted fish migration upstream of Anderson Dam, potentially affecting population abundance and genetics	Long-term monitoring of adult steelhead abundance and trend monitoring with Vaki Riverwatcher and PIT tag detectors (Section 3.7.6.7); Monitoring of population genetics including anadromy from tissue sampling (Section 3.7.6.7)
	Altered flows resulting in increased rearing habitat area and with reduced water temperatures	Long-term water temperature monitoring (Section 3.7.6); Long term juvenile fish density and condition monitoring with index reaches, condition analysis, and PIT tag mark/recapture (Section 3.7.6.7)
	Altered flows resulting in improved fish migration opportunities	Long-term monitoring of adult steelhead passage effectiveness with Vaki Riverwatcher (Section 3.7.6.7); long-term monitoring of juvenile downstream migration with PIT tag detections at stationary antennas (Section 3.7.6.7)
Post ADSRP operation of Anderson Reservoir	Source of non-native species potentially migrating downstream	Long term species composition monitoring with index reaches (Section 3.7.6.7)

1.3.5.3.1 FOCP Surface Water Releases to Coyote Creek

During FOCP, water is made available to steelhead in Coyote Creek downstream of Anderson Dam as in-basin and imported water sources allow. The following describes FOCP flows to Coyote Creek downstream of Anderson Dam and the facilities that will be applied by Valley Water to deliver these flows.

Imported Water Releases

Maintaining Anderson Reservoir at deadpool reduces reservoir storage that, prior to implementation of the FERC Order, would have been released from Anderson Dam for groundwater recharge operations and environmental flow releases, including flows necessary for fisheries. To help address this, the FOCP includes habitat monitoring and releases of out-of-basin water (imported water) delivered to Valley Water via the State Water Project and the Central Valley Project.

Estimates generated from imported water records[12] indicated that imported water would exceed 20 degrees C during the summer, and would therefore result in excessively warm habitat conditions for steelhead. During FOCP and ADSRP, Valley Water will not have the capability to reduce temperatures in Coyote Creek during warmer months because the cold water pool of Anderson Reservoir will not be available until ADSRP is complete. To reduce thermal impacts to steelhead resulting from warm water temperatures, Valley Water will install chillers at the Coyote Pumping Plant, which will decrease the temperature of the imported water prior to its discharge to Coyote Creek via the CDL. The chillers would not be used to cool CVPE discharges. The chillers are expected to be installed and operational by June 2025 (Valley Water and Stillwater Sciences 2024). Three chillers will be installed at the Coyote Pumping Plant facility (18300 Peet Road in Morgan Hill, California) near the South Channel outlet of the CVP (i.e., the CDL). Two chillers will be used to chill imported water, and the third chiller will be maintained as an available backup in case one of the chillers fails. During chiller operations, up to 10 cfs of CVP water will be routed to the two operating chillers via a bypass pipe. This water will be chilled as it passes through the chillers on its way to being discharged to Coyote Creek via the CDL. Combined, the two chillers are expected to reduce the temperature of 10 cfs of CVP water by up to 7 degrees C. The water temperature in the FCWMZ up to Tomcat Way approximately 2,000 feet upstream of Ogier Ponds) will be maintained at approximately 16 degrees C (60.8 degrees F) (BA Section 6.2.1.4; Table 6-1), which is below the target temperature of 18 degrees C. Valley Water will monitor water temperature as part of ADP compliance monitoring (Section 1.3.4.1.1). If monitoring demonstrates that chillers are not performing as planned, Valley Water will work with NMFS (as part of the OWG) to identify and implement corrective actions.

Additionally, to help address impacts to Valley Water's ground water recharge operations during FOCP, Valley Water has installed a new turnout, identified as the "Cross Valley Pipeline Extension" (CVPE), which is located approximately 4 miles downstream from Anderson Dam. The CVPE provides Valley Water with the ability to release imported water at the CVPE discharge location while maintaining discharge operations at the upstream CVP discharge location (i.e., CDL). CVPE operations are expected to begin in June 2025 and last until October 2033. The discharge capacity of the CVPE is 50 cfs; however, on average, it is expected to discharge approximately 20 to 30 cfs to Coyote Creek.

1.3.5.3.2 FOCP Suspended Sediment Concentration and Sediment Deposition Monitoring

During FOCP, Valley Water continuously monitors suspended sediment discharges from Anderson Reservoir, as well as the effect of the discharges on Coyote Creek downstream of

[12] Imported water temperature records from 1999 to 2019 indicated that the average temperature of imported water that would be released to Coyote Creek from the CDL reaches nearly 18 degrees C before the end of June and exceeds 20 degrees C from July through October (Valley Water 2019a).

Anderson Dam. SSC monitoring occurs at five locations throughout Coyote Creek—Highway 237, Edenvale, Coyote Ranch Road, Madrone, and the Anderson Dam outlet.

1.3.5.3.3 FOCP Aquatic Non-native Species Monitoring and Control

A fyke trap was deployed at the outlet of Anderson Dam during late September through late November 2020 to monitor the movement of fish from Anderson Reservoir to the FCWMZ during FOCP reservoir draining.

To help address the potential effects of non-native species on steelhead in Coyote Creek, the FOCP includes an Invasive Species Monitoring and Control Plan (BA, Section 3.7.6.5). This effort removes and sacrifices non-native species within the FCWMZ during project related construction and monitoring activities. Target species include non-native fish, crayfish (*Cambaridae*), American bullfrog, and red-eared sliders, as well as opportunistic removal of other non-native species. Methods include electrofishing, seine nets, dipnets, traps, and hand capture. Decontamination protocols are being implemented to prevent the spread of amphibian chytrid fungus (*Batrachochytrium dendrobatidis*), ranavirus, other pathogens, and non-native species. Valley Water is conducting a study on the removal of non-native fish from Anderson Reservoir. This effort involves the removal of non-native fish from the deadpool of Anderson Reservoir, last occurring in 2022 and 2023. Non-native removals are proposed to continue during ADSRP.

1.3.5.3.4 FOCP Restoration Actions

In order to mitigate habitat impacts occurring during FOCP, Valley Water is implementing habitat restoration at the Live Oak Restoration Reach, located in Coyote Creek approximately 2,500 feet downstream of Anderson Dam. Restoration activities are expected to begin in 2025 and will focus on increasing floodplain inundation/creation and increasing suitable spawning habitat. Primary enhancement actions will include channel contouring; sediment augmentation; and gravel, boulder, and large woody debris placement. The Live Oak Restoration is expected to enhance over 2,800 feet of channel; creating over 20,000 square feet of spawning habitat, over 65,000 square feet of suitable juvenile rearing habitat, and over 20,000 square feet of shallow water fry rearing habitat. Monitoring will be conducted to ensure the project is effective at achieving physical and biological restoration goals, and a scale as-built map (basemap) of the restoration will be created. Biological monitoring will be conducted annually at design flows of approximately 30 cfs and 50 cfs to determine the success of the project at achieving restoration objectives, and to inform maintenance. During each monitoring event, suitable fry, juvenile, and spawning habitat will be mapped on the basemap of the reach. Additionally, to provide steelhead and Chinook with refugia and spawning and rearing habitat, the South Channel will be enhanced with woody debris and gravel benches.

1.3.6 Other Activities

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

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

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

The FERC determined the proposed action is not likely to adversely affect sDPS green sturgeon or its critical habitat. Our concurrence is documented in the "Not Likely to Adversely Affect" Determinations section (Section 2.13).

2.1. Analytical Approach

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

This biological opinion also relies on the regulatory definition of "destruction or adverse modification," which "means a direct or indirect alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species" (50 CFR 402.02).

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

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

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

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

2.2. Rangewide Status of the Species and Critical Habitat

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

This biological opinion analyzes the effect of the proposed Anderson Dam Program actions from Anderson Dam on Coyote Creek to San Francisco Bay on the following federally-listed species (Distinct Population Segment [DPS] and designated critical habitats:

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

Species Description and Life History

Steelhead are anadromous forms of *O. mykiss*, spending some time in both freshwater and saltwater. Older juvenile and adult life stages occur in the ocean, until the adults ascend freshwater streams to spawn. Eggs (laid in gravel nests called redds), alevins (gravel dwelling hatchlings), fry (juveniles newly emerged from stream gravels), and young juveniles all rear in freshwater until they become large enough to migrate to the ocean to finish rearing and maturing to adults. The occurrence and timing of these transitions are highly variable and generally driven by environmental conditions and resource availability (Satterthwaite et al. 2009; Sogard et al. 2012).

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

Unlike Pacific salmon, steelhead are iteroparous—capable of spawning more than once before death (Busby et al. 1996). Although one-time spawners are the great majority, Shapovalov and Taft (1954) reported that repeat spawners are relatively numerous (17.2 percent) in California streams. Adult steelhead spawn in gravel substrates with low sedimentation and suitable flow velocities. Females lay eggs in redds. The eggs are then quickly fertilized by males and covered in gravel. Egg survival depends on oxygenated water circulating through the gravel which facilitates gas exchange and waste removal. Adults usually select spawning sites in pool-riffle transition areas of streams with gravel cobble substrates between 0.6 centimeters (cm) to 10.2 cm in diameter and flow velocities between 40 to 91 cm per second (Bjornn and Reiser 1991; Smith 1973). Eggs incubate in redds for approximately 25 days to 35 days depending on water temperature (Shapovalov and Taft 1954). Eggs hatch as alevin and remain buried in redds for an additional 2 weeks to 3 weeks until yolk-sac absorption is complete (Shapovalov and Taft 1954). Optimal conditions for embryonic development include water temperatures between 6 degrees Celsius (C) and 10 degrees C, dissolved oxygen near saturation, and fine sediments less than 5 percent of substrate by volume (Bjornn and Reiser 1991; U. S. Environmental Protection Agency [USEPA] 2001).

Steelhead fry generally rear in edgewater habitats and move gradually into pools and riffles as they grow larger. Cover is an important habitat component for juvenile steelhead, both as a velocity refuge and as a means of avoiding predation (Meehan and Bjornn 1991; Shirvell 1990). Steelhead, however, tend to use riffles and other habitats not strongly associated with cover during summer rearing more than other salmonids. Young steelhead feed on a wide variety of aquatic and terrestrial insects, and older juveniles sometimes prey upon emerging fry. Rearing steelhead juveniles prefer water temperatures of 7.2 degrees C (44.7 degrees F) to 14.4 degrees C (58 degrees F) and have an upper lethal limit of 23.9 degrees C (75 degrees F) (Barnhart 1986; Bjornn and Reiser 1991). They can survive in water up to 27 degrees C with saturated dissolved oxygen conditions and a plentiful food supply. Fluctuating diurnal water temperatures also aid in survivability of salmonids (Busby et al. 1996). Steelhead young usually spend 1 year to 3 years in freshwater before migrating to the ocean as smolts, but rearing periods of up to 7 years have been reported. Migration to the ocean usually occurs in the spring. Steelhead may remain in the ocean for 1 year to 5 years (2 years to 3 years is most common) before returning to their natal streams to spawn (Busby et al. 1996).

Juveniles undergo behavioral, morphological, and physiological changes in preparation for life in the ocean, collectively called smoltification. Juveniles begin smoltification in freshwater and the process continues throughout downstream migration with some smolts using estuaries for further acclimation to saltwater prior to ocean entry (Hayes et al. 2008). Juveniles typically will not smolt until reaching a minimum size of 160 millimeters (mm) (Burgner et al. 1992). Stream temperatures influence the rate of smoltification, with warmer temperatures leading to more rapid transition. Downstream migration of smolts typically occurs from April to June when temperatures and stream flows increase. Temperatures between 10 degrees C (50 degrees F) and 17 degrees C (62.6 degrees F) are preferred for smoltification and outmigration, with temperatures below 15 degrees C (59 degrees F) considered optimal (Hokanson et al. 1977; Moyle 2002; Myrick and Cech 2005; Wurtsbaugh and Davis 1977; Zedonis and Newcomb 1997).

The distribution of steelhead in the ocean is not well known. Coded wire tag recoveries indicate that most steelhead tend to migrate north and south along the continental shelf (Barnhart 1986). Adult steelhead typically migrate from the ocean to freshwater between December and April, peaking in January and February (Fukushima and Lesh 1998). Upstream migration typically begins once winter rains commence and stream flows increase. Within the action area, the CCC steelhead DPS migrates through San Francisco Bay before arriving in Coyote Creek.

Status of the Listed CCC Steelhead DPS

NMFS assesses four population viability[13] parameters to discern the status of the listed ESUs and DPSs and to assess each species' ability to survive and recover. These population viability parameters are: abundance, population growth rate, spatial structure, and diversity (McElhany et al. 2000). While there is insufficient data to evaluate these population viability parameters quantitatively, NMFS has used existing information to determine the general condition of the populations in the CCC steelhead DPS and factors responsible for the current status of these listed species.

The population viability parameters are used as surrogates for numbers, reproduction, and distribution, as defined in the regulatory definition of jeopardy (50 CFR 402.20). For example, abundance, population growth rate, and distribution are surrogates for numbers, reproduction, and distribution, respectively. The fourth parameter, diversity, is related to all three regulatory criteria. Numbers, reproduction, and distribution are all affected when genetic or life history variability is lost or constrained, resulting in reduced population resilience to environmental variation at local or landscape-level scales.

The CCC steelhead DPS includes all naturally spawned anadromous *O. mykiss* (steelhead) originating below natural and manmade impassable barriers from the Russian River in Sonoma County to, and including, Aptos Creek in Santa Cruz County, and all drainages of San Francisco, Suisun, and San Pablo Bays eastward to Chipps Island at the confluence of the Sacramento and San Joaquin rivers. The DPS also includes steelhead from two artificial propagation programs: the Don Clausen Fish Hatchery Program (DCFH) and the Kingfisher Flat Hatchery Program (Monterey Bay Salmon and Trout Project) (NMFS 2024; 71 FR 834; 85 FR 81822).

[13] 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).

CCC steelhead was listed as a federally threatened species in 1997 (62 FR 43937). The listing was updated in 2006 (71 FR 834) and 2014 (79 FR 20802). Busby et al. (1996) concluded that the CCC steelhead DPS was in danger of extinction, citing extreme risk for populations in Santa Cruz County and tributaries to San Francisco and San Pablo Bays, as well as apparent substantial declines in numbers and threats to genetic integrity in the Russian River caused by hatchery activities. A subsequent status review by NMFS (1997) concluded that the ESU was not presently in danger of extinction but was likely to become so in the foreseeable future. Good et al. (2005) similarly concluded that the DPS was not presently in danger of extinction, but was likely to become so in the foreseeable future, and the DPS's status as threatened was reaffirmed (71 FR 834).

Historically, 70 populations of steelhead existed in the CCC steelhead DPS. Of these populations, 37 were likely functionally or potentially independent, and 33 were likely dependent (Spence et al. 2012). Functionally independent populations have a high likelihood of persisting for 100 or more years regardless of exchanges of individuals with other populations, whereas potentially independent populations are too strongly influenced by immigration from other populations to exhibit independent dynamics (Bjorkstedt et al. 2005). Dependent populations have a substantial likelihood of going extinct within 100 years without migrants from neighboring populations to ensure their viability. (Bjorkstedt et al. 2005; McElhaney et al. 2000; Spence et al. 2012).

Abundance data for CCC steelhead are limited; however, existing information indicates population abundances have been 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, which is the largest population within the DPS (Busby et al. 1996). Long-term population trends suggest a negative growth rate, indicating the DPS may not be viable in the long-term. DPS populations that historically provided enough steelhead immigrants to support dependent populations may no longer be able to do so, thereby putting dependent populations at increased risk of extirpation.

According to NMFS' most recent 5-year status review for CCC steelhead DPS (NMFS 2024), ongoing primary threats to CCC steelhead conservation and recovery include impaired instream habitat complexity, disconnected floodplain habitat, reduced and degraded winter refugia, stream simplification, decreased instream water flow due to diversions and/or groundwater extractions, water quality impairment, and poor access to spawning and juvenile rearing habitat due to instream barriers. An emergent threat is wildfire related habitat impacts such as loss of riparian cover and sedimentation.

While data availability for this DPS remains generally poor, the new information for CCC steelhead available since the previous viability assessment (Spence 2016) indicates that overall extinction risk is moderate and has not changed appreciably since the prior assessment (SWFSC 2023). Although conservation efforts for CCC steelhead have reduced some threats for this DPS, most threats remain unchanged since the previous NMFS (2016a) 5-year review (NMFS 2024). In addition, increased risks of wildfires, drought, and poor ocean conditions are likely to continue and worsen. NMFS (2024) concluded that the risk to the persistence of the CCC steelhead DPS has not changed significantly since the previous 5-year review (NMFS 2016a), and recommended that the CCC steelhead DPS remain listed as threatened.

Status of Critical Habitat

In designating critical habitat, NMFS considers, among other things, the following requirements of the species: 1) space for individual and population growth, and for normal behavior; 2) food, water, air, light, minerals, or other nutritional or physiological requirements; 3) cover or shelter; 4) sites for breeding, reproduction, or rearing offspring; and 5) habitats that are protected from disturbance or are representative of the historic geographical and ecological distributions of this species (50 CFR 424.12(b)). In addition to these factors, NMFS also focuses on physical or biological features (PBFs)[14] within the designated area that are essential to the conservation of the species and that may require special management considerations or protection (81 FR 7214).

Status of CCC Steelhead Critical Habitat

Critical habitat was designated for CCC steelhead on September 2, 2005 (70 FR 52488) and includes the following CALWATER Hydrologic Units: Russian River, Bodega, Marin Coastal, San Mateo Coastal, Bay Bridge, Santa Clara, San Pablo, and Big Basin. Coyote Creek is designated as critical habitat for CCC Steelhead (Figure 5).

[14] The designation of critical habitat for these species uses the term primary constituent element (PCE) or essential features. The new critical habitat regulations (81 FR 7414) replace this term with physical or biological features (PBFs). This shift in terminology does not change the approach used in conducting our analysis, whether the original designation identified primary constituent elements, physical or biological features, or essential features. In this letter of concurrence, we use the term PBF to mean PCE or essential feature, as appropriate for the specific critical habitat.

Figure 5. Critical habitat designated in the ADP action area, including the FCWMZ and CWMZ (BA Figure 2-1).

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

The condition of CCC steelhead critical habitat, specifically its ability to provide for the conservation of CCC steelhead, has been degraded from conditions known to support viable salmonid populations. Impairments are due to a suite of water and land developments that lead to degradation of habitat and indirect and direct impacts to steelhead. For example, diversion and storage of river and stream flow has dramatically altered the natural hydrologic cycle in many of the streams within the CCC steelhead DPS. Altered flow regimes can delay or preclude migration, dewater aquatic habitat, strand fish in disconnected pools, entrain juvenile fish, and interrupt channel processes necessary for maintenance of high-quality habitat. Similarly, land development has led to channelization of streams and placement of developed areas close to waterways.

NMFS has determined that present depressed population conditions are, in part, the result of the following human-induced factors affecting critical habitat: logging, agricultural and mining activities, urbanization, stream channelization and bank stabilization, dams, wetland loss, and water withdrawals—including unscreened diversions for irrigation.[15] Impacts of concern include alteration of streambank and channel morphology, elevated water temperatures, loss of spawning and rearing habitat, fragmentation of habitat, loss of downstream recruitment of spawning gravels and large woody debris, degradation of water quality (see additional information below),

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

removal of riparian vegetation resulting in increased streambank erosion, loss of shade (higher water temperatures), increased erosion into streams from upland areas, and loss of nutrient inputs (Busby et al. 1996; 70 FR 52488, NMFS 2016a). Water development has drastically altered natural hydrologic cycles in many of the streams in the DPS. Alteration of flows results in migration delays, loss of suitable habitat due to dewatering and blockage; stranding of fish from rapid flow fluctuations; entrainment of juveniles into poorly screened or unscreened diversions, and increased water temperatures harmful to salmonids (Busby et al. 1996; NMFS 2016a; 70 FR 52488).

A final recovery plan for CCC steelhead was prepared by NMFS in October 2016 (NMFS 2016). The recovery plan includes actions needed to achieve recovery and measurable criteria by which NMFS will determine when recovery has been reached. Recovery plan actions are primarily designed to restore ecological processes that support healthy steelhead populations, and address the various activities that harm these processes and threaten the species' survival. The recovery plan calls for a range of actions including the restoration of floodplains and channel structure, restoring riparian conditions, improving streamflow, restoring fish passage, among other actions. Recently, restoration actions aimed at improving the condition of critical habitat have been implemented. These include, but are not limited to: the modification or removal of numerous fish passage impediments throughout the CCC steelhead DPS, improved reservoir operations at Calaveras Reservoir in the Alameda Creek watershed, a fish ladder and screen at Alameda Creek Diversion Dam, and a strategy to accelerate land protection and habitat restoration for the Lower Sonoma Creek area (NMFS 2024). Still, the 2024 5-year status review identifies habitat-related threats to CCC steelhead (see "Status of the Listed CCC Steelhead DPS" above), indicating that the overall current condition of CCC steelhead critical habitat throughout the DPS remains degraded, and may not provide the full extent of conservation value necessary for the recovery of the species.

Additional Threats to Listed Species and Critical Habitat

Global Climate Change

Another factor affecting the rangewide status of CCC steelhead and critical habitat is climate change. Impacts from global climate change are already occurring in California, and many of these changes are likely to further degrade CCC steelhead habitat.

For example, average annual air temperatures, heat extremes, and sea level have increased in California over the last century, and snowmelt from the Sierra Nevada has declined (Kadir et al. 2013). CCC steelhead have likely already experienced some detrimental impacts from climate change through lower and more variable stream flows, warmer stream temperatures, and changes in estuarine and ocean conditions. California experienced well below average precipitation during the 2012–2016 drought, as well as record high surface air temperatures in 2014 and 2015 and record low snowpack in 2015 (Williams et al. 2016). Paleoclimate reconstructions suggest the 2012–2016 drought was the most extreme in the past 500 years to 1,000 years (Williams et al. 2016; Williams et al. 2020; Williams et al. 2022). In addition, high surface temperatures amplified annual water deficits during 2012–2016. In 2020, California entered another period of drought. Climate change poses a threat to anadromous salmonid populations in central California. The period from 2020 through 2022 was the driest three-year period in over 100 years of records. As noted above, this extended period of drought was likely exacerbated by climate change. The resulting state of emergency was only recently lifted after heavy rains during the 2023 winter brought most of the state out of drought conditions. These drought periods are now likely part of a larger drought event (Williams et al. 2022). This recent long-term drought, as well as the increased incidence and magnitude of wildfires in California, have likely been exacerbated by climate change (Diffenbaugh et al. 2015; Williams et al. 2019; Williams et al. 2022).

The threat to CCC steelhead from global climate change is expected to increase in the future. Modeling of climate change impacts in California suggests that average summer air temperatures are expected to continue to increase (Lindley et al. 2007; Moser et al. 2012). Heat waves are expected to occur more often, and heat wave temperatures are likely to be higher (Hayhoe et al. 2004; Kadir et al. 2013; Moser et al. 2012). Total precipitation in California may decline, critically dry years may increase, and wildfires are expected to increase in frequency and magnitude (Lindley et al. 2007; Moser et al. 2012; Schneider 2007; Westerling et al. 2011). Increases in wide year-to-year variation in precipitation amounts (droughts and floods) are also projected to occur (Swain et al. 2018). 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 (California Department of Water Resources [DWR] 2013). Estimates show that snowmelt contribution to runoff in the Sacramento-San Joaquin Delta may decrease by about 20 percent per decade over the next century (Cloern et al. 2011).

Estuaries may also experience changes detrimental to CCC steelhead. Estuarine productivity is likely to change based on changes in freshwater flows, nutrient cycling and sediment amounts (Ruggiero et al. 2010; Scavia et al. 2002). 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 in September (Cayan et al. 2012). Climate simulation models project that the San Francisco Region will maintain its Mediterranean climate regime, but experience a higher degree of variability of annual precipitation during the next 50 years and years that are drier than the historical annual average during the middle and end of the twenty-first century. The greatest reduction in precipitation is projected to occur in March and April, with the core winter months remaining relatively unchanged (Cayan et al. 2012).

Similarly, in marine environments, ecosystems and habitats important to juvenile and adult CCC steelhead are likely to experience changes in temperatures, circulation, water chemistry, and food supplies (Abdul-Aziz et al. 2011; Brewer and Barry 2008; Doney et al. 2012; Feely et al. 2004; Osgood 2008; Turley 2008). The projections described above are for the mid- to late-21st Century. Some of these changes, including an increased incidence of marine heat waves, are likely already occurring and are expected to increase (Frolicher et al. 2018). In fall 2014, and again in 2019, a marine heatwave formed throughout the northeast Pacific Ocean, which greatly affected water temperature and upwelling from the Bering Sea off Alaska, south to the coastline of Mexico. The marine waters in this region of the ocean are utilized by salmonids for foraging as they mature (Beamish 2018). Although the implications of these events on salmonid populations are not fully understood, they are having considerable adverse consequences to the productivity of these ecosystems and presumably contributing to poor marine survival of salmonids, including CCC steelhead.

Water Quality

Stormwater runoff from urban areas and roadways is a primary source of water quality degradation in aquatic habitats, including streams designated as CCC steelhead critical habitat. Various pesticides, petroleum hydrocarbons, metals, and other toxic chemical contaminants common to commercial, industrial, and residential land-use activities have been documented in stormwater runoff (Caltrans 2000, 2003a, 2003b). These chemicals are mobilized from surfaces by rainfall or irrigation, and are transported to aquatic habitats via terrestrial runoff and discharges from stormwater conveyances (Good 1993). Recent studies have identified stormwater from roadways as causing mortality to juvenile steelhead in laboratory studies (Brinkmann et al. 2022). These recent publications have identified a degradation product of tires (6PPD-quinone) as the causal factor in this mortality (Tian et al. 2022, Brinkmann et al. 2022, Tian et al. 2020; Peter et al. 2018). The parent compound (6PPD) is widely used by multiple tire manufacturers and the tire shreds/dust that produce the degradation product have been found to be ubiquitous where both rural and urban roadways drain into waterways (Feist et al. 2018, Sutton et al. 2019).

2.3. Action Area

"Action area" means all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action (50 CFR 402.02). NMFS has described the action area to include portions of Coyote Creek, its tributaries, and San Francisco Bay affected by the proposed action for reasons that will be discussed in the 'Effects of the proposed action' section of this consultation.

For Coyote Creek and its tributaries, the action area includes the entire extent of Coyote Creek downstream of Anderson Dam, the portions of Upper Penitencia Creek watershed accessible to steelhead, the portion of Coyote Creek that will be buried beneath the rebuilt Anderson Dam, portions of Coyote Creek and its tributaries that will be inundated by water impounded by the rebuilt Anderson Dam (i.e., those areas that will be inundated by refilled Anderson Reservoir), and the Coyote Creek watershed upstream of Anderson and Coyote dams, including tributaries to Coyote Creek. Upper Penitencia Creek, and Coyote Creek and its tributaries upstream of Anderson and Coyote dams are included in the action area because ADP CMs and monitoring and adaptive management actions may occur in these areas. For all Coyote Creek and tributary portions of the action area, the action area includes the bed, bank, floodplain, and riparian areas of Coyote Creek and its tributaries in which ADP actions may occur.

The San Francisco Bay portion of the action area is continuous with the Coyote Creek portion of the action area downstream of Anderson Dam, and extends into San Francisco Bay out to the extent of measurable effects. Similar to Coyote Creek and tributary portions of the action area, which include bed, bank, floodplain, and riparian areas, the San Francisco Bay portion of the action area includes shoreline portions of San Francisco Bay.

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 impacts to listed species or designated critical habitat from federal agency activities or existing federal agency facilities that are not within the agency's discretion to modify are part of the environmental baseline (50 CFR 402.02).

As described above, the action area includes the entire extent of Coyote Creek downstream of Anderson Dam, the portions of Upper Penitencia Creek watershed accessible to steelhead, the portion of Coyote Creek that will be buried beneath the rebuilt Anderson Dam, portions of Coyote Creek and its tributaries that will be inundated by water impounded by the rebuilt Anderson Dam (i.e., those areas that will be inundated by refilled Anderson Reservoir), the Coyote Creek watershed upstream of Anderson and Coyote dams, including tributaries to Coyote Creek, and San Francisco Bay out to the extent of measurable effects. The following provides: an overview of the CCC steelhead DPS, including CCC steelhead and critical habitat in the action area; and information on contemporaneous actions affecting steelhead and critical habitat in the action area, previous actions affecting steelhead and critical habitat in the action area, and other factors affecting steelhead and critical habitat in the action area.

2.4.1 Overview of CCC Steelhead and Critical Habitat in the Action Area

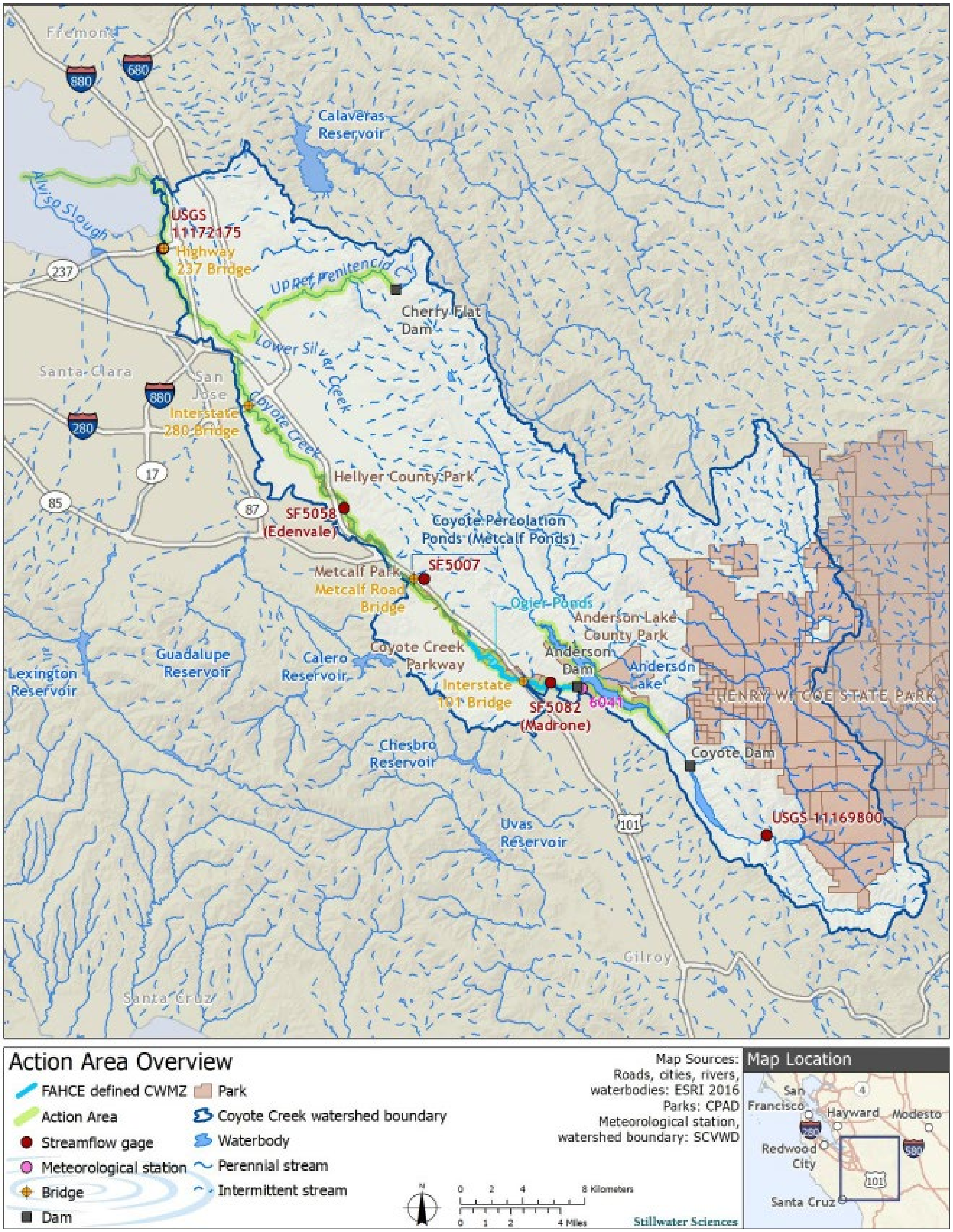
The following subsections provide an overview of the action area and a description of the status of CCC steelhead and their critical habitat and the factors affecting CCC steelhead and their critical habitat in the action area.

2.4.1.1 Action Area Overview

Coyote Creek extends approximately 70 miles from the Western Diablo Range upstream of Morgan Hill, California to its discharge to the San Francisco Bay in the city of Milpitas, California. There are two dams along Coyote Creek operated by Valley Water—Coyote Dam, built in 1936, and Anderson Dam, built in 1950 (Figure 6). Runoff from the portion of the Coyote Creek watershed upstream of Coyote Dam accounts for about 75 percent of the total runoff for the entire Coyote watershed (Iwamura 1999). Valley Water's operations of Anderson and Coyote reservoirs regulates stream flow downstream of the dams; with the majority of winter runoff being captured and stored in these two reservoirs for later release during the dry season to facilitate groundwater recharge. General land use types surrounding the action area include urban and residential development, rural development, and agriculture (Buchan & Randall 2003).

This area has a Mediterranean climate; most precipitation falls in winter and spring as rain. The freshwater outflow pattern is seasonal, and the highest outflow occurs in winter and spring. Coyote Creek and San Francisco Bay also receive inputs from stormwater runoff and wastewater from municipal and industrial sources that vary in volume depending on the location and seasonal weather patterns.

Figure 6. Anderson Dam Program action area and watershed features (BA Figure 3-1).



2.4.1.2 Status and Factors Affecting CCC Steelhead and Critical Habitat in the Action Area

NMFS has grouped populations within the CCC steelhead DPS into five genetically similar diversity strata (Spence et al. 2008, Spence et al. 2012): Interior, North Coastal, Coastal San Francisco Bay, Interior San Francisco Bay, and Santa Cruz Mountains. Population-level estimates of adult abundance are lacking for all nine independent populations and three dependent populations of steelhead in the Interior San Francisco Bay Stratum identified as essential or supporting in the CCC steelhead DPS Recovery Plan (NMFS 2016). Coyote Creek contains a functionally independent population within the Interior San Francisco Bay Diversity Stratum.

The condition of critical habitat for CCC steelhead—specifically its ability to provide for their conservation—has been degraded from conditions known to support viable salmonid populations. The recovery plan for CCC steelhead (NMFS 2016) describes key threats, actions needed to achieve recovery. All threats identified at the time of listing continue to impair CCC steelhead and their habitats, and several threats, including urbanization, habitat blockages, water diversions, water management, instream habitat problems, and certain agriculture types (e.g., illegal marijuana cultivation operations), pose particularly severe threats to the DPS. Recovery plan actions are primarily designed to restore ecological processes that support healthy steelhead populations, and address the various activities that harm these processes and threaten the species' survival. The recovery plan calls for a range of actions including the restoration of floodplains and channel structure, restoring riparian conditions, improving streamflows, restoring fish passage, and protecting and restoring estuarine habitat, among other actions. NMFS (2016) estimated 1,484 miles of critical habitat in the DPS, of which 49 miles (3.3 percent) are located within the action area.

Becker et al. (2007) identified 13.7 stream miles of available steelhead habitat out of a potential 34.6 miles of suitable habitat in the Coyote Creek Watershed. In this evaluation, suitable habitat included all stream reaches capable of supporting juvenile rearing regardless of migration barriers, whereas available habitat included stream reaches capable of supporting juvenile rearing and accessible to spawning steelhead. The evaluation also identified Coyote Creek as an "essential stream" within the San Francisco Estuary. Steelhead restoration in this watershed is largely dependent on fish passage and habitat quality in Coyote Creek and Upper Penitencia Creek (Becker et al. 2007)

Coyote Creek historically and currently supports an anadromous run of steelhead. Although steelhead are still present in Coyote Creek, the effects of urban development have limited the ability of the creek to support a viable population (NMFS 2016). Coyote and Anderson reservoirs, constructed in 1936 and 1950, respectively are complete passage barriers that collectively block access to roughly 56 percent of the upper Coyote Creek watershed (approximately 200 square miles) (NMFS 2016). Juvenile life stages in Coyote Creek are also limited by reservoir operations (NMFS 2016). Impacts of urban development on steelhead in the Coyote Creek watershed downstream of Anderson Dam include: timing, duration, and magnitude of surface water flows; channel form and function; riparian habitat; instream habitat; sediment transport; large woody debris (LWD) recruitment; and additional impacts described below.

Historically, both the resident and anadromous forms (steelhead) of *O. mykiss* were present upstream of the current location of Anderson Dam. With the construction of Anderson Dam in

1950, previous spawning and rearing reaches located upstream of Anderson Dam became inaccessible to steelhead. There is limited information on steelhead in Coyote Creek before the construction of Coyote and Anderson Dams. Descriptions of historical habitat conditions within the Coyote Creek Watershed provide general evidence of where steelhead likely occurred. In the upper Coyote Creek Watershed, perennial shaded reaches, such as San Felipe Creek, likely provided high quality habitat for both resident and anadromous *O. mykiss* (Grossinger et al. 2006). Additionally, within the present-day FCWMZ, Coyote Creek was historically a perennial reach with a dense riparian canopy, presumably supporting steelhead (Grossinger et al. 2006). Snyder (1905) documented steelhead (formerly named *Salmo irideus*) from collections made in Coyote Creek at two locations: near the mouth to San Francisco Bay and in the lower portion of the stream near present-day San Jose.

The resident *O. mykiss* population upstream of Anderson Dam is not ESA-listed, nor is the habitat above the dam designated as critical habitat. However, the watershed upstream of Anderson Dam, including the portions of the watershed upstream of Coyote Dam, is considered by NMFS as being important for the conservation and recovery of the CCC steelhead DPS in Coyote Creek for the provision of spatial structure and diversity (Garza and Pearse 2008, NMFS 2016, Spence *et al*. 2008). Studies of *O. mykiss* and their habitat in above-reservoir reaches of Coyote Creek include, but are not limited to sampling and observational studies performed by Leidy et al. (2005), Valley Water and their contractors (Leidy et al. 2005, HDR 2016, Stillwater Sciences 2023), and NMFS (2020). Above Anderson Dam, *O. mykiss* currently occur in Anderson Reservoir, Coyote Creek between Anderson Reservoir and Coyote Dam, Packwood Creek, and Coyote Creek and its tributaries upstream of Coyote Reservoir, and are believed to occur in portions of Las Animas Creek, San Felipe Creek, Cow Creek, and Hoover Creek. Suitable habitat and *O. mykiss* persist within significant portions of the above-reservoir Coyote Creek watershed (Leidy et al. 2005, HDR 2016, NMFS 2020, Stillwater Sciences 2023), anthropogenic habitat alteration within these reaches remains limited compared to downstream reaches (NMFS 2016, 2020), and observations of multiple year classes of *O. mykiss* within above-reservoir reaches of Coyote Creek (NMFS 2020) indicate successful reproduction of *O. mykiss* within these reaches. Additionally, use of Anderson Reservoir by above-reservoir *O. mykiss* (NMFS 2020, and Valley Water's ongoing fyke trapping [Valley Water 2021a]) suggests that migratory life history expression remains within the above-reservoir population.

Downstream of Anderson Dam, steelhead have been affected by instream flow and habitat alterations. A 1977 stream survey report (Curtis and Scoppettone 1977) noted that "Coyote Creek historically was a steelhead stream, but apparently no longer supported a viable steelhead resource because of flow regulation, habitat alteration, and pollution." In 1998, steelhead were determined to be relatively rare in the Coyote Creek system, and the most important spawning and rearing habitat resources remaining in the watershed were Upper Penitencia Creek and Arroyo Aguague in Penitencia Creek (Smith 1998). Leidy et al. (2005) and Grossinger et al. (2006) similarly identify Upper Penitencia Creek watershed as being an important tributary supporting steelhead.

Leidy et al. (2005) reviewed the historical distribution of steelhead in Coyote Creek watershed. As part of an environmental indicators testing project, the Santa Clara Valley Urban Runoff Pollution Prevent Program sampled 14 Coyote Creek stations in May-June, late June, and September-October 1999. According to the summary report, steelhead were collected throughout the length of the creek (Demgen and Dorsey 1999). A total of 11 steelhead were collected from five locations downstream from Metcalf Dam in approximately 1,500 meters of area sampled in the three events, while four individuals were collected from a single site between Metcalf and Anderson Reservoir in approximately 300 meters of stream length. Upstream of Anderson Reservoir, 31 steelhead were collected in three sampling events at three sites representing approximately 900 meters of reach sampled. Sampling in late June and September-October recorded 19 steelhead (47-250 mm FL) and four steelhead (175-253 mm FL), respectively.

Coyote Creek was sampled in 2007 and 2008 as part of a baseline fisheries survey for the Mid-Coyote Flood Protection Project. Seventeen locations were sampled spanning from downstream of Anderson Dam in Morgan Hill, California to upstream of Montague Expressway in San Jose, California. Fifty seven steelhead were captured across six sampling sites; 25 in 2007 and 32 in 2008 (Valley Water 2008, 2009). Upper Penitencia Creek was also sampled at two locations: upstream of Interstate 680 in San Jose and at the Noble Fish Ladder at Noble Avenue in San Jose. There were 103 steelhead captured in 2007, and 37 were captured in 2008 (Valley Water 2008, 2009).

Since 2014 in Coyote Creek, surveys have been conducted at sites up to 5.5 miles downstream of Anderson Dam in summer or fall each year. These surveys documented low numbers of young of the year steelhead in some, but not all years. Fish population sampling conducted from 2014-2019 in the reach between Anderson Dam and Ogier Ponds in Morgan Hill resulted in approximately 60 young-of-the-year (YOY) captured in 2014 (Leicester & Smith 2014), one yearling captured in 2015, and one yearling and one YOY captured in 2019 (Leicester & Smith 2014, 2015; Smith 2016, 2017, 2018, 2020). The level of effort and sampling stations were not consistent through the years, so a direct comparison of fish numbers between years would not be accurate. Although Smith (2018) did not record any captures, Valley Water conducted exploratory juvenile steelhead sampling at three reaches downstream of Anderson Dam in 2018 and captured two steelhead (Valley Water 2019b).

When Anderson Dam was built in 1950, the historical channel (North Channel) was separated from Coyote Creek at the upstream end by a dike, and a human-made South Channel, which now divides the Live Oak picnic area, was constructed. Since that time, the North Channel has only received water via the spillway of the dam whenever the reservoir overtopped. Further downstream, the channel generally follows its historical route and includes broad, flood-prone stream benches and long braided reaches (Grossinger et al. 2006).

Although large amounts of sediment are transported into the two reservoirs behind the dams, the presence of the dams reduce the amount of sediment transported downstream (Buchan and Randall 2003). These conditions have limited the amount of suitable habitat and presence of steelhead in the creek. Coyote Creek’s SSC and toxicity conditions are poor. The area has high urbanization, and conditions such as channel modification, water diversion and impoundments, and residential development have led to degraded water quality within Coyote Creek (NMFS 2016). The distribution of sediment within Coyote Creek is affected by Anderson and Coyote Reservoir. These reservoirs block downstream sediment transport and affect transport in the downstream reaches due to altering the hydrograph (NMFS 2016).

Valley Water’s past operation of Anderson Reservoir on Coyote Creek has regulated stream flow downstream of Anderson Dam. Past reservoir operations have muted the natural hydrograph downstream of Anderson Dam (NMFS 2016). In general, streamflow was regulated between April and October, and managed flows released from the dam reduced peak flows and increased summer flows for groundwater recharge (Buchan and Randall 2003). Although these flows may have provided suitable habitat below Anderson Dam, there is concern that this may have inadvertently affected emerging fry and young-of-the-year by creating high water velocities (NMFS 2016). Additionally, past operating procedures for reservoir releases might not have been appropriately incrementally increased or decreased (i.e., ramping) in a way to prevent stranding of juveniles. These hydrograph alterations likely affected adult passage during winter by muting attractant flows and curtailing passage opportunities at some partial, but significant, migratory barriers (e.g., Singleton Road Crossing and Ogier Pond Complex) (NMFS 2016). The NMFS (2016) recovery plan determined that further refinement of discharge operations from Anderson Reservoir was warranted.

The temperature and magnitude of water released from Anderson Dam has affected the instream water temperature in Coyote Creek. Periods of high volume, cold water releases have led to cooler downstream temperatures, whereas high volume releases during low cold water pool conditions has elevated downstream temperatures. The effect of reservoir release temperature on stream temperature was likely decreased as downstream distance increases (Buchan and Randall 2003).

To augment local water supplies within Coyote Creek watershed, imported water from the CVP has been utilized. Discharge temperature was estimated by interpolating temperature measurements at two locations — one upstream and one downstream of the current CVP discharge point in Coyote Creek, approximately 900 feet downstream of Anderson Dam. The discharge temperature was estimated by interpolating between the two measurement points and assuming uniform increases as water moves down the CVP. Based on estimates generated from temperature records from 1999 to 2019, the average temperature of imported water that was released to Coyote Creek downstream of Anderson Dam reached nearly 64 degrees F (18 degrees C) before the end of June and regularly exceeded 68 degrees F (20 degrees C) from July through October (BA Table 6-6). Table 6-1 in the BA includes discharge rates and project temperatures that have occurred during the dry season (May-October).

Ongoing water being released from Anderson Reservoir has a minimum flow requirement of 2.5 cfs past Edenvale streamflow stations (SF5058) when the Coyote Percolation Dam is raised that satisfies the CDFW Lake and Streambed Alteration Agreement (LSAA; 1600-2009-0411-R3). This flow requirement maintains flows in the Coyote Percolation Dam facility and is intended to generally maintain surface flows in the creek downstream to San Francisco Bay. Depending on the watershed and groundwater conditions mentioned above, releases of 20–65 cfs from Anderson Dam are needed to meet this requirement.

Water development has drastically altered natural hydrologic cycles in many of the streams in the CCC steelhead DPS. Impacts of concern include alteration of stream bank and channel morphology, alteration of water temperatures, loss of spawning and rearing habitat, fragmentation of habitat, loss of downstream recruitment of spawning gravels and large woody debris, degradation of water quality, removal of riparian vegetation resulting in increased stream bank erosion, increases in erosion entry to streams from upland areas, loss of shade (higher water temperatures) and loss of nutrient inputs (Busby et al. 1996; 69 FR 33102, 70 FR 52488).

Downstream of Anderson Dam, urban, suburban, and agricultural development; gravel mining; water development; and the flood control structures that have been placed to protect these developed areas, have affected stream hydrology, reduced floodplain and riparian habitat, impaired channel complexity, and impaired anadromous fish passage (NMFS 2016). Several miles of tributary streams have also been modified (Buchan and Randall 2003). The effects of this development on steelhead critical habitat include impaired passage, and accelerated erosion rates, hardened stream banks, channel incision, introduction of toxins, reduced riparian vegetation, low stream sinuosity, and reduced instream habitat complexity (Buchan & Randall 2003; Grossinger et al. 2006). Similar to the freshwater non-tidal portions of the action area (i.e., Coyote Creek), the tidal portions of the action area have been altered by past actions. The marshes of San Francisco Bay historically provided a highly productive estuarine environment for juvenile steelhead (NMFS 2016), but these areas have been largely altered for flood control, water development, and urban development; resulting in the loss of habitat, changes in vegetation, and changes to prey communities. Similarly, tidally-influenced reaches of streams in the action area have been dredged and channelized for navigation and flood control, and tidal marsh areas have been isolated from stream channels by levees. Past and ongoing tidal wetland restoration is occurring as part of the South Bay Salt Ponds Restoration Project.

Considering past alterations to habitat within the action area, two reaches of Coyote Creek downstream of Anderson Dam that have been geomorphically altered by previous actions and are proposed for enhancement during implementation of the ADP (i.e., Ogier Ponds and Coyote Percolation Dam) are described further below.

Ogier Ponds

During the winters of 1984 and 1997, Coyote Creek breached its levee and flowed into Ogier Ponds, a series of four interconnected former mining pits located within the reach of Coyote Creek between Anderson Dam and Old Golf Course Road - a reach of stream containing important steelhead spawning and rearing habitat. Since 1997, Coyote Creek has flowed through the ponds, bypassing its historical channel. Ogier Ponds reduces downstream flows, warms water, and results in reduced habitat coverage, especially for young fish, making it an impediment to salmonid migration. The ponds harbor non-native fish, create entrainment risks, impair spawning and rearing habitat, impair sediment transport, and impair steelhead passage to the approximately four-mile-long reach of Coyote Creek between the upper limit of the Ogier Ponds complex and Anderson Dam.

Until Ogier Ponds can be taken off channel and the creek can be restored to its previous banks, Valley Water has prioritized maintenance of suitable conditions in the reach of Coyote Creek between Anderson Dam and Ogier Ponds and has termed this subsection of the CWMZ the "Functional Cold Water Management Zone" (FCWMZ).

Coyote Percolation Dam

The Coyote Percolation Dam is an on-channel percolation dam that Valley Water operates for groundwater recharge. The facility is located approximately 11 miles downstream of Anderson Dam located about 31 miles upstream of the South San Francisco Bay on Coyote Creek between Metcalf Road and Highway 101, and impounds water (i.e., the Coyote Percolation Pond) behind the facility's dam (i.e., Coyote Percolation Dam) along an approximately one-mile-long reach of Coyote Creek that extends upstream to a point just north of Metcalf Road. The Coyote Percolation Ponds were created from historical gravel mining in the channel. A concrete dam using flashboards was installed at the ponds in the 1930s.

In 1999, a fish ladder was constructed to allow passage over the Coyote Percolation Dam (Buchan and Randall 2003). A Vaki Riverwatcher (Vaki) was installed in the fish ladder in 2018. It has been and will continue to be operated October 1–May 31 to detect steelhead passage through the facility.

The reach is now characterized by slow, deep-water conditions when the dam is operated within an artificially widened channel and a narrow band of sparse riparian vegetation along the edges. The dam at the Coyote Percolation Dam creates a large warmwater pond that supports populations of non-native bass, sunfish, and other piscivores that prey upon juvenile steelhead. Conditions that support the downstream migration of steelhead smolts, such as riparian cover, flowing/fast water, and surface turbulence, are absent.

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

Numerous previous consultations pursuant to Section 7 of the ESA have occurred in the action area for a wide range of projects, including activities performed by Valley Water. For the majority of these projects, NMFS determined that they were not likely to adversely affect CCC steelhead or designated critical habitat. For the smaller number of projects with potential adverse effects on threatened steelhead and/or designated critical habitat, NMFS determined that they were not likely to jeopardize the continued existence of listed fish nor adversely modify critical habitat. These formal consultations, where the proposed actions were likely to adversely affect ESA-listed fish species or their designated critical habitat, resulted in opinions containing Reasonable and Prudent Measures (RPMs) to minimize the impacts of incidental take of listed fish species. Additionally, steelhead monitoring and sampling is conducted in the action area by Valley Water and others. Programmatic consultations, individual consultations, and steelhead monitoring and sampling efforts that have occurred or are occurring in the action area and are relevant to this consultation area discussed below.

2.4.2.1 Previous Programmatic Section 7 Consultations in the Action Area

In addition to individual section 7 consultations, NMFS has conducted programmatic consultations that include activities in all or portions of the action area. Five of these programmatic consultations resulted in non-jeopardy, non-adverse modification biological opinions containing RPMs to minimize the impacts of incidental take of listed species. The remaining programmatic consultation resulted in a letter of concurrence with the action agency's determination that the proposed program would not adversely affect ESA-listed fish species or critical habitat. These consultations covered a range of project types across the action area, and the most relevant to the ADP include:

- Valley Water's Stream Maintenance Program (NMFS ECO # WCRO-2023-00561) includes actions in all of Santa Clara County streams where Valley Water has fee title or easement, including Coyote Creek.

- NOAA Restoration Center's (NOAA RC) Restoration Program (NMFS ECO # WCRO-2015-00003), which was used to authorize the restoration of Singleton Road Low Flow Crossing on Coyote Creek, a partnership project between Valley Water, the City of San Jose, and NOAA RC that enhanced anadromous salmonid passage in Coyote Creek downstream of Anderson Dam in 2021 by replacing an at-grade low-flow crossing with a channel-spanning bridge.

2.4.2.2 Previous Individual Section 7 Consultations in the Action Area

A recent individual completed consultation relevant to the ADP is the Coyote Creek Trail State Route 237 to Stony Point Project (NMFS ECO # WCRO-2012-00038). Consultation reinitiation occurred in 2022 (NMFS ECO # WCRO-2021-03031). NMFS provided a letter of concurrence on March 17, 2022. The Coyote Creek Trail is an existing trail system that runs along Coyote Creek through the City of San Jose in Santa Clara County, California. The purpose of the Coyote Creek Trail Extension Project is to extend the trail approximately 9.6 miles from State Route 237 to Story Road. Approximately 5.5 miles of the new trail will be constructed on existing paved service roads or gravel trails, approximately 2.35 miles will use either existing on-street facilities and other paved surfaces, and approximately 1.75 miles will be constructed on undeveloped land at the top of bank or outside the edge of the riparian corridor. The effects of the project include temporary degradation of water quality, temporary disturbance of soils and riparian vegetation along the creek bank, temporary disturbance of the creek bed, and stabilization of the channel with rock slope protection. Caltrans determined that the proposed project may affect, but is not likely to adversely affect CCC steelhead and their critical habitat.

2.4.2.3 Monitoring and Sampling

Monitoring and sampling of steelhead within the reach of Coyote Creek downstream of Anderson Dam has occurred, and continues to occur. Sampling and monitoring efforts performed downstream of Anderson Dam, where ESA-listed steelhead occur, are supported by ESA section 7 or section 10 permits. The following describes the sampling and monitoring within reaches downstream of Anderson Dam, and portions of the watershed upstream of Anderson Dam.

Examples of studies performed downstream of Anderson Dam include those performed over numerous years by Smith (1998, 2016, 2017, 2018, 2020), Leicester and Smith (2014, 2015), and past and current monitoring performed by Valley Water (2019b, 2020, 2021d, 2022b, 2023a, 2023b, 2024a, 2025a).

Valley Water conducts several types of fish monitoring activities in Coyote Creek downstream of Anderson Dam. Outside of Valley Water, there have been a handful of population sampling efforts. During FOCP, Valley Water performs habitat monitoring that includes Water Quality Monitoring, Suspended Sediment Monitoring, and Spawning Habitat Quality and Sediment Deposition Monitoring to monitor the condition of habitat in Coyote Creek downstream of Anderson Dam. The FOCP includes fish monitoring that involves direct handling of CCC steelhead. These actions are ongoing at the time of this consultation, and are described further below.

Coyote Creek Juvenile Rearing Monitoring

In 2019, three steelhead were captured in Coyote Creek across six sampling locations between Anderson Dam and the Metcalf Road overcrossing in San Jose, California during fall monitoring. In Upper Penitencia Creek, 63 steelhead were captured across four sampling locations between the upper extent of the City of San Jose's property upstream of Alum Rock Park and the Piedmont Road overcrossing (Valley Water 2020). In fall 2021, index sampling occurred at four isolated index reaches between Anderson Dam and Ogier Ponds and comprehensive sampling occurred across seven continuous reaches in the same area. In total, 49 steelhead were captured (Valley Water 2021f). In 2022, summer index sampling resulted in nine steelhead and fall index and comprehensive sampling resulted in eight steelhead (Valley Water 2023a). In 2023, Valley Water captured three steelhead during summer index sampling and 10 steelhead during fall index and comprehensive sampling (Valley Water 2024a).

Adult Escapement Monitoring—Vaki Riverwatcher at Coyote Percolation Dam

Valley Water has operated a video camera detection system (Vaki Riverwatcher) within the Coyote Percolation Dam fish ladder. From 2018-2024 there were three medium confidence detections and three low confidence detections of migrating adult steelhead. During this monitoring period, there were no high confidence detections (Valley Water 2020, 2021b, 2021e, 2021d, 2023a, 2024a).

Spawning Surveys

Since the Anderson Reservoir drawdown in 2020, Valley water has conducted spawning surveys to evaluate adult steelhead spawning distribution within the reach of Coyote Creek extending from Anderson Dam downstream to Golf Course Road, a reach of Coyote Creek identified in the Fish and Aquatic Habitat Collaborative Effort program as the cold water management zone (CWMZ), to determine if adult steelhead successfully constructed redds and provide information on the location of steelhead spawning activity. Spawning surveys will occur during FOCP, and are described in the Water Temperature and Fisheries Monitoring Plan and the FERC ordered supplement (Supplement to Section 4.3 Spawning Surveys).

To account for adult steelhead escapement, spawning surveys were conducted during the FOCP 2021 and 2022 monitoring seasons (which covered monitoring activities from September 2020 to June 2021 and September 2021 to June 2022, respectively). There were no live adults, redds, or carcasses observed during these surveys (Valley Water 2021e).

Migration Monitoring—PIT Tags

During the 2021–2022 season, six steelhead were detected from December 2021 to May 2022 on the Ogier Ponds PIT tag antenna, and no steelhead were detected at the Highway 237 or Coyote Percolation Pond antennas (Valley Water 2021f).

The antennas at Ogier Ponds and the Coyote Percolation Dam were damaged between December 30, 2022 and January 1, 2023, and they were inactive for a majority of the migration season. The Highway 237 antenna remained operational for the duration of the season, however high flows inundated the floodplain creating conditions in which fish could pass by in either direction without detection. No detections occurred on any PIT antenna array during the 2022–2023 monitoring season (Valley Water 2023a).

During the 2023–2024 monitoring season, the Highway 237 antenna was damaged and no repairs were able to occur on this antenna, or the Ogier Ponds antenna when outages occurred. The Coyote Percolation Pond's submersible antenna remained operational for the majority of the monitoring season, however the submersible was not able to capture the full width of the channel under the high flow conditions. Fish could pass by in either direction without detection. No detections occurred on any PIT antenna array in Coyote Creek during this monitoring season (Valley Water 2024f).

Fyke Trap

When conditions are suitable during FOCP (flows of 100 cfs or lower and temperatures under 21 degrees C), a fyke trap is installed downstream of the Anderson Reservoir outlet to sample fish passing through the discharge location. The operation period for the trap is defined as between February and May during storm events and subsequently, increased flow from the Anderson Dam outlet (greater than 5 cfs). The fyke trap is checked at least daily and any *O. mykiss* are tagged with a passive integrated transponder (PIT) tag prior to release (See Section 3.7.6.1 of the BA for more on Valley Water's PIT tagging and fyke trapping work).

In 2020 during the drawdown, a fyke trap installed at the base of Anderson Dam from late September to late November captured four live and one deceased *O. mykiss* over an intermittent 24 days of operation; demonstrating the possibility of migration from Anderson Reservoir into Coyote Creek (Valley Water 2021a). In spring 2021 and 2022, no *O. mykiss* were captured during the 13 days and seven days of intermittent operation, respectively (Valley Water 2021a, 2022a, 2022c). In 2024, the fyke trap was operated for less than 24 hours during the sampling season and no *O. mykiss* were captured. Operation of the fyke trap was limited during the 2024 season due to high flows and temperature (Valley Water 2024f).

Environmental DNA

Environmental DNA (eDNA) sampling has occurred from May to September in Coyote Creek within the waters of Anderson Reservoir, Coyote Creek, and Upper Penitencia Creek. In 2021 and 2022, a majority of the eight Coyote Creek reaches sampled had positive eDNA detections (Valley Water 2021e, 2021f, 2023b). In 2023, all eight Coyote Creek reaches sampled had negative eDNA detections (Valley Water 2024b). In 2024, Valley Water expanded their monitoring to 16 reaches in Coyote Creek. A majority of the 16 reaches sampled had negative eDNA detections and some were not sampled because the reaches had dried (i.e., surface flows were not present). Due to Anderson Reservoir being held at deadpool, it was not sampled in 2024 (Valley Water 2024b, 2024c, 2024d, 2024f). Positive detections occurred in Upper Penitencia Creek every sampling season from 2021-2024 (Valley Water 2021e, 2021f, 2023, 2024b, 2024c, 2024d, 2024e).

2.4.3 Other Factors Affecting Species and Critical Habitat in the Action Area

As described above in the Status of the Species and Critical Habitat section of this opinion (Section 2.4.1.2), climate change impacts (e.g., reduced streamflows, increased water temperature, and increased frequency and magnitude of drought) are affecting CCC steelhead and their critical habitat across their range. Consequently, climate change effects are occurring in the action area, and are likely to be similar to those occurring across the range of the affected species. In the San Francisco Bay region, which includes the action area, warm temperatures generally occur in July and August, but with climate change, these events will likely begin in June and could continue through September (Cayan et al. 2012). Climate simulation models indicate the San Francisco region will maintain its Mediterranean climate regime for the 21st century; however, these models predict a high degree of variability in annual precipitation through at least 2050, leaving the region susceptible to drought (Cayan et al. 2012). These models of future precipitation suggest that, during the second half of the 21st century in this region, most years will be drier than the historical annual average (1950-1999).

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 but that are not part of the action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (see 50 CFR 402.02).

Construction, maintenance, operations, conservation, monitoring, and adaptive management activities associated with the ADP may affect CCC steelhead and habitat. The following effects on steelhead and habitat may result from construction activities: unintentional direct injury or mortality during dewatering activities and fish collection, relocation, and monitoring; degraded water quality; predation; loss of benthic habitat and alteration; temporary reductions in riparian vegetation; temporary increases in suspended sediment concentrations; and exposure to construction debris and materials. These effects are presented in detail below.

2.5.1 Steelhead Rescue and Relocation

Steelhead rescue and relocation will occur during future FOCP and ADSRP dewatering associated with construction activities. Rescue and relocation may also occur after completion of ADSRP construction as an adaptive management measure in the Adaptive Management Program of ADP as a conservation measure, if streamflow and temperature triggers for relocation actions are met.

As described in the BA (Section 6.2.1.1 Reservoir Dewatering), water depth declined rapidly on three occasions during FOCP dewatering. Fish are more likely to strand at faster rates of decline (Phinney 1974, Bauersfeld 1978, Halleraker et al. 2003), and fluctuations within natural river environments are typically less than 2 inches per hour (Hunter 1992). Under certain circumstances, reductions in flow may also result in indirect effects on fish, such as temporary loss of habitat from dewatering, and behavioral responses that could reduce survival or growth (Hunter 1992). No observations of steelhead exist during the dewatering period; thus, it is not possible to estimate the injury or mortality that may have occurred. However, it is likely that direct mortality and indirect effects to steelhead did occur from the rapid reductions in flow during dewatering.

Dewatering for construction, maintenance, and adaptive management actions is expected to occur during the following ADP activities:

- Anderson Dam removal and reconstruction,
- Coyote Percolation Dam Phase 1 and 2 Construction,
- New Live Oak Public Use Area Bridge Construction,
- Live Oak Restoration Reach Construction, and
- Ogier Ponds Restoration Reach Construction.

Other small areas of Coyote Creek may be dewatered for routine construction activities during ADSRP. Valley Water will prepare and submit a detailed dewatering and fish rescue plan to NMFS for review and comment no less than 20 calendar days prior to starting localized dewatering activities in Coyote Creek (e.g., prior to placement of a cofferdam, dike, stream bypass, dewatering pump, etc.).

Fish collection and relocation activities pose a risk of injury or mortality to rearing juvenile salmonids. Any fish collecting gear, whether passive (Hubert 1996) or active (Hayes et al. 1996) has some associated risk to fish, including stress, disease transmission, injury, or death. The amount of unintentional injury and mortality attributable to fish capture varies widely, depending on the method used, the ambient conditions, and the expertise and experience of the field crew. Relocated fish may also have to compete with other fish, causing increased competition for available resources such as food and habitat. To reduce the potential for competition, fish relocation sites will be pre-approved by NMFS to ensure the sites have adequate habitat to allow for survival of transported fish and fish already present. Nonetheless, crowding could occur which would likely result in increased inter- and intraspecific competition at those sites. Responses to crowding by salmonids include self-thinning, resulting in emigration and reduced salmonid abundance with increased individual body size within the group, and/or increased competition (Keeley 2003).

Steelhead During Dewatering

For CCC steelhead, since construction and maintenance actions in Coyote Creek are scheduled to occur between June 1 and October 15, capture, rescue, and relocation activities will occur during the summer low-flow period after emigrating smolts have left and before adults have immigrated for spawning. Therefore, only juvenile steelhead are expected to be in the action area during the construction period, and NMFS expects capture and relocation of listed steelhead will be primarily pre-smolting and young-of-the-year fish, and fewer yearling juvenile steelhead.

Injury and mortality of juvenile salmonids during capture and relocation will be minimized during fish rescue and relocation activities because it will be conducted by qualified fisheries biologists following NMFS electrofishing guidelines (NMFS 2000). Netting as described above (Section 1.3.3) will occur. Effects of capturing fish using electrofishing and netting is described below (Fish sampling during monitoring). PIT tagging of juveniles will occur as described above (Section 1.3.3), and effects of PIT tagging are described below (Fish sampling during monitoring).

The BMPs proposed for fish capture and release, use of pump-intake screens during the dewatering phase, and fish passage around the isolation area are based on standard NMFS guidance to reduce the adverse effects of these activities (NMFS 2022). Use of properly sized screens during water withdrawal will reduce or nearly eliminate injury or death of fish caused by entrainment. 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. Stream flow diversion and dewatering could harm any rearing steelhead individuals by concentrating or stranding them in residual wetted areas before they are captured.

Given the variable densities of steelhead throughout the permit area, the number of steelhead encountered and estimates of mortality will vary with project location, timing, and magnitude. Fish relocation activities will occur during the summer low-flow period after emigrating smolts have left the proposed project sites and before adult fish travel upstream in the winter. Therefore, steelhead that may be captured will be juveniles, generally young-of-the-year and one-year age classes. Since fish relocation activities will be conducted by qualified fisheries biologists following NMFS electrofishing guidelines (NMFS 2000), injury and mortality of juvenile salmonids during capture and relocation will be minimized. Seining could also result in injury or mortality to a small percentage of captured fish. Data on fish relocation efforts between 2002 and 2009 show mortality rates from fish capture and relocation are approximately two percent for steelhead (Collins 2004; CDFW 2005, 2006, 2007, 2008, 2009, 2010).

Juvenile steelhead that avoid capture in the project work area will likely die during dewatering activities due to desiccation, thermal stress, or may be crushed by equipment or foot traffic if not found by biologists while water levels within the reach recede. All steelhead that avoid capture during fish relocation activities will be trapped in the isolated areas being dewatered, and 100-percent mortality is expected as a result. The guidelines provided by NMFS and applicable AMMs are expected to be effective at removing steelhead from work sites, and the pre-dewatering fish relocation efforts at the project site will be performed by qualified biologists. Therefore, it is anticipated that the number of juvenile steelhead that will be killed as a result of stranding during dewatering activities will be very small, likely no more than one percent of the steelhead within the work site prior to dewatering.

Based on the above, unintentional mortality of juvenile steelhead expected during steelhead captured will be less than two percent, and one percent of steelhead will remain trapped in dewatered areas and not be rescued or relocated. Thus, dewatering, capture, and handling procedures are not expected to exceed three percent.

Beyond the dewatered area, the temporary stream diversion is expected to resemble typical summer low flow conditions. Temporary changes to instream flow within and downstream of dewatered areas are expected. Once installation of the diversion systems is complete, stream flow above and below the work sites should be the same as free-flowing pre-project conditions, except within the dewatered reaches where stream flow is bypassed and/or pools are dewatered. These fluctuations in flow are anticipated to be small, gradual, and short-term, but are expected to cause a temporary loss, alteration, and reduction of aquatic habitat

The diversion system at the work site could restrict movement of listed steelhead in a manner similar to the normal seasonal isolation of pools by intermittent flow conditions. These conditions typically occur during summer within a portion of streams throughout the range of CCC steelhead. Because habitat in and around the action area is expected to be adequate to support steelhead, they will be able to find food both up- and downstream of the dewatered site as needed during dewatering activities.

Dewatering operations at the work site may affect benthic (bottom dwelling) aquatic macroinvertebrates, an important food source for steelhead. Benthic aquatic macroinvertebrates at the project site may be killed or their abundance reduced when river habitat is dewatered (Cushman 1985). However, effects to aquatic macroinvertebrates resulting from stream flow diversion and dewatering activities will be temporary because construction activities will be short lived, and the length of dewatered reach will be minimized to the extent practicable. Rapid recolonization (typically one to two months) of disturbed areas by macroinvertebrates is expected following rewatering (Cushman 1985, Thomas 1985, Harvey 1986). Within the action area, 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 the dewatered area since stream flow will be bypassed around the work site. Based on the foregoing, juvenile steelhead are not anticipated to be exposed to a reduction in food sources at the work site from the minor and temporary reduction in aquatic macroinvertebrates as a result of dewatering activities.

Steelhead Rescue During Conservation Measures

Water temperature, DO, and steelhead presence monitoring within the FCWMZ will continue to occur during FOCP and ADSRP. If steelhead are documented to occur, and conditions within the FCWMZ appear unsuitable (temperature greater than 24 degrees C [75 degrees F] and DO less than 7.0 mg/L), then fish rescue and relocation efforts may be conducted in coordination with the TWG, unless otherwise directed as determined in consultation with NMFS. Additionally, capture, rescue, and relocation may occur after completion of ADSRP construction in a similar manner as an adaptive management measure in the Adaptive Management Program of ADP.

Fish capture methods during steelhead rescues as a conservation measure are expected to occur in the same manner as described above for both FOCP drawdown and dewatering during ADSRP construction. Steelhead rescue and relocation as a conservation measure will also include PIT tagging and release (effects described below). Risks to individual steelhead during work-up include possible stress, injury, or direct and indirect mortality from anesthetization/handling, and from surgical procedures related to the implantation of PIT tags. As described above, it is anticipated that the mortality rates from fish capture and relocation will be approximately two percent for steelhead. Before FOCP drawdown activities began in August 2020, the majority of steelhead within the reaches of Coyote Creek downstream of Anderson Dam were relocated to Upper Penitencia Creek. A total of 76 steelhead were captured and 74 were relocated to Upper Penitencia Creek. The remaining two steelhead were deemed too large for relocation. There was one steelhead mortality and no steelhead injuries, resulting in a mortality rate of 1.3 percent (Valley Water and Stillwater Sciences 2020).

Due to low flows in the Coyote Creek FCWMZ, fish rescue and relocation efforts were conducted in 2021 when 158 steelhead were captured. In 2021, 47 fish were relocated to lower Coyote Creek and 109 were released back into the initial capture location (Valley Water 2021c).

There were two steelhead mortalities in 2021 during electrofishing, resulting in a mortality rate of 1.3 percent. Based on the fork-lengths of captured steelhead, multiple age classes were present in both years (2020, 2021) of fish relocation efforts (Valley Water and Stillwater Sciences 2020; Valley Water 2021c).

Steelhead Relocation Sites

Relocation sites for steelhead rescues will be selected to ensure they have similar water temperatures as the capture sites, and adequate habitat to allow for survival of transported fish and fish already present. However, some of the fish released at the relocation sites may choose not to remain in these areas and move either upstream or downstream to areas that have more vacant habitat and a lower density of fish. Increased predation may occur at relocation sites. As each fish moves, competition remains either localized to a small area or quickly diminishes as fish disperse. In some instances, relocated fish may endure some short-term stress from crowding at the relocation sites. Such stress is not likely to be sufficient to reduce their individual fitness or performance. NMFS cannot accurately estimate the number of fish likely to be exposed to predation and competition, but does not expect this short-term stress to reduce the individual performance of juvenile steelhead, or cascade through the watershed population of these species.

2.5.2 Fish Sampling during Monitoring Activities

The ADP includes fish sampling and monitoring activities during FOCP, ADSRP, and Post-ADSRP phases of the program. The ADP-related fish monitoring implemented during FOCP has been, and will continue to be limited to the capture and handling of reservoir-origin resident *O. mykiss*, which are considered to be non-listed above-reservoir fish. Because the FOCP monitoring actions will be limited to the monitoring of non-listed above-reservoir *O. mykiss*, these actions are not included in this biological opinion. Thus, this biological opinion considers steelhead monitoring to be implemented by Valley Water during the ADSRP and Post-ADSRP phases of the ADP.

Steelhead sampling during the ADP will involve capture, handling, PIT tagging and release of steelhead, electrofishing, netting, genetic tissue sampling. These monitoring methods have the potential to result in injury and mortality of sampled fish. For example, handling of fish may cause stress, injury, or death; typically, due to exposure to anesthetic, differences in water temperatures between source and holding water, low dissolved oxygen, and physical trauma. Similarly, netting, electrofishing, PIT tagging, and tissue (genetic) sampling all have direct and indirect effects on sampled fish; ranging from disturbance to injury, delayed mortality, and immediate mortality. Additionally, sampling effects may be exacerbated if fish are stressed. Decreased survival of fish can result when stress levels are high because stress can be immediately debilitating and may also increase the potential for vulnerability to subsequent challenges (Sharpe et al. 1998). These common effects of sampling actions can, however, be minimized by implementation of standard minimization measures and best practices, which Valley Water has included in the ADP to minimize factors that commonly lead to stress, injury, and mortality of fish during sampling. Valley Water has consistently displayed a very low incidence of mortality from the methods being proposed, best practices and appropriate guidelines are applied by Valley Water. Section 1.3.4 includes steelhead monitoring and sampling details, including timing that are considered in this opinion. For example, during sampling:

- fish are kept in aerated containers;
- sampling activities are minimized when water temperatures exceed 21 degrees C;
- only a subset of the daily catch of juvenile salmonids collected each day at a given sampling location are measured/fin-clipped/tagged;
- backpack electrofishers are set to minimize the risk of fish injury;
- incidence of encountering sensitive life stages (e.g., young fry or adults) is minimized;
- NMFS 2000 Electrofishing Guidelines are followed;
- PIT tagging methods follow established procedures from published literature;
- all Valley Water staff are well trained and have extensive experience with a wide range of fisheries monitoring projects in the Coyote Creek watershed and beyond;
- any additional personnel (i.e., seasonal staff) are carefully screened by Valley Water prior to hiring and are provided hands-on training prior to participating in sampling activities.

Due to the variations in habitat and the steelhead population that is expected over the duration of the ADSRP and post-ADSRP, and the variety of monitoring methods that will be applied over time, we cannot calculate a precise number of steelhead that may be injured or killed during future ADP steelhead monitoring and sampling activities. However, available information, including Valley Water's previous sampling activities in Coyote Creek, which include similar methods as those proposed for the ADP, including sampling methods that minimize injury and mortality of steelhead, indicate that impacts to sampled steelhead will be low (Valley Water and Stillwater 2020; and Valley Water 2021c). With the application of best practices that Valley Water has routinely applied, and has included in the ADP, incidental mortality of steelhead during monitoring and sampling is expected to be less than 5 percent of the steelhead encountered and close to or at zero. Valley Water will notify NMFS immediately and sampling activities will temporarily cease if mortality rates during sampling events meet or exceed 5 percent of the steelhead encountered. Additionally, all of these techniques are minimally intrusive in terms of their effect on critical habitat PBFs because they will involve very little, if any, disturbance of streambeds or adjacent riparian zones. Some fish collection activities involve seining/netting, which may temporarily disturb substrate, displace benthic invertebrate prey, and increase turbidity just above the water surface. However, such actions affect small spatial areas and are brief in duration, so these effects are expected to be ephemeral and attenuate rapidly. Therefore, ADP fish sampling activities will have no more than negligible effects on the CCC steelhead population in Coyote Creek.

2.5.3 Instream Flows and Temperature

The ADP will affect instream flows and, during periods of reduced surface water flow, water temperature. Instream flow and temperature alterations have the potential to affect steelhead and PBFs of critical habitat.

Adequate surface flows are necessary for steelhead survival. Reduced surface flows, such as may occur during periods of the ADP, have the potential to result in steelhead injury and mortality resulting from stranding, reduced habitat availability, and exposure to impaired water quality, including increased water temperatures. For the ADP, increased water temperatures may occur due to releases of imported water, which may be warmer than Coyote Creek water, or reduced surface flows, which are more easily warmed by solar radiation and surrounding air temperatures. Reiser and Bjornn (1979) reported that optimal water temperatures for steelhead are approximately 8-11 degrees C for adult migration, 4-11 degrees C for spawning, 9-11 degrees C for incubation and emergence, 7-16 degrees C for fry and juvenile rearing, and below 14 degrees C for smoltification. Water temperature can influence the metabolic rate, distribution, abundance, and swimming ability of rearing juvenile steelhead (Barnhart 1986; Bjornn and Reiser 1991; Myrick and Cech 2005). Optimal temperatures for steelhead growth range between 10 and 20 degrees C (Hokanson et al. 1977; Myrick and Cech 2005; Wurtsbaugh and Davis 1977). Fluctuating diurnal water temperatures are also important for the survival and growth of salmonids (Busby et al. 1996). Direct mortality of smolts could occur if water temperatures rise to levels in excess of 25 degrees C. Behavioral changes may also occur as temperature levels rise causing smolts to cease outmigration and reversal of the smoltification process (McCullough 1999).

2.5.3.1 FOCP and ADSRP

In October and December 2020, Valley Water implemented an emergency reservoir drawdown to deadpool, during which water was released from Anderson Reservoir at a net rate of 100 cfs (BA Section 3.5.2) to minimize impacts to steelhead and critical habitat PBFs. In May 2020, to encourage steelhead emigration out of FCWMZ (the portion of Coyote Creek downstream of Anderson Dam that was expected to be affected by flow reductions in the following months), Valley Water released a spring pulse flow from Anderson Reservoir and coupled this with the draining of the Coyote Percolation Pond. Then, in August 2020, Valley Water implemented fish rescue and relocation within the FCWMZ to minimize exposure of juveniles to high water temperature. These actions are expected to have minimized impacts to steelhead downstream of Anderson Dam by encouraging the volitional movement of steelhead out of the area to be affected and by directly placing steelhead in refuge habitat.

Additional measures to minimize impacts to steelhead and critical habitat PBFs downstream of Anderson Dam that will occur during the remainder of FOCP and ADSRP include monitoring of surface water flows and temperatures, additional fish relocation, if needed, and installation and operation of chillers to reduce the temperature of imported water prior to discharge to Coyote Creek.

During deadpool conditions (during FOCP and ADSRP Year 1), dry season bypass flows are expected to be approximately 1 cfs to 5 cfs, depending on normal releases from Coyote Reservoir. Dry season instream flows downstream of the dam will consist of combined through-reservoir flow and CVP discharge (CDL turnout located approximately 900 feet downstream of the dam). Surface water flows of this rate result in elevated water temperatures and impaired surface flow conditions within Coyote Creek downstream of Anderson Dam. Dry season releases into the FCWMZ are expected to be reduced compared to baseline conditions during FOCP and ADSRP, due to the lack of dry season dam releases. During dry season months, all steelhead within the FCWMZ that remained in Coyote Creek during FOCP reservoir deadpool conditions have been subject to potential impacts of elevated temperatures from imported water releases and water bypassed through the reservoir and released at deadpool conditions during dry season months. Although observations of steelhead injury and mortality do not exist, potential impacts to critical habitat PBFs of elevated temperatures during dry season months include physiological stress and mortality to juveniles rearing within the FCWMZ downstream of Anderson Dam.

Fish relocation actions would be expected to continue to minimize effects to steelhead by, as described above, placing them in refuge habitat. *The electric chillers are expected to minimize the potential for steelhead to be exposed to adverse water temperatures by* decreasing the temperature of imported CVP water by up to 12.6 degrees F (7 degrees C) prior to release into the FCWMZ, resulting in water temperatures at or below approximately 18 degrees C (64.4 degrees F) (BA Section 6.2.1.4; Table 6-1) from Anderson Dam downstream to Tomcat Way (approximately 2,000 feet upstream of Ogier Ponds). Additionally, based on the WEAP model results and habitat criteria mapping study (BA Section 4.3), combined flow releases from Anderson Dam and imported water ranging from 5 to 23 cfs during the spring and summer rearing period are anticipated to continue to provide adequate rearing critical habitat PBFs within the FCWMZ. Flows and temperatures are expected to be adequate for steelhead movement and migration PBFs. Due to operations to manage temperatures of the FCWMZ during ADSRP in the dry season, NMFS expects that flows and temperatures will be generally adequate for steelhead. With the measures included in the ADP to minimize the effects of increased water temperatures on steelhead, including real-time monitoring of the chiller operations and water temperatures, and rescue and relocation of steelhead, few, if any steelhead would be expected to be injured or killed during as a result of surface water flows and temperature during the remainder of FOC and ADSRP.

In the area below Coyote Percolation Dam to the upper limit of tidal extent, flows and temperatures are not being managed to support year-round rearing. Groundwater typically percolates up in this reach to contribute to surface water flows. Operational management of bypass flows, imported water, and groundwater percolation are expected to provide benefits to migrating steelhead and critical habitat PBFs.

Additionally, compared to pre-FOCP Anderson Dam conditions, the bypass of surface water flows through Anderson Reservoir during FOCP and ADSRP is expected to result in increased surface flow conditions during and after storm events. During storm events these bypassed flows will result in relatively unimpaired flow conditions and increased magnitude and duration of spring flows, which are expected to be sufficient to support migration PBFs for steelhead juvenile outmigration downstream and out of the FCWMZ (Stillwater Sciences 2020a). These increased flow rates will vary depending on precipitation events, and will range between as little as 3 cfs and as high as 6,000 cfs. While these flows are expected to provide surface water flow and temperature conditions, including variations, that are supportive of steelhead migration, spawning, movement, and rearing, the variation in flows could also result in impacts to steelhead and critical habitat PBFs. For example, periods of low flow between precipitation events could expose steelhead to impaired surface flows, and periods of high flow could expose steelhead to excessively high velocities, potentially resulting in decreased habitat availability, redd scour, and displacement of individuals. To reduce these effects during periods of low flow, monitoring and fish relocation, if needed, will be implemented.

Flow fluctuations within natural river environments are typically less than 2 inches per hour (Hunter 1992), and fish may be more susceptible to stranding when creek flow declines rapidly (Phinney 1974, Bauersfeld 1978, Halleraker et al. 2003). Reductions in flow may also result in indirect effects on fish, such as temporary loss of habitat from dewatering, and behavioral responses that could reduce survival or growth (Hunter 1992).

To reduce the potential for effects to steelhead and critical habitat PBFs during periods of high flow, including reductions in high flow, the ADP includes habitat enhancement and operational measures that are expected to reduce the exposure to, and severity of effects on steelhead. Operations and modifications at the Coyote Percolation Dam will maintain fish passage across a wide range of flows, curtailment of CVPE releases during periods of steelhead migration will reduce the potential stranding at this facility, implementation of ramping down procedures will decrease the potential for stranding, habitat enhancement at the Live Oak Restoration site will support spawning and refuge PBFs, the north-south channel weir will be operated to reduce impacts to steelhead within the South Channel, and monitoring and steelhead relocation will be implemented in the North Channel to reduce the potential for steelhead to be stranded when flows recede. To minimize stranding, the North Channel was also graded to remove existing holes and pools that may strand fish when waters recede. In addition, Valley Water will conduct wetland and riparian habitat monitoring, and fish monitoring will occur associated with steelhead rescues and relocation (Section 1.3.3.2) and the AMT (including NMFS) may make annual refinements to ramping rate measurable objectives or implementation.

With these measures, impacts to steelhead and PBFs of critical habitat will be minimized and few steelhead are expected to be injured or killed during these flow events. Additionally, unimpaired flow conditions during these periods could boost natural processes such as sediment sorting and maintenance of aerated gravels that are important habitat for supporting steelhead spawning PBFs, including adult spawning, egg incubation, and emergence.

2.5.3.2 Post-construction Anderson Dam Operations (post-ADSRP)

Upon completion of ADSRP, ADP water releases from Anderson Reservoir will include normal operational releases (including conservation measure releases) according to the FAHCE-Plus Modified Rule Curves. Controlled emergency releases and uncontrolled emergency releases will also occur. These releases would occur via the LLOW, HLOW, spillway, CVP, CVPE, raw water distribution system, the existing Main Avenue Pipeline, or through a combination of these facilities (See Proposed Federal Action, Section 1.3.2). Valley Water has conducted extensive modeling that has contributed to consideration of these effects. River systems are inherently dynamic, and additionally, flow and temperature modeling include assumptions, therefore Valley Water will conduct monitoring to track effects and inform operations guided by the OWG (Section 1.3.2.1.2.5) in the short-term, and adaptive management guided by the AMT in the long-term (see Section 1.3.4.2).

Normal operational releases (including conservation measure releases) include implementation of the FAHCE-Plus Modified Rule Curves. These rule curves consider dry-year, median-year, and wet-year hydrological conditions. Real-time operational management will occur with the OWG to ensure implementation occurs as expected. Compliance with FAHCE-Plus Modified Rule Curves will include NMFS in the OWG. If needed, the OWG will make in-season flow release adjustments to benefit fish as different conditions arise, especially during low storage and dry years. Deviations from Valley Water proposed flow release rates and amounts may occur due to minor imprecision of flow release equipment that will be installed at Anderson Dam. These deviations are expected to be very minor and inconsequential to the amount of flow being released and unnoticeable for steelhead and functioning of critical habitat PBFs. Long-term changes associated with operations will occur as adaptive management through the AMT. The FAHCE-Plus Modified Rule Curves have been designed by Valley Water, with resource agency input (including NMFS) to support critical habitat PBFs that are protective of all freshwater steelhead life stages.

2.5.3.2.1 Summer Base Flows

Summer Base Flows (May 1 through October 31) will maintain a minimum flow rate of 1 cfs and a daily average temperature not to exceed 18 degrees C (64.4 degrees F) at the downstream extent of the FCWMZ (as cold water supplies will allow) before the Ogier Ponds CM is complete, and throughout the full CWMZ after Ogier Ponds CM is complete. These instream flow and temperature targets are based on Valley Water's calculation of long-term data collection in Coyote Creek to estimate the 90 percent exceedance probability. In a small minority of drier water years, resulting instream flows may less than 1 cfs, depending on the combined storage of Coyote and Anderson Reservoirs. Decreased flows will result in a smaller length of Coyote Creek in the FCWMZ that will remain below 18 degrees C. If there is not available cold water storage to satisfy this condition, the release will be less than the total available cold water storage less estimated evaporation divided by 184 days as described in the BA, Section 3.6.3.4. Between April 15 and April 30 of each year, Valley Water will perform a thermal profile survey of Anderson Reservoir to determine the volume of the hypolimnion that is at or below 14 degrees C (57.2 degrees F) using the depth to cold water and a rating curve to calculate the size of the cold water pool in acre feet. If imported water from the Santa Clara Conduit is 14 degrees C (57.2 degrees F) or less and the combined reservoir storage is not adequate for summer releases, then releases from the Coyote Discharge Line to Coyote Creek may be substituted for releases from Anderson Reservoir to meet the target. The flows and temperatures of both the FCWMZ and CWMZ are expected to support critical habitat PBFs that will be protective for steelhead rearing.

2.5.3.2.2 Winter Base Flows

Winter Base Flows (November 1 through April 30) include multiple tiers of release rates conditional on storage conditions in the reservoir and groundwater recharge needs: 5 cfs, 10 cfs, 15 cfs, 23 cfs, and 26 cfs or more (depending on the amount necessary for managed recharge and environmental release). These FAHCE-Plus Modified Rule Curve flows have been designed to, and are expected to provide adequate surface water conditions to support critical habitat PBFs providing for steelhead migration, spawning, rearing, and movement during the winter period. Additionally, in wet years, implementation of the FAHCE-Plus Modified Rule Curves is expected to support storage of water in Anderson Reservoir that will allow for building a larger cold water pool in the reservoir, which will be used to support summer period base flows and cold water releases for steelhead in Coyote Creek. The Winter Base Flows are expected to support critical habitat PBFs that will be protective for all life stages of steelhead.

2.5.3.2.3 Migration Pulse Flows

Migration Pulse Flows will be implemented to support steelhead migration PBFs, providing adequate depth and velocities for migrating steelhead. Migrating steelhead adults and outmigrating juveniles are expected to benefit from the Primary Attraction Pulse Flows (December 1 through April 1), Safeguard Attraction Pulse Flows (January 15 and March 30, if no previous attraction adult steelhead upmigration pulse has occurred since December 1), and Security Pulse Flows (if no previous Primary or Safeguard pulse flow has occurred by March 1), and Outmigration Pulse Flows (April 1 through May 30) are expected to benefit steelhead smolt outmigration. With these flow programs, provision of passage conditions that support adult and smolt steelhead migration is expected. Some impairment of migration PBFs is also expected, because, compared to a system not impaired by a dam structure, the Anderson Dam will alter downstream flows important for the maintenance of passage conditions and provision of migration cues. For the ADP it is expected that these effects may result in passage delays for a small number of early migrating adults in some water years; primarily dry water years. The number of early migrating adults that will experience delayed migration as a result of ADP flow operations cannot be precisely quantified because the number of adult steelhead that may migrate and return to the Coyote Creek watershed each year is unknown, but it is anticipated to be small relative to the overall Coyote Creek steelhead population.

2.5.3.2.4 Emergency Releases

Controlled emergency releases for emergency drawdowns (both low-level and new high-level outlet options) may be up to 5,300 cfs. Uncontrolled emergency releases (higher capacity spillway) may range from very short events that are only a slightly greater release rate than the 5,300 cfs controlled emergency releases, to longer duration events that are significantly greater in release rate than the controlled emergency releases. Some steelhead injury or mortality may occur during controlled and uncontrolled emergency releases resulting from excessive velocities, including stranding of individuals and scouring of redds. However, as described above, the ADP includes operations and measures that are expected to minimize the adverse impacts of high flows on steelhead and their habitat in Coyote Creek and high flows are also expected to benefit steelhead habitat and steelhead movement and migration. With the implementation of these minimization measures NMFS expects the level of risk to be low and only a small number of steelhead individuals to be stranded during ADP. It is not possible to estimate the injury or mortality that may occur from future stranding. However, it is likely that direct mortality and indirect effects to steelhead will occur from the rapid reductions in flow.

While the ADP includes measures to minimize the effects of surface water flow alterations to CCC steelhead, some injury and mortality of steelhead is expected. The amount of steelhead injury or mortality that may occur during FOCP, ADSRP, and post-ADSRP due to altered flow releases cannot be accurately quantified as a specific number of steelhead individuals because the distribution of effects will occur over a large area and will vary widely depending on local habitat conditions. Moreover, the distribution and abundance of fish that may occur within the action area will be inconsistent over time, affected by habitat quality, interactions with other species, and other influences that cannot be precisely determined by observation or modeling. The best available indicator of injury or mortality from flow releases during ADP will be a habitat surrogate reflecting the operational management of flow releases and temperatures that will occur in the action area. Measurements of instream flows and temperatures will serve as the surrogate for watershed health as it is affected by ADP flow releases, and will function as a meaningful reinitiation trigger because it can be tracked in real time.

2.5.4 Suspended Sediment Concentration and Sediment Deposition

Increased suspended sediment concentrations (SSC) in instream and estuarine waters may result from construction, maintenance, and operations associated with disturbance of streambed and banks for construction and maintenance actions, and long-term operations of the reservoir and related facilities.

Instream and near-stream construction activities have been shown to result in temporary increases in SSC that could impact CCC steelhead and designated critical habitat (reviewed in Furniss et al. 1991, Reeves et al. 1991). High concentrations of suspended sediment can disrupt normal feeding behavior and efficiency (Cordone and Kelley 1961, Bjornn et al. 1977, Berg and Northcote 1985), reduce growth rates (Crouse et al. 1981), and increase plasma cortisol levels (Servizi and Martens 1992). Elevated SSC concentrations can reduce dissolved oxygen in the water column, result in reduced respiratory functions, reduce tolerance to disease, and can also cause fish mortality (Sigler et al. 1984, Berg and Northcote 1985, Gregory and Northcote 1993, Velagic 1995, Waters 1995). Even small pulses of turbid water will cause salmonids to disperse from established territories (Waters 1995), which can displace fish into less suitable habitat and/or increase competition and predation, decreasing chances of survival. Increased sediment deposition can fill pools and reduce the amount of cover available to fish, decreasing the survival of juveniles (Alexander and Hansen 1986). For steelhead, these effects are expected to result in harm in the form of decreased forage ability for juveniles, degraded spawning substrate that impairs adult spawning success, egg incubation, and fry survival (Sigler et al. 1984, Newcombe and Jensen 1996).

Determining the concentrations that cause direct effects in salmonids has generally been based on laboratory studies experimenting with exposures to concentrations of suspended sediment over 1,000 mg/L and usually much higher. According to Sigler et al. (1984), “yearling and older salmonids can survive high concentrations of suspended sediment for considerable periods, and acute lethal effects generally occur only if concentrations exceed 20,000 mg/L” (see reviews by Cordone and Kelly 1961, Sorenson et al. 1977). For 36-hour exposures using juvenile Chinook and Sockeye Salmon (*Oncorhynchus nerka*), Newcomb and Flagg (1983) reported 10-percent mortality at concentrations of 1,400 mg/L, 50-percent mortality at 9,400 mg/L, and 90-percent mortality at 39,400 mg/L. Concentrations of 82,000 mg/L resulted in 60-percent mortality after 6 hours of exposure. Estimated concentrations of 207,000 mg/L resulted in 100-percent mortality in one hour. Stober et al. (1981) reported mortality rates of 50-percent for juvenile Chinook and coho Salmon (*Oncorhynchus kisutch*) exposed to 500–1,000 mg/L for 96 hours. From the results of these and other studies, it appears that relatively short-term exposures to increases in suspended sediment concentration under 500-600 mg/L will not likely result in substantial direct mortality to either juvenile or adult steelhead in Coyote Creek. If the duration of exposure is extended, however, some direct mortality may be expected. Exposures of 19 days to SSC of 90–270 mg/L and higher have been reported as resulting in mortality to juvenile rainbow trout by Herbert and Merkens (1961).

To assess effects on steelhead that will result from elevated SSC during ADP, the BA and this opinion use the Newcombe and Jensen (1996) severity of ill effects index (SEV), which provides a ranking of the effects of SSC on salmonid species based on exposure to various suspended sediment concentrations and durations. The SEV scores represent severity of effects and range on a 15-point scale, representing relatively low-level effects such as disturbance (SEV 1) to relatively higher-level effects such as acute mortality (SEV 15).

As a conservation measure to minimize impacts of elevated SSC on steelhead, Valley Water has and will continue to implement fish rescue and relocation events. Results are expected to reduce exposure of juveniles to suspended sediment in the years in which high temperatures trigger a rescue (BA Section 3.7.4). Additionally, spring pulse flows, as implemented in 2020 prior to initial drawdown, can be used to encourage outmigration of steelhead (BA Section 3.3.1).

For the fish that are not relocated, lethal and sublethal effects likely occurred in the past and will likely occur in the future. Given the likelihood that approximately 1 percent of fish evade capture during fish handling and relocation events (see Fish Handling and Relocation, above), it is expected that some juvenile steelhead will remain in the portions of Coyote Creek affected by elevated suspended sediment concentrations between late-spring through early-fall. Steelhead adults, eggs, fry, and juveniles will also be present in the action area throughout the rest of the year, and may be exposed to elevated SSC during high flow events, most likely to occur during the late-fall through early-spring.

The following considers SSC effects that occurred during previous FOCP actions, and effects that will occur from ongoing and future FOCP actions, future ADSRP actions, and future post-ADSRP dam operations.

2.5.4.1 SSC and Deposition During FOCP Past Emergency Reservoir Drawdown

Elevated SSC and increased sediment deposition downstream of Anderson Dam occurred in Coyote Creek during emergency reservoir drawdown, and will occur during ongoing and future FOCP construction. In October and December 2020, Valley Water implemented the emergency reservoir drawdown. To minimize SSC effects to steelhead and critical habitat PBFs during FOCP, Valley Water released water during drawdown to deadpool at a drawdown net rate of 100 cfs to reduce landslide risk and to reduce sediment mobilization downstream (BA Section 3.5.2). Modeling for the emergency drawdown did not occur. Field monitoring (Sediment Deposition Monitoring Plan in Coyote Creek Downstream of Anderson Dam; Stillwater Sciences 2020b) implemented during the draining and maintenance of Anderson Reservoir at deadpool showed that high concentrations of suspended sediment occurred in the FCWMZ during the emergency drawdown. Conservation Measures to reduce impacts on steelhead and critical habitat PBFs from increased suspended sediment were implemented during reservoir drawdown, including a spring pulse flow in May 2020 and a fish rescue and relocation measure in August 2020. The pulse flow and the draining of the Coyote Percolation Pond likely increased emigration of juvenile steelhead out of the FCWMZ, and the fish rescue and relocation measure placed steelhead juveniles in refuge habitat prior to the potential for impacts to occur. However, any juveniles that were not relocated, and any migrating adults that move into Coyote Creek during periods of high flow, would be expected to have been exposed to elevated SSC and were likely injured or killed.

2.5.4.2 SSC and Deposition During Ongoing and Future FOCP and ADSRP

For ongoing and future FOCP construction, and future ADSRP construction, SSC in Coyote Creek downstream of Anderson Dam varies depending on reservoir inflow and stage of construction. For example, greater discharge of suspended sediment from Anderson Reservoir (i.e., higher SSC in Coyote Creek downstream of Anderson Dam) is expected when periods of high reservoir inflow coincide with periods of low reservoir storage, and comparatively lower discharge of SSC to Coyote Creek is expected during periods of lower reservoir inflow and/or greater reservoir storage. To evaluate the range of potential SSC discharges to Coyote Creek downstream of Anderson Dam during the remainder of FOCP and during ADSRP, modeling was performed (URS 2020a; URS 2020b; BA Section 4.2.1.1 and 6.2.2) that considered high flow events (2-year storm events or greater - the events expected to result in the greatest amount of SSC discharge to Coyote Creek downstream of Anderson Dam) low flow events (constant inflow to Coyote Creek), reservoir storage conditions during FOCP construction and ADSRP construction, and identified SSC expected to occur within Coyote Creek. The 2-year storm event was selected for the assessment of SSC effects to steelhead and designated critical habitat because the Anderson Dam reservoir outlet constricts reservoir discharge such that all storm events at or greater than a 2-year event would discharge at the same rate (during a larger storm event the reservoir would fill up). Additionally, because the events larger than 2-year events would result in an increased reservoir pool and decreased exposure of reservoir sediments to the scouring forces of surface flows, erosion of reservoir sediment deposits would be less for larger storm events than for smaller events. For example, a 5-year inflow event was modeled for the period during ADSRP when there is a small reservoir pool (Scenario 4). In this scenario, SSC reaches approximately 25,000 mg/L ahead of the water level reaching a maximum at elevation 510 feet (BA Figure 6-9). The 2-year storm event for the same scenario resulted in SSC of approximately 30,000 mg/L.

Modeling indicates that SSC will be highest in the reach of Coyote Creek between Anderson Dam and the upstream end of Ogier Ponds (i.e., the FCWMZ), which coincides with the reach of Coyote Creek where steelhead abundance is expected to be highest and critical habitat PBFs most essential for steelhead, and SSC will decrease as distance from the dam increases. The following provides modeled SSC estimates for the reach of Coyote Creek where SSC is expected and steelhead abundance are expected to be highest (i.e., the reach where effects to steelhead are expected to be greatest) - the reach of Coyote Creek from Anderson Dam to the upstream end of Ogier Ponds.

2.5.4.2.1 During Ongoing and Future FOCP Construction Prior to ADTP Completion

Sediment transport during FOCP construction that has occurred and will continue to occur prior to the completion of ADTP construction was modeled by URS (2020a) as Scenario 1 (see BA Section 4.2.1.1; BA Figure 6-3). Scenario 1 is based on Anderson Reservoir outflow limited to the capacity of the outlet structure (500 cfs maximum capacity), and the reservoir's water level does not fall below deadpool. Modeling of an average 2-year discharge event prior to ADTP completion, indicate that SSC in the reach of Coyote Creek from Anderson Dam to the upstream end of Ogier Ponds will peak at approximately 3,600 mg/L for less than an hour and then decreases to approximately 200 mg/L after 3.5 days as sediment is either diluted by the Coyote Creek inflows or settles out. SSC is expected to reduce slightly to 3,100 mg/L between Anderson

Dam and Ogier Ponds. Sediment deposition is modeled to occur in Ogier Ponds; resulting in lower SSC downstream of Ogier Ponds. Farther downstream at Milpitas, the peak SSC was modeled to be approximately 500 mg/L.

URS (2020a) modeling indicates that suspended sediment effects when the reservoir is at deadpool (during ADTP construction) result in impacts on steelhead that are exposed to elevated SSC. Upstream migrating steelhead adults are predicted to experience sublethal minor physiological stress, potentially resulting in an increase in rate of coughing and increased respiration rate (SEV of 5). The effect on rearing fry and juveniles is predicted to be sublethal minor physiological stress, increase in rate of coughing, and increased respiration rate (SEV of 5). For most redds, incubating eggs would experience up to 20-percent mortality (SEV of 10). As described in the BA Section 2.1.1.3, steelhead fry and juvenile rearing downstream of Ogier Ponds is not common. However, those individuals that do occur would be exposed to lower levels of suspended sediment than within the FCWMZ as a result of dilution from additional sources of flow and deposition within Ogier and Coyote Percolation Pond (URS 2020a), and thus would experience less of an impact.

Increased sediment deposition has and will continue to occur downstream of Anderson Dam during high flow events during FOCP prior to ADTP completion. The stream reach between Anderson Dam and Ogier Ponds is primarily erosional but there are a few locations of deposition, mainly downstream of bridges (AECOM 2021). Erosion is driven by higher than usual flows downstream of Anderson Dam during ADTP construction, and is predicted to increase pool depths, but reduce spawning gravel quantity, and potentially reduce access to low-terrace floodplain habitat. Deposition is predicted to occur in limited areas during FOCP, including approximately 6 inches of deposition downstream of the Sycamore Avenue crossing, and 2.4 inches is predicted near the U.S. Highway 101 Bridge (AECOM 2021).

Increased sediment deposition is expected to result in the following past and ongoing effects to steelhead and critical habitat PBFs: sediment deposition on spawning gravel reducing quality of steelhead spawning habitat, reduced BMI production as food supply for rearing steelhead, and reduced pool habitat for rearing steelhead. SSC will be monitored (BA Section 3.7.6.3) during FOCP to determine the actual sediment release, relative to the model predictions, and inform management actions. Valley Water will also continue to monitor according to the Sediment Deposition Monitoring Plan (Stillwater Sciences 2020b) to inform mitigation (BA Section 3.7.6.4). As mitigation to offset impacts to steelhead and critical habitat PBFs from SSC and sediment deposition during FOCP, Valley Water is conducting habitat restoration, including spawning gravel augmentation and channel restoration within the Live Oak Restoration Reach (see Habitat Restoration below).

2.5.4.2.2 During Future FOCP Construction Following ADTP Completion

After completion of ADTP, the maximum outflow from Anderson Reservoir will be increased to 2,500 cfs. This scenario will occur during the remainder of FOCP. The ADTP design reservoir outflow of 2,500 cfs is lower than discharges anticipated during storm events, which means that the reservoir is expected to fill during storm events. Once the ADTP is constructed, the reservoir could be drawn down to deadpool relatively quickly following a storm event.

SSC was modeled for this scenario to determine effects on steelhead and critical habitat PBFs (URS 2020a; Scenario 2; BA Figure 6-4) as a 2-year event with a double peak representing a sequence of storms (i.e., two back-to-back storms). Model results for the SSC in the reach from Anderson Dam to the upstream limit of Ogier Ponds under this scenario peaks at approximately 8,800 mg/L for less than an hour, and then decreases to approximately 200 mg/L in approximately 3.5 days as sediment is either diluted by the Coyote Creek inflows or settles out. Modeling indicates that during the two events, the SSC downstream of the reservoir would remain over 5,000 mg/L for approximately two days. SSC is expected to reduce slightly to 7,400 mg/L between Anderson Dam and Ogier Ponds. Farther downstream at Milpitas, the peak SSC was modeled to be approximately 4,800 mg/L. Upstream migrating steelhead adults exposed to these SSC within the FCWMZ are predicted to experience sublethal minor physiological stress, potentially resulting in increased coughing and respiration rates (SEV of 5). Rearing fry and juveniles exposed to these SSC are expected to experience sublethal minor physiological stress, and increased coughing and respiration rates (SEV of 5). For most redds, incubating eggs exposed to these SSC would experience up to 20-percent mortality (SEV of 10).

Downstream of Ogier Ponds, steelhead fry and juvenile rearing is not as common as upstream of Ogier Ponds (BA Section 2.1.1.3). As a result of dilution from additional sources of flow and sediment deposition within Ogier and Coyote Percolation Pond (URS 2020a), steelhead individuals that do occur downstream of Ogier Ponds would be exposed to lower SSC than the SSC within the FCWMZ and thus would experience less of an impact.

Increased sediment deposition has and will continue to occur downstream of Anderson Dam during high flow events during FOCP following ADTP construction. Deposition is predicted to occur in limited areas during FOCP, including, approximately,7.6 inches of deposition near the Serpentine Trail Crossing, 1.1 inches downstream of the Sycamore Avenue crossing, and 3.0 inches is predicted near the U.S. Highway 101 Bridge (AECOM 2021). Effects on steelhead and critical habitat PBFs are expected to be similar to those described above for the period of FOCP prior to ADTP completion. Other project components designed to accommodate higher peak water discharges, including the ADT itself, channel modifications below the dam, and Coyote Percolation Dam Replacement (see BA Sections 3.4) will support the flushing of sediment that may otherwise settle in areas of Coyote Creek with lower velocities.

2.5.4.2.3 ADSRP During Construction

During year 1 and year 2 of ADSRP, the reservoir will be drawn down to a fully dewatered state (empty reservoir), fully removing standing water that occurred during deadpool conditions. Years 3 through 6 of ADSRP will include a small pool of about 590 acre-feet (reservoir elevation 467 feet) that will be maintained through each of the four wet seasons. Flows through the empty reservoir and small reservoir pool will mobilize sediment throughout the reservoir reach, elevating SSC within Coyote Creek downstream of Anderson Dam. SSC and sediment deposition modeling simulations conducted by URS (2020b) were run for constant inflow and the 2-year storm events (Scenario 3) to inform assessment of effects on steelhead and spawning, rearing, and migrating PBFs of designated critical habitat.

2.5.4.2.3.1 Constant Inflow with an Empty Reservoir

Constant inflow during empty reservoir conditions was modeled during wet season months of ADSRP year 1 and year 2. Since the URS (2020b) modeling approach (Scenario 3) assumes no pool of water to trap sediment or reduce the ability of flows to erode sediment, even small flows could erode sediment creating high levels of suspended sediment. Since this was meant to represent a period of constant flow, the results were averaged over a period where the average outflow rate equaled the inflow rate. For an inflow rate of 180 cfs (typical moderate flow that occurs in nearly all years for at least a few days per year, see BA Section 5.3.5, Figure 6-5), the average SSC was modeled to be 5,200 mg/L, which is assumed to occur for up to two weeks.

Under a constant inflow scenario upstream migrating steelhead adults within the FCWMZ are expected to experience sublethal effects, including moderate physiological stress, and increased coughing and respiration rates (SEV of 6) during the migratory period (December through April). The elevated SSC during empty reservoir configuration is anticipated to occur during early spring (April), near the end of the adult migration period when there is a low likelihood of adult migration to occur. Impacts on steelhead and PBFs are expected to occur for only a short time (3 months) starting in April (or possibly earlier) following the first ADSRP season. For redds that occur into April in the FCWMZ, incubating eggs would experience reduced growth and potentially delayed hatching and smaller fry, and up to 20-percent mortality (SEV of 10). This level of effect may impact spawning PBFs and result in a decrease in spawning production for redds constructed during late winter. Adults or redds exposed further downstream of Ogier Ponds would be exposed to lower SSCs, and experience less of an impact. The effect on rearing fry and juveniles of the modeled empty reservoir and constant inflow during April is predicted to result in sublethal effects, including moderate physiological stress and potential short-term reduction in feeding rates and feeding success (SEV of 6). As a result of dilution from additional sources of flow and sediment deposition within Ogier and Coyote Percolation Pond (URS 2020b), steelhead individuals and critical habitat PBFs that occur downstream of Ogier Ponds would be exposed to lower SSC than the SSC within the FCWMZ and thus would experience less of an impact.

Regarding sediment deposition effects on steelhead and critical habitat PBFs, assuming a constant 180 cfs inflow (typical moderate flow that occurs in nearly all years for at least a few days per year, see BA Section 5.3.5.1), the reach of Coyote Creek between Anderson Dam and the upstream end of Ogier Ponds is predicted to experience deposition in limited areas, including around 0.12 inches downstream of the Coyote Creek Trail Crossing (AECOM 2021). For the limited areas predicted to experience deposition, this magnitude of deposition could reduce the quality of steelhead spawning habitat and reduce BMI production as food supply for rearing steelhead. This deposition is predicted to reduce the survival of incubating eggs, and potentially the growth of fry and juveniles rearing within these limited areas. This impact would occur until sediment is transported by high winter flows following Seismic Retrofit Improvements construction (when the reservoir fills again, reducing additional sediment release).

2.5.4.2.3.2 2-year Storm Event with an Empty Reservoir

During wet season months of ADSRP year 1 and year 2, the modeling for a 2-year inflow event (approximately 6,000 cfs) into an empty reservoir (Scenario 3, BA Figure 6-6) shows an initial spike in SSC (values ranging between 30,000 to 39,000 mg/L in the reservoir) due to significant erosion of reservoir sediments. As the reservoir fills (to elevation 502 ft), erosion is expected to decrease, and SSC in water discharged to Coyote Creek from Anderson Dam is expected to decrease to less than 1,000 mg/L in less than 3 days.

Upstream migrating steelhead adults within the FCWMZ exposed to these SSC are expected to experience an SEV of approximately 6 during a 2-year event in the migratory period (December through April) (BA Table 6-8). Upstream migrating steelhead in the FCWMZ could be exposed to these SSC approximately three to five times and, while exposed, are expected to experience moderate physiological stress and increased coughing and respiration rates. This level of effect is anticipated to result in sublethal effects to adults that may occur during storm events. Because of the relatively short duration of the spikes in SSC (1–2 hours), adult migration effects are expected to be incurred over a short duration. The modeled empty reservoir is anticipated to occur during early spring (April), near the end of the adult migration period when there is a lower likelihood of adult migration to occur. Within the action area, flows exceeding a 2-year magnitude are rare in April (less than 10-percent of years recorded). For redds that occur in the FCWMZ into April, incubating eggs would be expected to experience reduced egg growth and potentially delayed hatching and smaller fry, and up to 20 percent mortality (SEV of 10). This level of effect will impact spawning critical habitat PBFs that may result in a decrease in spawning production for redds constructed during late winter. Adults or redds exposed further downstream of Ogier Ponds would be exposed to lower levels of suspended sediment, and experience less of an impact.

The effect on rearing fry and juveniles of the empty reservoir and a 2-year inflow during April is predicted to result in sublethal effects, including moderate physiological stress, potential short-term reduction in feeding rates and feeding success (SEV of 6). Relatively short duration of spikes in SSC (1–2 hours) are expected. As a result of dilution from additional sources of flow and sediment deposition within Ogier and Coyote Percolation Pond (URS 2020b), steelhead individuals and critical habitat PBFs that occur downstream of Ogier Ponds would be exposed to lower SSC than the SSC within the FCWMZ and thus would experience less of an impact.

Regarding effects of sediment erosion and deposition on steelhead and critical habitat PBFs during this period, sediment erosion is expected if a 2-year flow event or greater occurs. This magnitude of erosion will be driven by higher than usual flows downstream of Anderson Dam during ADSRP, and is predicted to increase pool depths, but reduce spawning gravel quantity, and potentially reduce access to low-terrace floodplain habitat from increased channel incision. Deposition is predicted to occur in limited areas, including around 2.9 inches of deposition near the Serpentine Trail Crossing, around 4.6 inches downstream of the Sycamore Avenue crossing, and around 3.8 inches is predicted near the U.S. Highway 101 Bridge (AECOM 2021). For the areas predicted to experience deposition, this magnitude of deposition could reduce the quality of spawning critical habitat PBFs and reduce BMI production as food supply for rearing steelhead. This deposition is predicted to reduce the survival of incubating eggs, and potentially the growth of fry and juveniles rearing within these limited areas. This impact would occur during year 1 of ADSRP, and could last until sediment is transported by high winter flows following ADSRP when the reservoir fills again (post-ADSRP), reducing additional sediment release into Coyote Creek.

2.5.4.2.3.3 Constant Inflow with a Small Reservoir Pool

During portions of ADSRP construction when a diversion pipe will be placed through the reservoir reach, a small pool of about 590 AF will be maintained within the reservoir reach during portions of each of the four wet seasons when a small reservoir pool will exist (years 3 through 6). Modeling (URS 2020b; Scenario 4) indicates that large storm events, such as a 2-year event and greater, will enlarge the pool, which will then drain relatively quickly. During smaller precipitation events, much of the eroded fine sediment is expected to pass through the reservoir because the pool volume and depth would be too small to greatly reduce SSC. To consider periods of constant inflow during these conditions, modeling results were averaged over a period where the average outflow rate equaled the inflow rate. For an inflow rate of 180 cfs (typical moderate flow that occurs in nearly all years for at least a few days per year, see BA Section 5.3.5.1) the average suspended sediment concentration is expected to be 259 mg/L or less for a period of several days (which could occur in a wet year, BA Figure 6-7).

Under a constant inflow scenario migration critical habitat PBFs will be impacted and upstream migrating steelhead within the FCWMZ are expected to be exposed to SSC that will cause minor physiological stress, and increased coughing and respiration rates (SEV of 5). This level of effect is expected to occur for up to two weeks, and is anticipated to result in sublethal effects to adults in the FCWMZ. For most redds in the FCWMZ, incubating eggs would experience up to 20-percent mortality (SEV of 10). Adults or redds exposed further downstream of Ogier Ponds would be exposed to lower levels of suspended sediment, and experience less of an impact.

Critical habitat PBFs for rearing juveniles will be impacted and rearing fry and juveniles exposed to these SSC in the FCWMZ are expected to experience minor physiological stress, and increased coughing and respiration rates (SEV of 5). This level of impact is anticipated to result in sublethal effects to fry and juveniles in the FCWMZ. As a result of dilution from additional sources of flow and sediment deposition within Ogier and Coyote Percolation Pond (URS 2020b), steelhead individuals and PBFs that do occur downstream of Ogier Ponds would be exposed to lower SSC than the SSC within the FCWMZ and thus would experience less of an impact.

During the Seismic Retrofit Improvements under a constant 180 cfs flow, the reach is predicted to experience some deposition in limited areas; including around 0.05 inches downstream of the Serpentine Trail Crossing, 0.24 inches downstream of Sycamore Avenue Crossing, and 0.12 inches downstream of the Coyote Creek Trail Crossing (AECOM 2021). Suspended and deposited sediment into the lower reaches of Coyote Creek and the tidal zone of San Francisco Bay is not predicted to be higher due to flows during Seismic Retrofit Improvements construction during periods of constant inflow than under baseline conditions (AECOM 2021). For the limited areas predicted to experience deposition, this magnitude of deposition could reduce the quality of steelhead spawning PBFs and reduce BMI production as food supply for rearing steelhead. This deposition is predicted to reduce the survival of incubating eggs, and potentially the growth of fry and juveniles rearing within these limited areas. This impact would occur during Seismic Retrofit Improvements construction if a 2-year flow event occurs and could potentially persist until sediment is transported by high winter flows following Seismic Retrofit Improvements construction (when the reservoir fills again, reducing additional sediment release).

2.5.4.2.3.4 2-year Storm Event with a Small Reservoir Pool

Two-year inflow events are modeled during ADSRP when a diversion extension pipe extends from the ADSRP diversion intake to upstream of the ADSRP cofferdam (four wet seasons years 3 through 6). SSC reaches a maximum value of about 30,000 mg/L ahead of the water level reaching a maximum at deadpool (Scenario 4, BA Figure 6-8). The SSC in the outflow closely follows the inflow since the reservoir never fills up deep enough to prevent erosion. In this scenario, the inflow from Coyote Creek continues after the storm passes so the SSC concentration in the outflow stabilizes at a value of about 230 mg/L after 3 days.

Critical habitat PBFs for migrating adults and smolts will be impacted and upstream migrating steelhead adults within the FCWMZ exposed to these SSC are expected to experience moderate physiological stress, and increased coughing and respiration rates (SEV of 6). This level of effect is expected to persist for a short duration (hours) per event and is anticipated to result in sublethal effects to adults. Incubating eggs exposed to these SCC would be expected to experience reduced growth, delayed hatching and smaller fry, and up to 20-percent mortality (SEV of 10). As described above, PBFs of critical habitat and adults or redds exposed further downstream of Ogier Ponds would be exposed to lower levels of suspended sediment, and experience less of an impact.

Critical habitat PBFs for rearing juveniles will be impacted and rearing fry and juveniles in the FCWMZ exposed to these SSC are expected to experience moderate physiological stress, potential short-term reduction in feeding rates and feeding success (SEV of 6). This level of impact is anticipated to result in sublethal effects to fry and juveniles and would not substantially affect rearing mostly because of the low level of impact. As a result of dilution from additional sources of flow and sediment deposition within Ogier and Coyote Percolation Pond (URS 2020b), PBFs of critical habitat and steelhead individuals that do occur downstream of Ogier Ponds would be exposed to lower SSC than the SSC within the FCWMZ and thus would experience less of an impact.

Flows during ADSRP construction in this reach are predicted to result in erosion if a 2-year flow event or greater occurs. This magnitude of erosion will be driven by higher than usual flows downstream of Anderson Dam during Seismic Retrofit Improvements construction, and is predicted to increase pool depths, but impact PBFs through reduced spawning gravel quantity, and potentially reduced access for steelhead to low-terrace floodplain habitat from increased channel incision. Deposition is predicted to occur in limited areas, including around 4.9 inches of deposition near the Serpentine Trail Crossing, around 3.8 inches downstream of the Sycamore Avenue crossing, and around 3.6 inches is predicted near the U.S. Highway 101 Bridge (AECOM 2021). For the limited areas predicted to experience deposition, this magnitude of deposition could reduce the quality of steelhead spawning PBFs and reduce BMI production as food supply for rearing steelhead. This deposition is predicted to impact rearing PBFs and reduce the survival of incubating eggs, and potentially the growth of fry and juveniles rearing within these limited areas. This impact would occur during ADSRP construction if a 2-year flow event occurs and could potentially persist until sediment is transported by high winter flows following Seismic Retrofit Improvements construction (when the reservoir fills again, reducing additional sediment release).

2.5.4.3 SSC and Deposition During Future Flows Greater than 2-year Events

For storm events greater than a 2-year event, SSC levels are not expected to exceed 2-year event concentrations as described above; however, sediment deposition levels in Coyote Creek are expected to increase and affect steelhead and critical habitat PBFs. Sediment deposition modeling results are included in the BA for ADSRP (Section 6.3.2.2). For 5-year storm events, deposition is predicted to occur in limited areas, including around 6.0 inches of deposition near the Serpentine Trail Crossing, around 4.8 inches downstream of the Sycamore Avenue crossing, around 3.5 inches downstream of the Coyote Creek Trail Crossing, and around 2.8 inches near the U.S. Highway 101 Bridge (AECOM 2021). For the limited areas predicted to experience deposition of fine sediment, this magnitude of deposition will reduce the quality of steelhead spawning PBFs and reduce BMI production as food supply for rearing steelhead but is not likely to be substantial enough to reduce pool habitat availability for rearing steelhead. This deposition is predicted to impact rearing PBFs and reduce the survival of incubating eggs, and potentially the growth of fry and juveniles rearing within these limited areas.

Other project components designed to accommodate higher peak water discharges, including the ADT itself, and CM-2 North Channel Extension (BA Section 3.7.2) below the dam, will support the flushing of sediment that may otherwise settle in areas of Coyote Creek with lower velocities. In addition, sediment deposition on spawning gravel, BMI habitat, juvenile rearing, and migration habitat (BA Section 3.7.6.4) will be monitored during ADSRP to measure the impacts of sediment deposition on steelhead habitat parameters.

Increased sediment deposition is expected to result in the following effects to steelhead and PBFs during ADSRP: sediment deposition on spawning gravel reducing quality of steelhead spawning PBFs, reduced BMI production as food supply for rearing steelhead, and reduced pool habitat for rearing steelhead. SSC will be monitored (BA Section 3.7.6.3) during ADSRP to determine the actual sediment release, relative to the model predictions, and inform management actions. Valley Water will also continue to monitor according to the Sediment Deposition Monitoring Plan (Stillwater Sciences 2020b) to inform mitigation measures (BA Section 3.7.6.4). As mitigation to offset impacts to steelhead from SSC and sediment deposition during ADP (including ADSRP), Valley Water is conducting habitat restoration, including spawning gravel augmentation and channel restoration, based on results of monitoring (BA Section 3.7.7), including: restoration of rearing and spawning habitat at Ogier Ponds reach and Live Oak Restoration Reach, Coyote Creek Restoration Evaluation (CM-7, Section 3.7.7), and the Sediment Augmentation Program (CM-8, BA Section 3.7.8). Critical habitat PBFs that are expected to benefit from these offsetting measures include 1.8 miles of spawning and rearing habitat restoration (CM-7, BA Section 3.7.7) and at least 500 cy of sediment augmentation program (CM-8, BA Section 3.7.8).

Regarding tidally influenced areas of Coyote Creek, during modeled scenarios of both constant flows and 2-year storm events and greater, suspended and deposited sediment levels into the lower reaches of Coyote Creek and the tidal zone of San Francisco Bay are predicted to be higher during ADSRP construction than under baseline conditions, mostly because flows during ADSRP construction could be higher than under baseline operations (AECOM 2021). However, steelhead use these reaches primarily for migration (rather than spawning or rearing), and concentrations of sediment will be less than upstream conditions discussed above. Increases in sediment associated with ADSRP construction may affect PBFs and steelhead migration rates for adults migrating during a large flow event.

2.5.4.4 SSC and Deposition during post-ADSRP during Reservoir Operations

Available information from other watersheds indicates that reservoir operations have the potential to affect critical habitat PBFs and result in chronic releases of elevated suspended sediment concentrations.

The amount of fine sediment reaching the reservoir's outlet will vary depending on particle size, density of sediment in the inflow, amount and rate of inflow, distance traveled through the reservoir, reservoir release operations, and suspended sediment transported during large storms that may reach the outlet at a higher concentration than during smaller storms. Although some of the suspended sediment settles from the water column in Anderson Reservoir, like other San Francisco Bay Area reservoirs (Kittleson et al. 1996), Anderson Reservoir can prevent some of the turbid water from moving quickly through the system and may prolong the release of mildly turbid water to Coyote Creek downstream of Anderson Dam for weeks following a storm.

Modeling has not been performed to estimate the SSC that may be discharged to Coyote Creek during post-ADSRP operations; however, as described in the BA (Section 5.3.9), a small amount of SSC and turbidity measurements have been collected sporadically in Coyote Creek downstream of Anderson Dam during Anderson Reservoir operations occurring prior to the start of ADP actions (i.e., prior to the beginning of FOCP) that suggest post-ADSRP SSC and deposition levels may be significantly lower compared to ADSRP and FOCP levels . For example, as presented in the BA:

- Turbidity point measurements collected in 2007 and 2008 between Montague Expressway and Anderson Dam ranged from 2 to 35 Nephelometric Turbidity Units (NTU).
- Seventeen turbidity measurements in Coyote Creek downstream from Anderson Dam were collected in March 2019, when flows ranged from 430 to 610 cfs and 32 to 55 NTUs.
- Five suspended sediment samples collected in Coyote Creek downstream from Anderson Dam from 2011 through 2015 ranged from 7 to 65 mg/L.
- Suspended sediment samples collected at 17 sampling sites in Coyote Creek downstream from Anderson Dam from December 2019 to March 2020 ranged from 0 to 111 mg/L.

This limited pre-FOCP data and monitoring data collected by Valley Water during FOCP and modeling performed for Anderson Reservoir during deadpool conditions prior to ADTP completion (Scenario 1), provide the best available information for characterizing SSC discharges and sediment deposition that may occur during post-ADSRP reservoir operations.

Because future reservoir operations will improve reservoir storage compared to past conditions (i.e., will maintain a fuller reservoir), it is expected that, compared to pre-ADP conditions, scour of reservoir sediments will be less and deposition of reservoir sediment in the reservoir will be greater. Thus, SSC discharge and subsequent sediment deposition in Coyote Creek downstream of Anderson Dam are expected to be less than past conditions during pre-FOCP Anderson Dam operations. Similarly, as suggested by past sporadic turbidity and SSC measurements listed above, post-ADSRP SSC and deposition levels may be significantly lower compared to levels expected during ADSRP and FOCP. Considering past monitoring data and modeling of Anderson Reservoir deadpool conditions prior to ADTP completion (Scenario 1), we expect that during a 2-year storm event or greater, SSC will be significantly lower than 3,600 mg/L for over 24 hours at the gage immediately upstream of Ogier Ponds, and will decrease to approximately 200 mg/L after 3.5 days of flows returning to less than those of a two-year event.

Although expected to be reduced compared to pre-FOCP conditions, post-ADSRP SSC levels and sediment deposition are expected to impair freshwater PBFs of critical habitat in Coyote Creek, and result in a low level of steelhead injury and mortality. Available information is insufficient to accurately estimate and quantify as a specific number of steelhead individuals that may be injured or harmed because the distribution of effects will occur over a large area and will vary widely depending on local habitat conditions. Moreover, the distribution and abundance of fish that may occur within the action area will be inconsistent over time, and affected by habitat quality, interactions with other species, and other influences that cannot be precisely determined by observation or modeling. In the absence of information sufficient to estimate and quantify specific numbers of individuals that may be injured or killed, we apply a surrogate approach to estimate take. Because rates of sediment deposition are dependent on available SSC, the best available indicator of injury or mortality from SSC and sediment deposition post-ADSRP ADP will be a habitat surrogate based on observed SSC levels that will occur in the action area downstream of Anderson Dam. Measurements of SSC will serve as the surrogate because levels of steelhead injury and mortality are proportional to levels of SSC, and will function as a meaningful reinitiation trigger because it can be tracked in real time.

To minimize the sediment deposition effects of future post-ADSRP actions, the ADP includes conservation measures to improve habitat and monitor conditions downstream of Anderson Dam (e.g., Sediment Augmentation, Geomorphic Flows, and monitoring of these plans [BA Section 3.6.3.3]). As described above (Streambank, channel, and riparian habitat), these conservation measures are expected to support steelhead and PBFs of critical habitat in Coyote Creek.

2.5.5 Pollution from Hazardous Materials and Contaminants

FOCP and ADSRP construction actions, and post-ADSRP operations and maintenance actions will require operating equipment in and near Coyote Creek. Operating equipment in and near streams has the potential to impair steelhead critical habitat PBFs by introducing hazardous materials and contaminants into streams directly or via runoff. Oil and similar substances from construction equipment can contain a wide variety of polynuclear hydrocarbons (PAHs) and metals. PAHs can alter salmonid egg hatching rates and reduce egg survival as well as harm the benthic organisms that are a salmonid food source (Eisler 2000). Any CCC steelhead exposed to ADP-related hazardous materials or contaminants could experience harm or injury. However, measures included in the ADP to prevent the discharge of hazardous materials and contaminants (Section 1.3.3.6 of this biological opinion) are expected to prevent or substantially reduce the potential for construction, maintenance, and operational actions to release contaminants and hazardous materials into waterways. For example: equipment will be checked daily to ensure proper operation and avoid any leaks or spills; spill prevention and containment measures will be in place; construction materials will be properly stored, treated, and disposed of; and stormwater management plans will be in place for all components of the ADP. These measures are expected to prevent the discharge of hazardous materials into receiving waters. Thus, the potential for steelhead critical habitat PBFs to be impaired or steelhead to be exposed to ADP-related hazardous materials or contaminants is considered to be negligible.

2.5.6 Aquatic Non-native Species Introductions

Imported water releases into the Coyote Creek watershed are ongoing during FOCP, and will occur during ADSRP and post-ADSRP. Imported water released to Coyote Creek may carry larval phases or juveniles of aquatic non-native species (BA Section 6.2.4). As described in the BA (Section 5.3.11.1), a variety of non-native fish species have occurred in Anderson Reservoir and the FCWMZ, including competitors and predators of steelhead. Imported water is typically warm relative to waters of Coyote Creek, which exacerbates existing impairments to critical habitat PBFs associated with warm, slow moving water conditions in various locations of Coyote Creek downstream of Anderson Dam, which favor aquatic non-native species (e.g., Ogier Ponds, Coyote Percolation Dam). Aquatic non-native species have been documented to prey on steelhead, and to compete for habitat and food resources (Carey et al. 2011, Thompson et al. 2012).

During FOCP drawdown of Anderson Reservoir, migratory rates of non-native species from Anderson Reservoir to the FCWMZ potentially increased as a result of reduced reservoir volume and increased flows from the reservoir during drawdown. As described in the BA (Section 5.3.11.1), a variety of non-native fish species have occurred in Anderson Reservoir and the FCWMZ, including competitors and predators of steelhead.

A fyke trap was deployed at the outlet of Anderson Dam during late September through late November 2020 to monitor the movement of fish from Anderson Reservoir to the FCWMZ during FOCP reservoir draining. The fyke trap captured substantial numbers of largemouth bass, black crappie, bluegill, common carp, threadfin shad, and inland silversides leaving Anderson Reservoir (BA, Section 5.3.11.2). It is likely that juvenile steelhead mortality increased from higher predation rates during the reservoir drawdown, although no observations exist and no quantitative estimates can be determined. During the spring 2021 sampling effort few individual non-native species were captured.

After ADTP construction, wet weather flow releases will be higher than the capacity of the existing outlet. As detailed in the BA (Section 3.5.2.1 - FOCP Action Flow Releases). This could result in increased entrainment/migration of non-native species from Anderson Reservoir into the FCWMZ. Increased water temperatures in the FCWMZ (BA, Section 6.2.3) for five summers prior to chiller operation may favor conditions for non-native species rearing and spawning (BA, Section 5.3.11.2).

To help address the potential effects of non-native species on steelhead in Coyote Creek, Valley Water has developed and is implementing an Invasive Species Monitoring and Control Plan (BA, Section 3.7.6.5) during FOCP and will continue during ADSRP. This effort removes and sacrifices non-native species within the FCWMZ during ADP-related construction and monitoring activities. Targeted control methods are also occurring at Coyote Percolation Pond. Target species include non-native fish, crayfish (*Cambaridae*), American bullfrog, and red-eared sliders, as well as opportunistic removal of other non-native species. The non-native fish species that pose the most significant risk to native fish and wildlife are the predatory largemouth bass, spotted bass (*Micropterus punctulatus*), green sunfish (*Lepomis cyanellus*), bluegill (*Lepomis macrochirus*), crappie (*Poxomis spp*.) and catfish (*Ictalurus and Ameiurus spp.*) species. Methods include electrofishing, seine nets, dipnets, traps, and hand capture. Measures to capture and dispatch non-native aquatic species will include humane euthanasia and removal of carcasses. Additionally, decontamination protocols are being implemented to prevent the spread of amphibian chytrid fungus (*Batrachochytrium dendrobatidis*), ranavirus, other pathogens, and non-native species.

Valley Water is also conducting a study on the removal of non-native fish from Anderson Reservoir. This effort involves the removal of non-native fish from the deadpool of Anderson Reservoir, which last occurred in 2022 and 2023 during FOCP. This likely reduced the number of non-native fish within the deadpool area that have the potential to migrate to the FCWMZ, and potentially reduced impacts to juvenile steelhead.

It is likely that steelhead mortality, behavioral changes, and reduced migration success have occurred during FOCP and will continue to occur during ADSRP and post-ADSRP due to predation from imported water releases. The amount of steelhead injury or mortality that may occur during FOCP, ADSRP, and post-ADSRP from imported water releases and degraded steelhead critical habitat PBFs that favor aquatic non-native species cannot be accurately quantified as a specific number of steelhead individuals because the distribution of effects will occur over a large area and will vary widely depending on local habitat conditions. Moreover, the distribution and abundance of fish that may occur within the action area will be inconsistent over time, affected by habitat quality, interactions with other species, and other influences that cannot be precisely determined by observation or modeling. The best available indicator of steelhead injury or mortality from increased aquatic non-native species predation resulting from imported water releases during ADP will be a surrogate reflecting the implementation of the Invasive Species Monitoring and Control Plan that will occur. Implementation of the Invasive Species Monitoring and Control Plan will serve as the surrogate for watershed health as it directly affects the abundance of aquatic non-native species in the action area, and will function as a meaningful reinitiation trigger because it can be tracked in real time.

2.5.7 Streambank, Channel, and Riparian Habitat

The ADP will affect streambank, channel, and riparian habitat, and steelhead through removal of riparian vegetation, construction of flood protection structures, and implementation of habitat enhancement projects and studies.

2.5.7.1 Temporary and Recurring Removal of Emergent and Riparian Vegetation

ADP construction and maintenance actions will result in temporary and recurring impacts to freshwater critical habitat PBFs through reductions in riparian and emergent vegetation within the freshwater portions of Coyote Creek, including trimming and tree removal necessary for construction access, staging, and facility maintenance. Reductions in riparian and emergent vegetation will occur during the following ADP components: Phase 1 and Phase 2 Coyote Percolation Dam construction and operations; North and South Channel construction below

Anderson Dam; Maintenance of the North Channel Extension; Ogier Ponds CM construction and maintenance; and construction activities associated with the removal and rebuilding of the Anderson Dam structure.

Riparian vegetation provides cover and habitat complexity required by migrating and rearing steelhead through the action area. Riparian zones and emergent wetland/aquatic vegetation serve important functions in stream ecosystems such as providing shade (Poole and Berman 2001), sediment storage and filtering (Cooper et al. 1987, Mitsch and Gosselink 2000), nutrient inputs (Murphy and Meehan 1991), water quality improvements (Mitsch and Gosselink 2000), channel and streambank stability (Platts 1991), source of woody debris that creates fish habitat diversity (Bryant 1983, Lisle 1986, Shirvell 1990), and both cover and shelter for fish (Bustard and Narver 1975, Wesche et al. 1987, Murphy and Meehan 1991). Riparian vegetation helps maintain stream habitat conditions necessary for salmonid growth, survival, and reproduction by providing shade and cover, sediment storage and filtering, nutrient inputs, sources of woody debris, and habitat complexity and cover. Riparian vegetation disturbance and removal can degrade these ecosystem functions and impair stream habitat, increasing stream exposure to solar radiation, and leading to increases in stream temperatures (Poole and Berman 2001). The temporary and recurring reductions in riparian and emergent vegetation within the freshwater portions of Coyote Creek have the potential to affect all freshwater life stages of CCC steelhead and freshwater critical habitat PBFs in the form of permanent and temporary reductions in shade and cover for fish, that may contribute to habitat diversity and complexity, and may result in increased stream temperatures.

The ADP includes measures to minimize impacts to emergent and riparian vegetation, such as BMPs, replanting, and monitoring (BA Appendix X). For larger areas of vegetation removal (North Channel Extension), revegetation plans containing details on planting in the channel banks and riparian zone, as well as the installation of habitat improvement features, will be prepared and provided to resource agencies (including NMFS) for review prior to implementation. BMPs are designed to minimize local erosion increases from in-channel vegetation removal, and are also expected to minimize degradation of water quality, including sediment discharge. These measures will reduce the effects of vegetation trimming; however, the services provided by vegetation will remain degraded at each project site until new vegetation is replanted and becomes established. When considering complete removal of trees, we expect riparian vegetation attributes on-site will return to pre-project levels after native trees are replanted and established. Considering the BMPs and vegetation growth rates, we expect conditions to return to pre-trimming conditions within approximately 5-10 years. Because of the timing and establishment of the on-site revegetation and recruitment of new woody debris, loss of riparian vegetation may cause individual steelhead to seek alternative areas for cover and forage. Such temporary displacement of steelhead is not expected to reduce their individual performance because there are sites nearby that provide these features and can accommodate additional individuals without becoming overcrowded. Vegetation removal will occur in localized areas, and steelhead will be able to access large areas of Coyote Creek that will be available for refuge, rearing, and foraging. However, a number of individuals could remain in the area directly adjacent to areas where vegetation is either temporarily or permanently impacted. For individuals that choose to stay in the area, the impacts to critical habitat PBFs associated with reduced shade, cover, and other vegetative services (i.e. sediment storage and filtering, nutrient input, etc.) from removal of riparian vegetation is not expected to significantly reduce their performance because areas of adequate habitat will persist in adjacent reaches of Coyote Creek. Thus, we do not expect steelhead to experience reduced fitness, injury, or mortality as a result of temporary or recurring vegetation removal as part of the ADP.

In addition to the expected impacts to emergent and riparian vegetation, the ADP includes actions that will enhance emergent and riparian vegetation conditions (see 'Habitat Enhancement' below).

2.5.7.2 Flood Protection

The portions of the Coyote Creek Flood Protection Project implemented during FOCP (construction during June 2023 to October 2024) resulted in approximately 8,654 linear feet of floodwalls placed within developed urban and suburban portions of the Coyote Creek floodplain between Highway 280 and Oakland Road.

By placing flood walls within the developed floodplain of Coyote Creek, the Coyote Creek Flood Protection Project portion of the FOCP (i.e., a subcomponent of the ADP) will contribute to the perpetuation of conditions in Coyote Creek that prevent lateral channel migration. Projects that prevent lateral channel migration force streams into a simplified linear configuration without the ability to move laterally, which consequently results in streams eroding and deepening vertically (Leopold 1968; Dunne and Leopold 1978). The resulting simplified stream reaches typically produce limited macroinvertebrate prey and poor functional habitat for rearing juvenile salmonids (Florsheim et al. 2008), typically fail to establish and sustain functioning floodplain, riparian, and aquatic habitats, and may disrupt the connectivity of groundwater and stream flow. Because such structures are typically designed to withstand high streamflows caused by large storms, the structure, and by extension the impacts to instream habitat, are in effect everlasting, harming future salmonid generations in the affected reach well into the future. Impacts will be seen both upstream and downstream of the hardened bank structures (Florsheim et al. 2008) due to natural erosive processes resulting in the need for additional stabilization in the future. Effects to steelhead and critical habitat PBFs will include: impaired aquatic and riparian habitats; disrupted floodplain connectivity of groundwater and stream flow; hindered functioning of floodplain and riparian habitats; limited macroinvertebrate prey and reduced foraging; and reduced spawning substrate (Spence et al. 1996). Steelhead exposed to habitat impairments related to streambank stabilization will experience injury, reduced fitness, and mortality.

The amount of harm, injury, or mortality to steelhead that may result from the Coyote Creek Flood Protection Project portion of the FOCP is expected to be low due to its placement within developed portions of the Coyote Creek, but cannot be accurately quantified as a specific number of CCC steelhead individuals that may be harmed, injured, or killed due to the difficulties of counting the precise number of CCC steelhead, including: 1) some life-stages of steelhead are relatively small (especially as eggs, alevins, and juveniles); 2) these species live in aquatic environments where visibility is often low, hiding cover is often available, and predators feed; and 3) we cannot precisely predict where and when habitat impacts may affect these species later in their life cycles. Additionally, individual fish behavior, and how that behavior adapts to evolving habitat conditions, will influence how many fish will be harmed and to what degree. The best available indicator of harm, injury, or mortality to listed steelhead is reflected in the linear feet of flood protection infrastructure installed. Although the surrogate is somewhat coextensive with the action, it nevertheless functions as a meaningful surrogate for the extent of steelhead harm, injury, or mortality because this measure correlates with the level of habitat impact assumed in this opinion. Linear feet will function as a meaningful reinitiation trigger because it can be tracked in real time.

It is expected that the flood protection components will maintain their structure and function as described in this opinion. Therefore, the linear feet of flood protection infrastructure will be used as a habitat surrogate to quantify the amount of harm, injury, or mortality to CCC steelhead as a result of the ADP's flood protection infrastructure activities. The total distance of flood protection infrastructure is approximately 8,654 linear feet of floodwalls placed within developed urban and suburban portions of the Coyote Creek floodplain between Highway 280 and Oakland Road.

2.5.7.3 Habitat Enhancement

The ADP includes habitat enhancement actions aimed to improve critical habitat conditions for steelhead, including the Ogier Ponds CM, Live Oak Restoration, Sediment Augmentation, Geomorphic Flows, and Restoration Study. The ADP also includes actions that will enhance emergent and riparian vegetation conditions.

2.5.7.3.1 Ogier Ponds

The Ogier Ponds Conservation Measure (CM) of ADP aims to restore and enhance steelhead habitat by separating the existing hydraulic connection between Coyote Creek and the Ogier Ponds, returning the creek to its pre-1997 channel, and adding ecological enhancements to the channel and floodplain. Based on conceptual designs for the Ogier Pond CM, it is expected that the Ogier Ponds CM will restore approximately 6,500 linear feet of channel, and create over 20,000 square feet of spawning habitat area, 67,000 square feet of juvenile rearing habitat enhanced with increased habitat complexity, and 33,000 square feet of shallow water for fry rearing in inundated margin habitat at typical 30 cfs spring and summer flows.

Effects to steelhead and freshwater critical habitat PBFs during construction of Ogier Ponds CM include dewatering, steelhead rescue and relocation, clearing/grubbing, channel excavation and grading, filling of ponds, planting of native species and vegetation establishment activities, installation of bio-engineered slope protection, placement of rootwads and similar material in the channel. Effects on steelhead from dewatering and rescue and relocation are considered above, and expected to result in no more than 3 percent juvenile steelhead mortality.

Upon completion of construction, the Ogier Ponds CM will result in long-term enhancement of freshwater critical habitat PBFs. Under existing conditions, surface water exposure to solar radiation and ambient air temperatures as surface waters pass through the exposed, slow moving ponded reach increases water temperature by 6 to 8 degrees Celsius during warm months (ESA 2023). Disconnecting the creek from the ponds will reduce water temperatures in the restored creek channel and downstream, with the greatest improvement when flows are less than 50 cfs. The expected temperatures of Coyote Creek water downstream of the ponds will decrease post-construction to temperatures similar to the temperatures occurring upstream of the ponds. The reduction in creek water temperatures will benefit steelhead by providing more suitable rearing habitat in both this 6,000-ft-long reach and downstream portions of Coyote Creek.

The ecological enhancements added to the new channel and floodplain are also expected to provide benefits to all life stages of steelhead and freshwater critical habitat PBFs. Native vegetation will be planted along the floodplain to create riparian habitat and large woody debris and boulder structures will be included within the channel and floodplain to create a diverse fish habitat and high-flow refugia while maintaining design flow capacity. For steelhead passage during dry conditions, a low-flow channel designed to convey flows within Coyote Creek downstream of Anderson Dam will be incorporated. The low-flow channel substrate will be appropriate for steelhead, consisting of a mixture of sand, gravel, and boulders. A drainage structure equipped with fish screens will be constructed to release flows from Pond 4 to the creek downstream of the restoration reach, which is an avoidance measure to prevent aquatic non-native species from entering Coyote Creek. Monitoring will be conducted to track progress of the Ogier Ponds CM. Monthly inspections will be conducted to monitor water quality within the adjacent ponds. Solar powered floating aerators will be installed to maintain or improve dissolved oxygen levels. Other water quality best management practices may also be used, if water quality monitoring results indicate that they are necessary. A scale as-built map (basemap) of the restoration will be created to document fry, juvenile, and spawning suitable habitat, and updated annually with habitat and flow monitoring results to determine the success of the project at achieving restoration objectives and to inform maintenance.

Based on the above, low levels of steelhead injury and mortality are anticipated during construction of the Ogier Ponds CM, and channel and bank habitat will be disturbed and altered, temporarily impacting freshwater critical habitat PBFs. Post-construction, the separation of Ogier Ponds from Coyote Creek and habitat enhancements included are expected to provide benefits to all life stages of steelhead and migratory, spawning, rearing, critical habitat PBFs.

2.5.7.3.2 Live Oak Restoration

The Live Oak Restoration project will be located in Coyote Creek approximately 2,500 feet downstream of Anderson Dam in an important spawning and rearing location for steelhead. The Live Oak Restoration is expected to enhance over 2,800 feet of channel; creating over 20,000 square feet of spawning habitat, over 65,000 square feet of suitable juvenile rearing habitat, and over 20,000 square feet of shallow water fry rearing habitat in inundated stream margin areas at typical spring and summer flows (approximately 30 cfs). Major activities will include channel contouring, sediment augmentation, and gravel, boulder, and large woody debris placement. The Live Oak Restoration actions will also enhance emergent and riparian vegetation, place large woody debris, and establish and maintain gravel benches within this reach. These habitat enhancements will improve freshwater critical habitat PBFs by increasing steelhead spawning habitat, high-flow floodplain habitat, and habitat complexity.

Effects to steelhead and critical habitat PBFs during construction (FOCP and ADSRP) of Live Oak Restoration include dewatering, steelhead rescue and relocation, clearing/grubbing, channel excavation and grading, planting of native species and vegetation establishment activities, placement of rootwads, gravel, and similar material in the channel. Effects on steelhead from dewatering and rescue and relocation are considered above, and expected to result in no more than 3 percent juvenile steelhead mortality.

Following construction, long-term effectiveness monitoring will inform site maintenance and, if needed, adaptive management (Section 1.3.4.4.2). During each monitoring event suitable fry, juvenile, and spawning habitat will be mapped on the basemap of the reach. Based on the above, during construction of the Live Oak Restoration site, low levels of steelhead injury and mortality are anticipated, and freshwater critical habitat PBFs will be temporarily disturbed. Post-construction, the Live Oak Restoration is expected to provide benefits for steelhead during spawning, egg incubation, alevin, and juvenile rearing life stages and spawning and rearing freshwater critical habitat PBFs.

2.5.7.3.3 Sediment Augmentation

Sediment augmentation activities will be implemented to improve spawning and rearing critical habitat PBFs by enhancing spawning gravels in appropriate Coyote Creek areas downstream of Anderson Dam, with a focus on opportunities for restoration within the FCWMZ. During sediment augmentation activities, new spawning gravel will be placed directly into the wetted channel to provide for immediate spawning habitat. Additional sediment augmentation will occur within the Live Oak restoration area and the Ogier Ponds conservation measure area. Gravel composition, volume, and placement frequency will be determined to mimic and partially restore natural course sediment transport processes in Coyote Creek.

Gravel and cobble are essential for steelhead spawning substrate, and are important physical building blocks for the channel and habitat features as well as important for macroinvertebrate and fish productivity. Sediment, including gravel and cobble, plays a critical role in the physical and biological health of an anadromous salmonid stream. Sediment size is important in determining channel form and changes in sediment size distribution may induce channel changes (Kondolf 1997). Coarse sediment (i.e., gravel and cobble) has a tremendous ecological importance as habitat for benthic macroinvertebrates and as spawning habitat for salmonids. Gravel and cobble create interstitial spaces in the streambed that serve as cover and velocity refugia for small fish, and support through-sediment water flow which helps maintain oxygenation and cool water temperatures. The loss of sediment can reduce or eliminate hyporheic exchange, and the mixing between groundwater and surface water may be too short to significantly affect temperature (Beechie et al. 2012).

Suspended sediment placement activities have the potential to temporarily increase SSC in Coyote Creek. However, placement events will be infrequent and BMPs to avoid and minimize effects to steelhead and critical habitat will be implemented, including working within the in-water work period (June 15 - October 15), monitoring water quality, and placement of sediment outside of the wetted channel. With the implementation of these BMPs, effects to steelhead and critical habitat resulting from sediment placement events are expected to be infrequent, localized, and of short duration (likely several hours or less). Steelhead exposed to these elevated SSC would be expected to access suitable habitat in adjacent or nearby reaches, and any effects to steelhead and critical habitat resulting from placement events would be expected to be minimal (see Suspended Sediment Concentration and Sediment Deposition, above). Additionally, the transport and deposition of coarse sediment is predicted to increase spawning habitat and support inundation of channel margin habitat, resulting in benefits to steelhead spawning, egg incubation, alevins, and rearing juveniles, and improvements to spawning and rearing critical habitat PBFs.

2.5.7.3.4 Geomorphic Flows

Implementation of the Geomorphic Flows Plan (BA Section 3.6.3.3) is expected to support spawning gravel maintenance, channel formation, and long-term maintenance of healthy riparian habitat. Through implementation of the Geomorphic Flows Plan, Valley Water will provide periodic high flows sufficient to establish and maintain diverse habitat in Coyote Creek downstream of Anderson Dam. As described in the principles of high flow function in the California Environmental Flows Framework (CEFWG 2021), periodic high flows support habitat creation and maintenance by scouring substrate, mobilizing gravel, and supporting channel migration. Additionally, infrequent high flows sufficient to scour sediment, erode banks, scour vegetation, and result in channel migration in localized areas maintain and increase habitat complexity, reduce non-native invasive species, improve spawning gravel quality (Kiernan et al. 2012), and increase BMI production benefiting steelhead spawning and rearing and increase the productivity of the population (Cross et al. 2011). By providing geomorphic flows the ADP will provide and maintain habitat used by all life stages of steelhead in Coyote Creek, and will support the maintenance of spawning and rearing critical habitat PBFs.

2.5.7.3.5 Restoration Study

Following the Ogier Ponds restoration described above and implementation of post-construction operations, a geomorphic and habitat evaluation of Coyote Creek from Ogier Ponds to Metcalf Road (Restoration Study) will be conducted to describe channel conditions and habitat suitability for steelhead (Section 1.3.3.4.4). The Restoration Study will include a detailed evaluation of the condition of channel confinement, channel incision, floodplain condition, spawning gravel quality and deposition, water temperatures, flows, and passage within the reach. Valley Water will assess feasibility of various habitat restoration opportunities in this reach that would be expected to benefit steelhead and critical habitat, including increasing channel width, increasing access to off-channel or side channel habitat, increasing spawning gravel deposition and quality, and assessing passage challenges for steelhead in this reach. Valley Water will also include up to three key locations where conceptual designs for future restoration projects will be considered as habitat restoration opportunities by other Valley Water programs. This evaluation will occur as part of the AMP (Section 1.3.4.2) following completion of Ogier Ponds, and NMFS will be included in the design process. If habitat restoration actions will occur that are based on the results of the Restoration Study, then it can be expected that those actions would result in benefits to steelhead through restoration and/or enhancement of critical habitat PBFs.

2.5.8 Steelhead Passage and Migration

In addition to altered hydrology discussed above, ADP actions that will affect steelhead passage and migration include the Ogier Ponds Conservation Measure, Coyote Percolation Dam, and the replacement of Anderson Dam.

2.5.8.1 Coyote Percolation Dam

As described in the Project Description (Section 1.3.1.2), the Coyote Percolation Dam is a channel-spanning, on-channel percolation dam consisting of an energy dissipation structure, inflatable dam, fish ladder, fishway, operable control structures, and the associated on-channel impoundment (pond).

Such facilities have the potential to impair fish migration and rearing by altering the physical and ecological conditions, including the following: the energy dissipation structure and inflatable dam create physical barriers; operable flow control structures can alter flows important for steelhead upstream and downstream migration cues and channel navigation; physical and operable components can cause flow conditions that may result in injury to migrating fish; and creation of pond conditions that may increase predation on juvenile steelhead (Stillwater 2023, HDR 2016). As such, an on-channel facility such as the Coyote Percolation Dam has the potential to impair adult and juvenile steelhead migration and juvenile rearing. Further, considering the location of this facility within the watershed - downstream of the majority of Coyote Creek's mainstem available primary spawning and rearing habitat, impairment of steelhead migration at this facility could have the potential to result in impacts to the Coyote Creek CCC steelhead population.

Valley Water has begun a phased approach to improve the Coyote Percolation Dam for steelhead. This phased approach includes the Coyote Percolation Dam Phase 1 Project (fish ladder improvements, and construction of a partial fishway) that was implemented during FOCP. Phase 1 modifications to the Coyote Percolation Dam will improve flexibility in flow operations and fish passage during the FOCP and improve upstream and downstream anadromous salmonid passage where possible. The Coyote Percolation Dam Phase 2 Project, which will be constructed during ADSRP, will further improve passage conditions at the facility, including: additional improvements to the fish ladder, right bank fishway roughened channel completion, alterations to provide adequate flow depth and velocity across the apron and deflated bladder dam; and the post-ADSRP operations of the Coyote Percolation Dam included in the ADP (see Project Description, Section 1.3.2).

Biological monitoring, fish relocation, and invasive species management will occur during construction, including the drawdown of Coyote Creek. Work will occur between June 15 and October 15 to minimize injury or mortality to steelhead rearing juveniles. It is expected that steelhead in Coyote Creek will be utilizing higher quality rearing habitat further upstream in FCWMZ, which is expected to be available to steelhead juveniles during Phase 1 and 2 construction activities.

Although Phase 1 upgrades to the Coyote Percolation Dam completed during FOCP will benefit steelhead passage, they will not support steelhead migration across the full range of flows under which steelhead are expected to be migrating in Coyote Creek.

As described in Section 1.3 Proposed Federal Action, Phase 2 of the Coyote Percolation Dam modifications will further improve fish passage through the facility to meet NOAA Fisheries West Coast Region Anadromous Salmonid Passage Design Manual guidelines (NMFS 2022) and will be completed during ADSRP and operated during ADSRP and Post-ADSRP.

Upon completion of Phase 2 improvements, Valley Water will operate the Coyote Percolation Dam and release flows from Anderson Dam to support fish passage through the Coyote Percolation Dam facility. When the bladder dam is inflated, Valley Water will release flows from Anderson Dam that will maintain a minimum bypass flow rate of 7.5 cfs at Coyote Percolation Dam, and a minimum of 2.5 cfs at streamflow station 5058 (Coyote Creek at Edenvale; located 4.5 miles downstream of the Coyote Percolation Dam). This flow measure will be implemented by Valley Water year-round to ensure upstream and downstream passage conditions at the fish ladder are sufficient for all life stages of steelhead when the bladder dam is inflated.[16] Upstream fish passage through the Coyote Creek Percolation Dam Facility will generally be provided at flows between 2.5 cfs and 320 cfs. The bladder dam will remain raised throughout the year to provide groundwater recharge, except during high instream flows greater than 275 cfs when the bladder dam is deflated. When the bladder dam is deflated, upstream passage will be provided through the roughened channel. Additional operation flexibilities are expected to benefit steelhead passage, such as the use of the new bypass overshot weir to release flows between October 16 through June 14 (above 25 cfs and less than 275 cfs). Valley Water will have the capacity to maintain the minimum required flows (per the LSAA) to Coyote Creek during summer periods (June 15 through October 15) outside of the steelhead migration season to allow for inspection and maintenance activities. Adaptive management may include modification of the Coyote Percolation Dam Phase 2 Operations plan, which will be based on steelhead outmigration studies (described below).

Maintenance activities at the Coyote Percolation Dam will include periodic removal of accumulated sediment from the facility and pond, vegetation management, and repair of the roughened channel. Similarly, vegetation maintenance would be implemented to remove and/or trim non-native plants that compete with native plants and/or impair channel capacity. The roughened channel maintenance will include replacement of roughness elements and/or repair in-channel bioengineered habitat enhancements (e.g., rootwads, stream barbs, overhanging banks), and rock slope protection will be replaced as needed to maintain channel function and maintain fish passage conditions. These maintenance activities are expected to result in temporary habitat disturbance, and habitat conditions are expected to return to similar or improved conditions after maintenance activities are completed.

Together, these structural and operational improvements will be designed to provide conditions that meet NOAA Fisheries West Coast Region Anadromous Salmonid Passage Design Manual guidelines (NMFS 2022) and are expected to provide safe, timely, and effective uninterrupted upstream and downstream fish passage through the facility. Additionally, because fish passage through structurally and operationally complex facilities such as the Coyote Percolation Dam can be challenging even with well-designed facilities, Valley Water has included monitoring and adaptive management actions in the ADP that apply to this facility. Monitoring and adaptive management of the Coyote Percolation Dam will further ensure that the facility meets NOAA Fisheries West Coast Region Anadromous Salmonid Passage Design Manual guidelines (NMFS 2022) and provides uninterrupted safe, timely, and effective upstream and downstream fish passage through the dam.

[16] Valley Water will also implement this flow regime in compliance with their California Department of Fish and Wildlife (CDFW) Lake and Streambed Alteration Agreement (LSAA) for the Coyote Percolation Dam (1600-2009-0411-R3).

Upon completion of the Coyote Percolation Dam Phase 2 construction activities, degraded critical habitat PBFs in the pond when the dam is raised are likely to result in predation on steelhead juveniles by non-native aquatic species because, as described above, large areas with warm, slow moving water (e.g., impoundments upstream of dams) result in conditions favorable for non-native aquatic species. Predation in the pond will likely result in mortality of juvenile steelhead. The amount of steelhead injury or mortality that may occur from the pond upstream of the Coyote Percolation Dam during ADSRP and post-ADSRP cannot be accurately quantified as a specific number of steelhead individuals because the distribution of effects will occur over a large area and will vary widely depending on local habitat conditions. Moreover, the distribution and abundance of fish that may occur within the action area will be inconsistent over time, affected by habitat quality, interactions with other species, and other influences that cannot be precisely determined by observation or modeling. The best available indicator of injury or mortality from the formation of the pond upstream of the Coyote Percolation Dam on juvenile steelhead will be a habitat surrogate reflecting the operational management of the Coyote Percolation Dam. When the bladder dam is deflated at flows greater than 275 cfs, some flushing of non-natives downstream is expected to occur. Valley Water's action of deflating the dam at flows greater than 275 cfs will serve as the habitat surrogate as it directly affects habitat conditions, and will function as a meaningful reinitiation trigger because it can be tracked in real time.

Draining of the Coyote Percolation Pond is included in the Anderson Dam Program (ADP) as an adaptive management action that may be implemented if monitoring and other adaptive management considerations indicate the need for this action to be implemented. If the draining is deemed practicable (given water supply demands) and appropriate in terms of habitat management to protect steelhead and other listed and sensitive aquatic and riparian species, then Valley Water will conduct seasonal draining (February 1 through April 30). Draining the pond is expected to reduce predators of steelhead (e.g., bass) within the Coyote Percolation Pond that utilize warm-water pond habitat, which will significantly improve rearing and passage conditions for juvenile steelhead.

Passage monitoring will be conducted at the Coyote Percolation Dam that will focus on three key areas, including: predation (piscivorous avian and aquatic species); out-migration success and passage conditions under a variety of stream conditions; and periodic percolation pond draining evaluated from an ecological and water supply standpoint (Section 1.3.4.4). The findings of these studies will be used by Valley Water, in coordination with the AMT, to determine if adaptive management actions are needed at the Coyote Percolation Dam to improve the facility and its operations so that it meets NMFS' fish passage guidelines and provides safe, timely, and effective passage of steelhead. If the Coyote Percolation Dam is found to not provide safe, timely, and effective steelhead passage, Valley Water will, within 5 years after completion of the construction phase of the Coyote Percolation Dam Phase 2 Project, provide a preliminary summary report to the AMT to inform the development and implementation of adaptive management measures that will be implemented at the Coyote Percolation Dam to ensure that safe, timely, and effective steelhead passage is provided at the facility (see Section 1.3.3.4 Adaptive Management Program). The 5-year timeframe will allow a sufficient amount of time for passage to be evaluated during a variety of flow conditions, and impacts associated with predation to be developed during a period that is reflective of long-term Post-ADSRP operations.

2.5.8.2 Anderson Dam Barrier to Fish Passage

Coyote and Anderson reservoirs, constructed in 1936 and 1950, respectively are complete passage barriers that collectively block access to roughly 56 percent (approximately 200 square miles) of the Coyote Creek watershed historically accessible to CCC steelhead (NMFS 2016). The replacement of Anderson Dam will continue to maintain an impassable barrier to upstream migration. By removing and reinstalling Anderson Dam, the ADP will perpetuate this effect into the future.

NMFS (2016) predicts that above reservoir reaches are important for the support of a robust steelhead population within the Coyote Creek system (Spence et al. 2008; Spence et al. 2012), and the habitat and function of these above reservoir reaches cannot be effectively replaced through enhancement of downstream reaches due to natural differences in gradient and hydrology between the below- and above-reservoir reaches and the effects of anthropogenic landscape alteration (e.g., urbanization and floodplain development) within the below-reservoir reaches. To address these effects Valley Water has included in the ADP, conservation measures downstream of the dam and above-reservoir reintroduction of steelhead as an adaptive management action.

ADP conservation measures planned for implementation downstream of Anderson Dam are expected to improve downstream conditions compared to existing conditions and contribute to the conservation of CCC steelhead in Coyote Creek watershed (see Section 1.3.3). However, it remains uncertain if the improvements to downstream habitat will be adequate to compensate for the full range of impacts resulting from ADSRP construction and post-construction reservoir operations, including those related to the prevention of access to above-reservoir habitat. It is also uncertain if the habitat downstream of Anderson Dam will be sufficient to support long-term persistence of a viable steelhead population. To address this uncertainty, Valley Water has included above-reservoir reintroduction as a Phase 2 AMP action (Section 1.3.4.2); specifically, reintroduction of steelhead above Anderson Dam (i.e., restoring anadromous steelhead to reaches of Coyote Creek upstream of Anderson Reservoir) through trap and truck operations that would be pursued as an AMP action if the AMT determines that the following restoration objective has not been met:

> Restore and maintain a healthy steelhead trout and salmon population in Coyote Creek watershed, by providing: (A) approximately five miles of spawning and rearing habitat below Anderson Dam and in Upper Penitencia Creek; and (B) adequate passage for adult steelhead trout and salmon to reach suitable spawning and rearing habitat, and for out-migration of juveniles.

Restoring and maintaining a healthy steelhead population in Coyote Creek is important to support conservation and recovery of the CCC steelhead DPS. Accomplishment of components (A) and (B) of this AMP objective are expected to restore and maintain a healthy steelhead population in Coyote Creek by providing habitat for all steelhead life stages, creating passage opportunities, maintaining suitable temperatures, and restoring habitat to improve conditions for steelhead downstream of Anderson Dam. The AMP includes Phase 2 measures that would be implemented, in coordination with the AMT, if the AMP objective does not occur.

This AMP objective supports the recovery of CCC steelhead in Coyote Creek through the ADP because Valley Water will ensure components (A) and (B) will occur within the downstream reach that are designed to contribute to a healthy steelhead population in Coyote Creek or, if these conditions do not occur, then additional measures (AMP Phase 2 measures) will be implemented to provide spawning habitat, rearing habitat, and passage conditions that align with components (A) and (b) to contribute to the restoration and maintenance of a healthy steelhead population in Coyote Creek. A Phase 2 measure included in the AMP that may be implemented by Valley Water includes reintroduction through trap and truck operations that may be implemented. Reintroduction of anadromous steelhead to above-reservoir reaches of Coyote Creek is a recovery action included in the 2016 CCC Steelhead Recovery Plan (Action Step CoC-CCS-5.1.1.3, NMFS 2016). Reintroduction of anadromous steelhead to above-reservoir reaches of Coyote Creek is expected to contribute to the restoration and maintenance of a healthy steelhead population in Coyote Creek because suitable habitat and *O. mykiss* persist within significant portions of the above-reservoir Coyote Creek watershed (Leidy et al. 2005, HDR 2016, NMFS 2020, Stillwater Sciences 2023). Anthropogenic habitat alteration within these reaches remains limited, so they could again potentially provide important habitat for an anadromous steelhead population if steelhead passage past Anderson and Coyote dams is restored (NMFS 2016).

NMFS (2020) identified multiple year classes of *O. mykiss* within above-reservoir reaches of Coyote Creek, suggesting successful reproduction of *O. mykiss* within these reaches. Use of Anderson Reservoir by above-reservoir *O. mykiss* (NMFS 2020, and Valley Water's ongoing fyke trapping) may suggest the persistence of anadromous behavior within the above-reservoir *O. mykiss* population. Additionally, reintroduction has become a common approach for the conservation of anadromous salmonids on the west coast of North America (Anderson et al. 2014; McClure et al. 2018; Kock et al. 2021) and Valley Water has begun looking into the potential feasibility of above-reservoir reintroduction within the Coyote Creek watershed and has identified potential feasibility and potential ecological benefits to the Coyote Creek steelhead population (HDR 2016; Stillwater Sciences 2023).

In addition to the benefits associated with reintroduction programs, such programs also carry risks and uncertainties that must be assessed in the studies before a reintroduction adaptive management measure can be implemented (McClure et al. 2018). Given the complexities of above-reservoir reintroduction, studies must be performed prior to implementation to determine if reintroduction is feasible and if so, how it may be best implemented, monitored, and adaptively managed. In support of long-term planning for potential implementation of this adaptive management measure, Valley Water has begun assessing the potential feasibility of above-reservoir reintroduction (HDR 2016; Stillwater Sciences 2023). In addition to the fish and habitat conditions mentioned above, these preliminary planning efforts have identified preferred methods for reintroduction above Anderson Dam (e.g., fish trap and haul as opposed to volitional reintroduction), and have identified the importance of monitoring and addressing considerations of implementing reintroduction programs with small source populations (e.g., potential for trap and transport of fish from small populations to inadvertently decrease the condition of the source population). Additionally, Valley Water has included a process for monitoring-informed implementation of the above-reservoir steelhead reintroduction AMP measure.

Considering the above, the implementation of above-reservoir reintroduction of steelhead in the Coyote Creek watershed is considered to be reasonably certain to occur if the aforementioned AMP management objective has not been met and implementation is deemed feasible by the AMT.

If above-reservoir steelhead reintroduction does occur, NMFS expects that a small number of steelhead will be injured or killed during trap and truck operations. It is not possible to determine the exact number of individuals that would be injured or killed because the trap and truck operations will occur long after the completion of this opinion and details are not available regarding a future plan at this time. However, NMFS expects that best management practices based on the best available science would be implemented, which in turn would be effective at minimizing harm to steelhead during trap and truck operations. Based on results from past trap and truck operations, a very small proportion of steelhead captured are expected to be injured or killed during capture, transport, or release (Sutphin et al 2019; Sutphin 2025; NMFS 2024a; NMFS 2024b). We assume that the rates of injury and mortality will be the same as those associated with the ADP proposed handling, rescue, relocation, and monitoring methods that make up such programs. Thus, fish handling and relocation is not expected to exceed 2 percent of the fish handled and relocated, and monitoring and sampling is not expected to exceed 5 percent mortality.

NMFS also expects that, based on the availability of suitable steelhead habitat above Anderson Dam, implementation of an above-reservoir steelhead reintroduction program, guided by the AMT, has significant potential to increase numbers of the steelhead population in Coyote Creek, including within Coyote Creek downstream of Anderson Dam. Such a program would be expected to improve the abundance, productivity, spatial structure, and diversity of steelhead within the Coyote Creek watershed and, in this manner, would be expected to contribute to the biological viability of CCC steelhead in Coyote Creek and the conservation and recovery of CCC steelhead.

2.6. Cumulative Effects

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

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

Actions occurring outside of the action area may affect the action area. For example, modification of dams located on tributaries to Coyote Creek and their subsequent operations may affect flows in the action area. Potential non-Federal actions affecting the action area in the future could include state angling regulation changes, voluntary or state sponsored upslope habitat restoration activities, discharge of stormwater and agricultural runoff, and continued development, including building of private roads, wells, and land use change. Urban development, including rural residential and agricultural development is likely to continue throughout the action area. The primary cumulative effects will arise from those water quality and quantity impacts that occur as human population growth and development shift patterns of water and land use, thereby creating more intense pressure on streams and rivers within this geography in terms of volume, velocities, pollutants, baseflows, and peak flows.

Future state, tribal, and local government actions will likely be in the form of legislation, administrative rules, or policy initiatives. Government and private actions may include changes in land and water uses, including ownership and intensity, any of which could impact listed species or their habitat. Government actions are subject to political, legislative, and fiscal uncertainties. These realities, added to the geographic scope of the action area, which encompasses numerous government entities exercising various authorities, make any analysis of cumulative effects difficult and speculative. For more information on the various efforts being made at the local, tribal, state, and national levels to conserve CCC steelhead, see any of the recent status reviews, listing Federal Register notices, and recovery planning documents, as well as recent consultations on issuance of section 10(a)(1)(A) research permits.

Thus, non-federal activities are likely to continue affecting listed species and habitat within the action area. These cumulative effects in the action area are difficult to analyze because of this opinion's large geographic scope, the different resource authorities in the action area, the uncertainties associated with government and private actions, and the changing economies of the region. Whether these effects will increase or decrease is a matter of speculation; however, it seems likely that they will continue to increase as a general pattern over time. Although many state, tribal, and local governments have developed plans and initiatives to benefit listed fish, they must be applied and sustained in a comprehensive way before NMFS can consider them "reasonably foreseeable" in its analysis of cumulative effects.

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.

From upstream to downstream, the action area consists of the Coyote Creek watershed upstream of Anderson and Coyote dams, including tributaries to Coyote Creek, portions of Coyote Creek and its tributaries that will be inundated by water impounded by the rebuilt Anderson Dam, the portion of Coyote Creek that will be buried beneath the rebuilt Anderson Dam, the entire extent of Coyote Creek downstream of Anderson Dam, including portions of the downstream tributary watershed, Upper Penitencia Creek, accessible to steelhead, and, out to the extent of measurable effects, open water and shoreline portions of San Francisco Bay. The portions of the action area downstream of Anderson Dam, including Coyote Creek, Upper Penitencia Creek, and the open water and tidal areas of San Francisco Bay support CCC steelhead. CCC steelhead in the action area are part of the Interior San Francisco Bay CCC steelhead diversity stratum. Within this stratum and the action area, the Coyote Creek population of CCC steelhead are considered a functionally independent population and deemed essential to recovery of CCC steelhead (NMFS 2016).

The Coyote Creek watershed, adjacent tidal areas, and small 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 runoff, 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 stormwater runoff, continue to contribute to the degradation of water quality within the action area. Due to these factors and the factors listed above, the ability for CCC steelhead to occupy the action area has declined and critical habitat within the action area is degraded.

There is limited population data for CCC steelhead in the Coyote Creek watershed. What data exists includes low numbers of multiple age classes of steelhead, which indicates low levels of past spawning success in multiple years. Although the Coyote Creek steelhead population is substantially reduced from historical numbers, this steelhead population uses the action area and is likely to persist with enough resiliency to rebound from 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 conservation and recovery of this population will therefore depend upon programs that protect and restore aquatic and riparian habitats in the watershed and the continued reduction of impacts from land and water use.

Regarding cumulative effects, additional development, and accompanying infrastructure construction is expected to occur in the affected watersheds based on the general and specific plans of local communities in the Coyote Creek Watershed. Additional urban and suburban development is likely to lead to increasing water demands and groundwater pumping, which may impact stream flows if current allocations are not being fully utilized. Agricultural activities surrounding the action area are expected to continue to occur in the same capacity in the foreseeable future. The impacts of this overall land use on aquatic species also include decreased bank stability, loss of shade and cover producing riparian vegetation, increased sediment and contaminant inputs, decreased ground and surface water supply, and elevated coliform bacteria levels.

Global climate change presents another real threat to the long-term persistence of listed salmonids, including CCC steelhead, 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 larger 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.

CCC steelhead have experienced significant declines in abundance, and long-term population trends suggest a negative growth rate, although they have maintained a better distribution overall, and remain well distributed throughout their range. This suggests that, while there are significant threats to the population, they possess a resilience (based in part, on a more flexible life history) that likely slows their decline. However, the poor condition of their habitat in many areas and the compromised genetic integrity of some stocks pose a risk to the survival and recovery of the DPS. Recent status reviews (NMFS 2024) and available information indicate CCC steelhead are likely to become endangered in the foreseeable future. The action area represents a relatively small portion of the overall CCC steelhead geographic range (NMFS 2024). 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 remain highly important for the conservation and recovery of the DPS. Additionally, although the CCC steelhead population in Coyote Creek is reduced and is currently composed of low numbers of individuals, the population persists, remains in a condition that is expected to respond positively to habitat improvements, and continues to be important for the conservation and recovery of the DPS. Small populations are more vulnerable to demographic and environmental fluctuations than are larger populations (Gilpin and Soule 1986, Pimm et al. 1988), while each small population also acts as a buffer against extinction of the species. Species' relatively broad distribution throughout their ranges is a positive indicator of persistence because species with broad distributions may be better able to withstand environmental fluctuations and stochastic events as a whole (Pimm et al. 1988), even if they suffer local extirpation. Thus, despite the impairments of the Environmental Baseline, the value of the Coyote Creek watershed, and the steelhead within it, remain important for the conservation of the CCC steelhead population in Coyote Creek, and the DPS as a whole.

As described in the Effects of the Action, NMFS anticipates several proposed actions of ADP are expected to adversely affect listed CCC steelhead and their critical habitat. These effects are summarized below.

Dewatering and Steelhead Rescue and Relocation

Dewatering of portions of Coyote Creek to support construction actions, or as a result of maintaining the reservoir in a reduced storage condition, is included in all phases of the ADP. To help minimize the effects of dewatering on steelhead, the ADP includes fish rescue and relocation as a minimization measure in all phases of the ADP. Steelhead rescue and relocation is also included in the ADP as a large-scale conservation measure to reduce impacts to steelhead from poor streamflow and water temperature conditions. Steelhead rescue and relocation activities were implemented in 2020 and 2021, and additional steelhead rescue and relocation activities may occur in the future during the remainder of FOCP construction, during ADSRP construction, and, if needed, during post-ADSRP operations as an adaptive management measure post-ADSRP.

Rescue and relocation actions reduce the effects of dewatering on exposed fish; however, we also expect that relocation actions will result in limited injury and mortality of CCC steelhead. Future ADP-related fish relocation actions are expected to have the same, low level of impacts to CCC steelhead in Coyote Creek that have occurred during the 2020 and 2021 FOCP restoration actions. Thus, we expect that two percent mortality will not be exceeded for each rescue and relocation event. Any steelhead missed during rescue and relocation actions would be expected to die due to a variety of impacts; however, because steelhead rescue and relocation actions are expected to be effective at removing the majority of the fish within the dewatered reach, we expect that no more than one percent of the steelhead within the affected reach will remain within the affected reach and will be killed. Thus, collectively, we expect that no more than three percent of the steelhead within a reach in which fish handling and relocation is implemented will be killed. These steelhead are expected to make up a very small portion of the individuals within the action area and an even smaller portion of the overall DPS, and the steelhead rescue and relocation conservation measure is expected to provide benefits to the steelhead population of Coyote Creek.

Fish Monitoring and Sampling

The ADP monitoring program will evaluate the effectiveness of the conservation measures and guide steelhead restoration efforts in the Coyote Creek watershed. The monitoring program includes collection and tagging of juvenile steelhead which will result in incidental injury and mortality of less than 5 percent of the steelhead encountered during monitoring and sampling activities. Because these impacts will be experienced by only a small portion of the population (i.e., less than 5 percent of the sampled subset of the entire steelhead population) the risks to CCC steelhead from this scientific monitoring and sampling program are reasonably small and not expected to impact future returns of steelhead in the watershed. Due to the relatively large number of steelhead juveniles produced by each spawning pair, steelhead spawning in the Coyote Creek watershed in future years are likely to produce enough juveniles to replace the few that may be lost due to sampling by the monitoring program, even during the initial years after ADSRP when steelhead numbers are expected to be relatively small. For these reasons, NMFS expects that the small potential loss of juveniles during the monitoring program is unlikely to impact future adult returns. Additionally, NMFS believes this scientific monitoring program will make an important contribution to our understanding of steelhead biology in Coyote Creek and will assist in management decisions that will support the conservation and recovery of CCC steelhead.

Flows and Temperature

Beginning in 1936 and 1950 when the dams were built, major alterations occurred to the hydrology in the watershed including changes to the magnitude, timing, duration, and variability of unimpaired flow in the watershed. These alterations affected habitat, water quality, ecosystem processes which negatively impacted multiple life history stages of CCC steelhead in freshwater. Rebuilding Anderson Dam will continue to impair hydrology in the system.

During the wet season during FOCP, inflows to Anderson Reservoir have been passed through the existing outlet works to maintain the reservoir at deadpool. This period results in greater reservoir discharge over a shorter period of time and maintains the reservoir in a condition in which dry season releases are reduced or curtailed during FOCP. As a result, steelhead critical habitat rearing PBFs have been impaired from the following: elevated surface dry season water temperatures downstream of the reservoir, decreased surface water flows, and reduced available habitat quantity and quality. Valley Water implemented measures to minimize impacts to steelhead during this time (e.g., monitoring, and fish handling and relocation); however, due to the extent of the area affected, the duration of effects (multiple dry seasons over several years), and the inherent risk associated with the primary minimization measure, fish relocation, it is likely that during this period an unquantifiable number of steelhead within the affected area experienced effects ranging from disturbance, physiological stress, reduced fitness, delayed mortality, and direct mortality, including stranding, redd scour, and impaired migration.

As the FOCP progresses in the future, additional infrastructure intended to reduce these effects of the FOCP on steelhead and habitat will be constructed and operated (e.g., ADTP and chillers), and habitat improvements (e.g., South Channel and Live Oak Restoration) will provide shade, cover, and improved habitat conditions within the affected reach. To maintain temperatures suitable for steelhead rearing, operation of chillers, during the latter stages of FOCP and the entire period of ADSRP construction, will reduce thermal impacts on steelhead. With the use of the chillers, Valley Water has the capacity to maintain water temperature in the FCWMZ up to Tomcat Way (approximately 2,000 feet upstream of Ogier Ponds) at or below the target temperature of 18 degrees C for steelhead. During ADSRP, less impaired flows within Coyote Creek downstream of Anderson Dam will continue in a similar manner as they occurred during FOCP. The measures implemented during FOCP to minimize flow-related impacts to steelhead and their habitat will continue to be implemented during ADSRP. Measures to reduce effects of flow and temperature alterations during FOCP and ADSRP (e.g., monitoring, fish handling and relocation, chiller operation, North-South weir operation, and the Live Oak Restoration) will be protective of steelhead migration, rearing, and spawning life stages and critical habitat PBFs that support steelhead migration, rearing, and spawning, such that the population will be able to persist through the FOCP and ADSRP components of the ADP and will remain in a condition to respond positively to Post-ADSRP operations and habitat improvements.

Anderson Dam and Coyote Percolation Dam will be replaced and will function in perpetuity post-ADSRP, impairing steelhead critical habitat PBFs. The hydrodynamic response of Coyote Creek downstream of the dam will be dampened and instream seasonal flow variability will be reduced in perpetuity, which is expected to harm steelhead and habitat that will not fully benefit from the dynamic nature of the river's natural flow and disturbance regime. After ADSRP is completed and Anderson Dam is operational, Valley Water will operate Anderson Dam in conformance with the proposed ADP flow releases (FAHCE-Plus Modified Rule Curves). Although a low level of injury and mortality to steelhead may occur during Post-ADSRP operations due to stranding during dissipating flows, and excessive velocities during emergency releases, the level of injury and mortality is expected to be low because these flow releases are anticipated to support critical habitat PBFs for all steelhead life stages by providing flows that will simulate a natural hydrograph, which will work with existing and enhanced habitat conditions, and will be managed adaptively to provide passage and habitat conditions supporting PBFs for all steelhead freshwater life stages across the range of water year types expected to occur across the decades-long operation of the rebuilt reservoir. For example, winter and spring flow releases will support steelhead migration and spawning, egg incubation and smolt outmigration, summer and fall base flows will support juvenile steelhead rearing, and winter and spring pulse flows will support adult and juvenile migration. Additionally, because the North-South channel weirs will remain in use during post-ADSRP operations, their use is expected to support flow management in Coyote Creek long-term. Similarly, the Live Oak restoration reach will continue to provide habitat for steelhead long-term. These flow releases are anticipated to support steelhead critical habitat PBFs that will be protective of the freshwater life stages of CCC steelhead downstream of Anderson Dam, and are expected to contribute to the AMP objective of providing steelhead spawning habitat, rearing habitat, and passage conditions that contribute to the restoration and maintenance of a healthy steelhead population in Coyote Creek.

Suspended Sediment Concentration and Sediment Deposition

High concentrations of suspended sediment (SSC) are expected to continue to occur during FOCP and will likely continue during ADSRP, impacting critical habitat PBFs and causing steelhead injury or mortality. Injury or mortality of steelhead is expected to occur during storm events, and bypass flows in the form of acute and chronic mechanisms, including: disrupted normal feeding behavior and efficiency, reduced growth rates, physiological stress, reduced respiratory functions, reduced tolerance to disease, dispersal from established territories to less suitable habitat, increased competition and predation, decreasing chances of survival, and fish mortality. Increased sediment deposition will impact PBFs and can fill pools and impair adult spawning substrate, reduce the amount of cover available to fish, decrease BMI and forage ability for juveniles, impact egg incubation and fry survival, and decrease the survival of juveniles. Up to 20-percent mortality of incubating eggs and alevins from suspended sediment impacts may occur during the remainder of FOCP and throughout ADSRP if there were a two-year flow event or greater during the incubation period. Conservation measures to minimize impacts to steelhead during the remainder of FOCP and throughout ADSRP will be implemented in the Anderson Dam Program, including fish rescue and relocation. Fish rescue and relocation will occur when flow and temperature criteria are met, and steelhead will be relocated to habitat that will not be exposed to elevated SSC and sediment deposition, thus serving as an effective minimization measure. Modeling and monitoring are not proposed to assess effects of elevated SSC and sediment deposition post-ADSRP, thus it is not feasible to accurately estimate the amount of steelhead injury or mortality that is likely to occur post-ADSRP during Anderson Dam operations. Because the reservoir will be refilled, which will reduce the contact of reservoir waters with erodible sediments along the shoreline of the reservoir, and, during the summer, the reservoir outlet will draw water from deeper waters below the reservoir thermocline, which are not expected to contain high SSC, it is expected that discharges from Anderson Dam Post-ADSRP will have low SSC, which will not impair steelhead or their critical habitat in Coyote Creek. With implementation of the FAHCE-Plus Modified Rule Curves presented above, injury and mortality of steelhead due to exposure to elevated SSC during the post-ADSRP period is expected to be low and is not expected to impair the AMP objective of restoring and maintaining a healthy steelhead population in Coyote Creek. Additionally, the habitat enhancement conservation measures included in the ADP (e.g., Live Oak Restoration, Ogier Ponds Restoration, and spawning gravel augmentation) are expected to help improve the effects of SSC on steelhead and habitat during FOCP, ADSRP, and Post-ADSRP, provide benefits to all life stages of steelhead, and contribute to the AMP objective of providing steelhead spawning habitat, rearing habitat, and passage conditions that contribute to the restoration and maintenance of a healthy steelhead population in Coyote Creek.

Aquatic Non-native Species

Imported water releases into the Coyote Creek watershed are ongoing during FOCP, and will occur during ADSRP, and post-ADSRP. Imported water released to Coyote Creek may carry larval phases or juveniles of aquatic non-native species. A variety of non-native fish species, including competitors and predators of steelhead, occur in Anderson Reservoir and Coyote Creek downstream of Anderson Dam, and will be discharged into Coyote Creek downstream of the dam during all phases of the ADP via imported water releases. Additionally, imported water may, at times, be warmer than the waters of Coyote Creek and may, during these periods, warm surface waters within portions of Coyote Creek downstream of Anderson Dam. Increased surface water temperatures would exacerbate existing degraded steelhead critical habitat PBFs in portions of Coyote Creek downstream of Anderson Dam where warm, slow moving water favors aquatic non-native species (e.g., Ogier Ponds, Coyote Percolation Dam). Additionally, the continued operation of Coyote Percolation Dam, which creates a ponded condition within Coyote Creek, will likely continue to result in conditions that favor aquatic non-native species. Similarly, due to the continued use of imported water proposed during the Post-ADSRP period of the ADP, predation and competition from non-native aquatic species is expected to continue to persist in perpetuity. As a minimization measure, Valley Water will continue to implement the Invasive Species Monitoring and Control Plan during FOCP and ADSRP. The Invasive Species Monitoring and Control Plan is expected to reduce aquatic non-native species in the action area and contribute to our understanding of their impacts on steelhead. With the implementation of these measures, ADP-related non-native aquatic species discharge to, and support within Coyote Creek is expected to result in low rates of injury and mortality of steelhead within Coyote Creek, and is not expected impair the AMP objective of providing steelhead spawning habitat, rearing habitat, and passage conditions that contribute to the restoration and maintenance of a healthy steelhead population in Coyote Creek.

Streambank, Riparian, and Channel Habitat

The ADP includes temporary and permanent impacts to streambank, riparian, and channel habitat that will affect PBFs of critical habitat in freshwater that steelhead depend upon for completion of their life cycle. Construction and maintenance actions will result in temporary and recurring reductions in riparian and emergent vegetation within the freshwater portions of Coyote Creek, including trimming and tree removal necessary for construction access, staging, and facility maintenance. The portions of the Coyote Creek Flood Protection Project implemented during FOCP resulted in approximately 8,654 linear feet of floodwalls placed at high elevations within developed portions of the Coyote Creek floodplain between Highway 280 and Oakland Road. The amount of harm, injury, or mortality to steelhead and impacts to critical habitat PBFs that may result from the Coyote Creek Flood Protection Project portion of the FOCP is expected to be low due to its placement within developed portions of the Coyote Creek.

The ADP includes habitat enhancement actions that are expected to improve existing channel and bank habitat conditions, and associated critical habitat PBFs that steelhead depend upon. The Live Oak Restoration Project, located 2,500 feet downstream of Anderson Dam in the FCWMZ, will increase and enhance habitat in the reach, providing benefits to rearing and spawning steelhead and critical habitat PBFs in this area. The Ogier Ponds CM will restore and enhance steelhead habitat by separating the existing hydraulic connection between Coyote Creek and the Ogier Ponds, returning the creek to its historical (pre-1997) channel, and adding ecological enhancements to the channel and floodplain. The Ogier Ponds CM is expected to provide benefits to all life stages of steelhead and freshwater critical habitat PBFs. Low levels of steelhead injury and mortality are anticipated during construction of the Live Oak Restoration and Ogier Ponds CM, and channel and bank habitat will be temporarily disturbed and altered, impacting freshwater critical habitat PBFs. Additionally, gravel augmentation activities will be included and designed to enhance spawning gravels and associated freshwater critical habitat PBFs in appropriate Coyote Creek areas impacted by, but amenable to restoration downstream of Anderson Dam, with a focus on opportunities for restoration within the FCWMZ. Implementation of the Geomorphic Flows Plan is expected to achieve geomorphic function, spawning gravel maintenance, channel formation, and long-term maintenance of healthy riparian habitat that will improve spawning and rearing critical habitat PBFs in the action area.

After Ogier Ponds CM has been constructed, to prepare for potential future restoration opportunities, Valley Water will develop a Restoration Study that will assess feasibility of various habitat restoration opportunities in the reach from Ogier Ponds to Metcalf Road. Measures that are expected to benefit steelhead and critical habitat include increasing channel width, decreasing pool depth, increasing access to off-channel or side channel habitat, increasing spawning gravel deposition and quality, and assessing passage challenges for steelhead in this reach. This evaluation will occur as part of the AMP, which will include NMFS.

Steelhead Passage and Migration

The ADP will both improve steelhead passage and maintain degraded steelhead critical habitat PBFs that impair steelhead passage within Coyote Creek. The Coyote Percolation Dam is an existing structure that affects steelhead passage in Coyote Creek downstream of Anderson Dam, and is being modified in two phases during the ADP. Monitoring will occur at the Percolation Dam to develop protective measures that will provide effective fish passage at the facility. Fish passage at Ogier Ponds will be improved during ADP. Modifications to these passage impediments below Anderson Dam will be designed and implemented according to NMFS Fish Passage Guidelines (NMFS 2022). Anderson Dam is an existing structure that prevents steelhead passage to historically accessible above-dam habitat important for the recovery of CCC steelhead, and will be rebuilt during the ADP. Additionally, reservoir operations have the potential to impair surface water flows necessary for the provision of PBFs that either support fish passage or cue steelhead migration conditions (e.g., water depths, temperatures, and the timing, duration, and magnitude of surface water flows). To address these effects on steelhead passage, the ADP includes measures to support the safe, timely, and effective passage of steelhead within Coyote Creek downstream of Anderson Dam. These measures include: Phase 1 and Phase 2 Coyote Percolation Dam physical and operational improvements; habitat improvements at Ogier Ponds and Live Oak; fish handling and relocation actions during FOCP and ADSRP; Post-ADSRP reservoir operations that include base and pulse flows protective of steelhead movement and migration; sediment augmentation to maintain conditions supporting steelhead movement and migration; and installation and operation of the north/south channel weirs to support steelhead access into and use of the South Channel. Additionally, the AMP includes measures to monitor and adaptively manage passage conditions downstream of Anderson Dam (e.g., monitoring and adaptive management of the Coyote Percolation Dam) and, if needed, provide steelhead reintroduction to above-reservoir reaches of the Coyote Creek watershed. With the inclusion of these measures, the ADP is expected to support PBFs downstream of Anderson Dam that will improve passage conditions in Coyote Creek downstream of Anderson Dam.

Adaptive Management

ADP implementation and operations will directly affect many factors that influence the steelhead population in Coyote Creek and critical habitat PBFs (e.g., water temperature, water flows, habitat health, passage, and access to habitat). To minimize impacts to steelhead expected from implementation of ADP, including FOCP and ADSRP construction, and post-ADSRP reservoir operations, Valley Water has included operations (including OWG coordination) and conservation measures in the ADP that are expected to minimize impacts of the ADP and improve steelhead critical habitat PBFs in Coyote Creek downstream of Anderson Dam. These operations and minimization measures are expected to be protective of steelhead and their critical habitat in Coyote Creek. However, due to the long-term effects of the ADP and uncertainty regarding the Coyote Creek steelhead population's ability to respond to the improvements downstream of Anderson Dam, Valley Water will apply data-informed adaptive management to some ADP operations and conservation measures (e.g., Coyote Percolation Dam operations, sediment augmentation, habitat enhancement and, if needed, above-reservoir steelhead reintroduction). The AMP includes goals and objectives, including a management objective to support the restoration and maintenance of a healthy steelhead population in Coyote Creek by providing (A) approximately five miles of spawning and rearing habitat below Anderson Dam and in Upper Penitencia Creek; and (B) adequate passage for adult steelhead trout and salmon to reach suitable spawning and rearing habitat, and for out-migration of juveniles. The AMP also includes coordination with resource agencies through the AMT (including monitoring, reporting, and coordination with NMFS regarding development and implementation of Valley Water's ADP steelhead monitoring program), and data-info need management of AMP measures. Thus, the implementation of the AMP is expected to contribute to the ADP's conservation of steelhead and habitat in Coyote Creek.

Above Reservoir Reintroduction

Valley Water has included reintroduction of steelhead above Anderson Dam (restoring anadromy) through trap and truck operations as an adaptive management measure in the event that ADP conservation measures implemented downstream of Anderson Dam do not succeed in restoring and maintaining a healthy steelhead population in Coyote Creek watershed by providing: (A) approximately five miles of spawning and rearing habitat below Anderson Dam and in Upper Penitencia Creek; and (B) adequate passage for adult steelhead trout and salmon to reach suitable spawning and rearing habitat, and for out-migration of juveniles. Reintroduction above Anderson Dam was identified as a specific recovery action to consider in the 2016 NMFS Recovery Plan for CCC steelhead (NMFS 2016).

Given the complexities of reintroduction, studies must be performed prior to implementation to determine if reintroduction is feasible and if so, how it may be best implemented, monitored, and adaptively managed. This, combined with the need to develop specific measurable metrics for the ADP that would trigger reintroduction, precludes the definitive determination of whether or not above-reservoir reintroduction would be implemented as part of the ADP. Due to this, the potential effects to the Coyote Creek CCC steelhead population cannot be quantified. For example, the potential number of steelhead that may be injured or killed during relocation activities (e.g., trap and truck actions) cannot be accurately estimated. Similar to the effects of proposed ADP steelhead rescue and relocation activities described above, we expect that two percent mortality will not be exceeded for each trap and truck event. Additionally, the effects of steelhead monitoring and sampling associated with reintroduction activities will be the same as proposed ADP monitoring and sampling, and we expect that five percent mortality will not be exceeded each year. Similarly, without improved habitat information and carrying-capacity estimates, the specific numbers of steelhead that may be reared within above-reservoir habitat cannot be quantified.

Considering steelhead life history, the extent of available habitat upstream of the dam, and the findings of NMFS (2016), which indicate the importance of above-reservoir habitat in the Coyote Creek for the conservation and recovery of the DPS, benefits to the steelhead population in Coyote Creek would be expected if an above-reservoir reintroduction program were to be implemented. Additionally, although risks to individuals, and potentially the source population, do exist with reintroduction programs, the monitoring and coordination included in the AMP would be expected to result in the inclusion of designs, operations, measures, and monitoring within the reintroduction program that would sufficiently reduce the risks to the Coyote Creek steelhead population, such that any above-reservoir reintroduction-related impacts to the Coyote Creek steelhead population would be expected to be miniscule compared to the overall benefit to the population and the DPS. Thus, the implementation of an above-reservoir steelhead reintroduction program as part of the ADP would, if implemented, be expected to contribute to the conservation and recovery of steelhead in Coyote Creek and, in so doing, contribute to the conservation and recovery of the DPS.

Summary

With the implementation of conservation measures, monitoring, and adaptive management included in the program, no more than a small percentage of juvenile steelhead within the Coyote Creek population are expected to be harmed or killed annually during the ADP. Overall, the proposed water operations, fish passage and habitat enhancement actions, and adaptive management included in the ADP are anticipated to support critical habitat PBFs 5 miles downstream of Anderson Dam and adequately protect all life stages of steelhead in Coyote Creek downstream of Anderson Dam in future years. ADP actions are expected to support critical habitat PBFs that will provide steelhead suitable water quality, successful migration opportunities, and spawning and rearing habitat in Coyote Creek downstream of Anderson Dam. The resilience and persistence of CCC steelhead populations, their numbers, reproduction, and distribution are unlikely to be meaningfully reduced by the small percentage of juveniles killed or harmed annually from the ADP. Consequently, we do not expect that implementation of the ADP 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 effects of the ADP, 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 DPS level. Coyote Creek is designated as critical habitat for CCC steelhead downstream of Anderson Dam. Upstream of Anderson Dam is not designated as critical habitat for CCC steelhead. The condition of critical habitat PBFs of the environmental baseline in the action area remains degraded due to the original Anderson Dam, urban development, historical agricultural practices (e.g., channelization), stormwater runoff, and other impacts. Valley Water is implementing avoidance and minimization measures best management practices to minimize short-term temporary effects of the ADP, and will implement conservation measures, monitoring, and adaptive management in the program to address long-term effects of the ADP. As a result, the condition of critical habitat PBFs are expected to improve in some portions of the action area relative to baseline conditions (CWMZ, Coyote Percolation Dam, and Ogier Ponds). Although the ADP will not address some existing causes of degradation of critical habitat into the future, it will aid in maintaining and improving habitat processes essential for steelhead downstream of Anderson Dam. Therefore, the ability of CCC steelhead designated critical habitat to play its intended conservation role of supporting populations of CCC steelhead 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 its designated critical habitat.

2.9. Incidental Take Statement

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

The recommendations provided by NMFS during the emergency response for FOCP function in place of terms and conditions with respect to the incidental take caused by the emergency response, and are incorporated here as terms and conditions of this consultation. Thus, to the extent that the emergency response action was performed in compliance with those recommendations, the associated incidental take is considered exempt from the ESA take prohibition.

2.9.1. Amount or Extent of Take

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

Steelhead Rescue and Relocation

The amount of take during FOCP emergency response activities was recorded by Valley Water during two steelhead rescue and relocation events in 2020 and 2021. The 2020 and 2021 steelhead rescue and relocation events both resulted in mortality rates of juvenile CCC steelhead below 2 percent (1.3 percent). During the remainder of the ADP (i.e., future FOCP, ADSRP, and Post-ADSRP Anderson Dam operations and adaptive management), a low-level of incidental take of juvenile CCC steelhead in the form of injury, harm, or mortality is reasonably certain to occur during dewatering and fish rescue and relocation activities, including during post-ADSRP Anderson Dam operations and adaptive management. All steelhead within a specific dewatered area are anticipated to be captured as a part of rescue and relocation activities. As described in Section 2.5 of this opinion, steelhead capture, rescue, and relocation actions are expected to result in no more than 2 percent mortality for any steelhead rescue and relocation action not involving dewatering, and no more than 3 percent mortality for any steelhead capture, handling, and relocation action involving dewatering.

The extent of incidental take will therefore be considered to be exceeded if either of the following occur:

a. For steelhead rescue and relocation actions involving dewatering:
    i. Mortality of steelhead exceeds 3 percent of the total amount of steelhead within dewatered reaches in any one annual construction season.
b. For steelhead rescue and relocation actions not involving dewatering:
    i. Mortality of juvenile steelhead exceeds 2 percent of the total steelhead captured in any one annual construction season.

Steelhead Monitoring and Sampling

A low-level of incidental take of juvenile CCC steelhead in the form of capture, injury, harm, or mortality is reasonably certain to occur during fish monitoring and sampling activities during the remainder of the ADP (i.e., future FOCP, ADSRP, and post-ADSRP Anderson Dam operations and adaptive management). As discussed in Section 2.5 of this opinion, lethal incidental take of steelhead is not expected to exceed 5 percent mortality.

The extent of incidental take will therefore be considered to be exceeded if the following occurs:

Unintentional mortality of juvenile steelhead during the capture, handling and relocation of fish during monitoring and sampling and potential reintroduction activities exceeds 5 percent of the total steelhead captured during one annual monitoring season.

Instream Flows and Temperature

Although the ADP includes operations, coordination with NMFS, adaptive management and conservation measures to maintain habitat conditions that are expected to be protective of steelhead, a small amount of injury and mortality to steelhead may result during dry and wet season conditions. Incidental take of steelhead from instream flow and temperature effects cannot be accurately quantified as a specific number of steelhead individuals because the distribution of effects will occur over a large area and will vary widely depending on local habitat conditions and water year type. Moreover, the distribution and abundance of fish that may occur within the action area will be inconsistent over time, affected by habitat quality, interactions with other species, and other influences that cannot be accurately determined by monitoring or modeling. NMFS will therefore use the following incidental take surrogates pursuant to 50 CFR 402.14(i)(1)(i). The best available indicator of incidental take from flow releases during ADP will be a habitat surrogate reflecting the operational management of flow releases and temperatures that will occur in the action area. Measurements of instream flows and temperatures will serve as the habitat surrogate for incidental take of CCC steelhead as they are directly affected by ADP flow releases, and are established habitat features that are essential for all life stages of steelhead. Measurements of instream flows and temperatures will function as meaningful reinitiation triggers because instream flows and temperatures can be tracked in real time. NMFS will, therefore, use the following incidental take surrogate pursuant to 50 CFR 402.14(i)(1)(i).

The extent of incidental take will therefore be considered exceeded if any of the following occur:

a. **During the remainder of FOCP and during the entirety of ADSRP, as part of the proposed action:**
   i. If daily average instream water temperatures during the summer period (May 1 through October 31) in the FCWMZ from Anderson Dam to Tomcat Way exceed 18 degrees C (64.4 degrees F), and minimization measures (e.g., operational adjustments, steelhead rescue and relocation, or other appropriate measures are not implemented by Valley Water in coordination with the OWG or AMT); or
   ii. Chillers do not effectively reduce water temperature of CVP water by up to 7 degrees Celsius (C) (12.6 degrees Fahrenheit [F]), and minimization measures (e.g., operational adjustments, steelhead rescue and relocation, or other appropriate measures) are not implemented by Valley Water in coordination with the OWG or AMT).
b. **During long-term Anderson Dam flow release operations (post-ADSRP), as part of the proposed action:**
   i. Before Ogier Ponds Restoration, summer period base flows (May 1 through October 31) fall below 1 cfs at Tomcat Way (FCWMZ), or if

there is not available cold water storage to satisfy this condition, the release is less than the total available cold water storage less estimated evaporation divided by 184 days; or

ii. Before Ogier Ponds Restoration, daily average instream water temperatures in the FCWMZ from Anderson Dam to Tomcat Way exceed 18 degrees C (64.4 degrees F), or if there is not available cold water storage to satisfy this condition, the release is less than the total available cold water storage less estimated evaporation divided by 184 days; or

iii. After completion of Ogier Ponds Restoration, summer period base flows (May 1 through October 31) fall below 1 cfs at Golf Course Road (CWMZ), or if there is not available cold water storage to satisfy this condition, the release is less than the total available cold water storage less estimated evaporation divided by 184 days; or

iv. After Ogier Ponds Restoration, daily average instream water temperatures at Golf Course Road (CWMZ) exceed 18 degrees C (64.4 degrees F); or if there is not available cold water storage to satisfy this condition, the release is less than the total available cold water storage less estimated evaporation divided by 184 days

v. Winter period base flows (November 1 through April 30) are not implemented according to the established operations described in Section 3.6.3.2 of the BA, Table 3-11, included below.

Begin month storage (AF)	Release for recharge/ Minimum 26 cfs	23 cfs	15 cfs	10 cfs	5 cfs
November 1	31,050	29,173	26,411	23,648	20,886
December 1	31,050	29,173	26,411	23,648	20,886
January 1	31,050	29,216	26,454	23,691	20,929
February 1	31,050	29,495	26,733	23,970	21,208
March 1	31,050	30,316	27,554	24,791	22,029
April 1	31,050	30,842	28,080	25,317	22,555
May 1	31,050	31,050	28,288	25,525	22,763

vi. Migration pulse flows are not implemented according to the established FAHCE-Plus Modified Rule Curves as described below, including additional limits and conditions for each pulse flow presented in Section 3.6.3.2 of the BA.[17] Specifically, as adapted from the FAHCE-Plus Modified Rule Curves that are part of the proposed action, take will be exceed if:

1. During December 1 through April 1, Valley Water does not implement (Primary) Adult Attraction (upmigration)/juvenile outmigration pulse flows (Primary Attraction Pulse Flows) of 90 cfs for 10 days (or equivalent volume released if flow shaping is implemented) when combined reservoir storage equals 80,000 AF and it is safe to release such flows.

[17] NMFS acknowledges that slight deviations from proposed flow release amounts may occur due to minor imprecision of flow release equipment installed on Anderson Dam.

2. During January 15 through March 30, Valley Water does not implement (Safeguard) Adult Attraction (upmigration)/juvenile outmigration pulse flows (Safeguard Attraction Pulse Flows) of 90 cfs for 5 days (or equivalent volume released if flow shaping is implemented) if no previous Primary Attraction Pulse Flow has occurred since December 1, and combined storage equals 55,000 AF, and flow is at least 30 cfs for two consecutive days, and it is safe to do so. Additionally, if the 30 cfs trigger is not met by March 1 and storage is over 55,000 AF, then take will be exceeded if Valley Water does not release a 90 cfs pulse flow for 10 days (or equivalent volume released if flow shaping is implemented).
3. During April 1 through May 31, Valley Water does not implement Outmigration Pulse Flows of 60 cfs for 3 days (or equivalent volume released if flow shaping is implemented) if combined storage equals 45,000 AF, and flow is at least 10 cfs for two consecutive days, and it is safe to do so. Additionally, if the 10 cfs trigger is not met by May 15 and storage is over 45,000 AF, then take will be exceeded if Valley Water does not release a 60 cfs pulse flow for 7 days (or equivalent volume released if flow shaping is implemented).
4. Valley Water does not implement Security Adult Steelhead Upmigration/Juvenile Steelhead Outmigration Pulse Flow(s) (Security Pulse Flows) of 90 cfs for 4 days (or equivalent volume released if flow shaping is implemented) if no previous Primary Attraction Pulse Flows or Safeguard Attraction Pulse Flows have occurred by March 1, and combined storage is greater than 20,000 AF and will remain so after the completion of the pulse, and streamflow is connected to San Francisco Bay, and inflows have been greater than a 90-percent exceedance year, and Valley Water is not receiving or pursuing emergency water supply allocations, and the OWG has determined that a Security Pulse Flows is/are warranted.
5. Valley Water does not implement ramping over a period of up to 36 hours in a maximum of four increments with a target of 50 percent reduction in successive incremental flows if decreases in flow will be 50 cfs or less and the total decrease in flow is greater than 50 percent of the total original flow. Take will be exceeded when Valley Water does not implement ramping over a period of up to 72 hours in a maximum of seven increments with a target of 50 percent reduction in success incremental flows if decreases in flow will be greater than 50 cfs and the total decrease in flow is greater than 50 percent of the total original flow.

Suspended Sediment Concentration and Sediment Deposition

Injury and mortality to CCC steelhead are expected to occur from elevated suspended sediment concentrations (SSC) and sediment deposition during FOCP, ADSRP, and post-

ADSRP Anderson Dam operations. Incidental take of steelhead resulting from SSC and sediment deposition during FOCP, ADSRP, and post-ADSRP Anderson Dam operations cannot be accurately quantified as a specific number of steelhead individuals because the distribution of effects will occur over a large area and will vary widely depending on local habitat conditions and water year type. Moreover, the distribution and abundance of fish that may occur within the action area will be inconsistent over time, affected by habitat quality, interactions with other species, and other influences that cannot be accurately determined by monitoring or modeling. NMFS will therefore use the following incidental take surrogates pursuant to 50 CFR 402.14(i)(1)(i). The best available indicator of incidental take from elevated SSC and sediment deposition will be a habitat surrogate reflecting the flow releases that will occur from Anderson Dam in the action area. Measurements of SSC during the remainder of FOCP and the entirety of ADSRP as modeled by Valley Water (BA Section 4.2) will serve as the habitat surrogate for incidental take of CCC steelhead as they are directly affected by flow releases from Anderson Dam, and directly affect all life stages of steelhead. Measurements of SSC will function as a meaningful reinitiation trigger because it can be tracked in real time. NMFS will, therefore, use the following incidental take surrogate pursuant to 50 CFR 402.14(i)(1)(i).

The extent of incidental take will therefore be considered exceeded if any of the following occur:

a. Prior to ADTP completion throughout the remainder of FOCP during a 2-year storm event or greater, SSC exceeds 3,600 mg/L for over 24 hours at the gage immediately upstream of Ogier Ponds and does not decrease to approximately 200 mg/L after 3.5 days of flows returning to less than those of a two-year event.

b. Following ADTP completion throughout the remainder of FOCP during a 2-year storm event or greater, SSC exceeds 8,800 mg/L for over 24 hours or exceeds 5,000 mg/L for over 2 days at the gage immediately upstream of Ogier Ponds and does not decrease to approximately 200 mg/L within approximately 3.5 days of flows returning to less than those of a two-year event.

c. During ADSRP periods with an empty reservoir and a constant inflow, SSC exceeds 5,200 mg/L for 2 weeks at the gage immediately upstream of Ogier Ponds.

d. During ADSRP periods with an empty reservoir and a 2-year storm event or greater, SSC exceeds 39,000 mg/L for over 24 hours at the gage immediately upstream of Ogier Ponds, and does not decrease below 1,000 mg/L within 3 days of flows returning to less than those of a two-year event.

e. During ADSRP periods with a small reservoir pool and a constant above-reservoir inflow, SSC exceeds 259 mg/L for one week at the gage immediately upstream of Ogier Ponds.

f. During ADSRP periods with a small reservoir pool and a 2-year storm event or greater, SSC exceeds 30,000 mg/L for over 24 hours at the gage immediately upstream of Ogier Ponds, and does not decrease below 230 mg/L within 3 days of flows returning to less than those of a two-year event.

g. Post-ADSRP during reservoir operations and a 2-year storm event greater, SSC exceeds 3,600 mg/L for over 24 hours at the gage immediately upstream of Ogier Ponds and does not decrease to approximately 200 mg/L after 3.5 days of flows returning to less than those of a two-year event.

Aquatic Non-native Species

Injury and mortality are expected to occur to CCC steelhead from predation by and competition with non-native aquatic species resulting from FOCP, ADSRP and post-ADRP Anderson Dam operations (e.g., imported water releases, and maintenance of ponded conditions in Coyote Creek due to operation of the Coyote Percolation Dam).

Incidental take of steelhead from the ADP actions resulting in steelhead exposure to aquatic non-native species cannot be accurately quantified as a specific number of steelhead individuals because the distribution of effects will occur over a large area and will vary widely depending on local habitat conditions and water year type. Moreover, the distribution and abundance of fish that may occur within the action area will be inconsistent over time, affected by habitat quality, interactions with other species, and other influences that cannot be accurately determined by monitoring or modeling. NMFS will therefore use the following incidental take surrogates pursuant to 50 CFR 402.14(i)(1)(i).

The best available indicator of incidental take from effects associated with aquatic non-native species resulting from imported water discharges will be a surrogate associated with the active reduction of aquatic non-native species in the action area. To reduce non-native species interactions with steelhead, Valley Water is implementing the Invasive Species Monitoring and Control Plan during FOCP and ADSRP construction (Valley Water 2020a). Similarly, the best available indicator of injury or mortality from the formation of the pond upstream of the Coyote Percolation Dam on juvenile steelhead will be a habitat surrogate reflecting the operational management of the Coyote Percolation Dam. When the bladder dam is deflated at flows greater than 275 cfs, some flushing of non-natives downstream is expected to occur. Valley Water's actions of implementing aquatic non-native species monitoring and control measures, including adaptive management, and deflating the Coyote Percolation Dam at flows greater than 275 cfs will serve as surrogates for incidental take of steelhead, and will function as a meaningful reinitiation trigger because it can be tracked in real time. NMFS will, therefore, use the following incidental take surrogate pursuant to 50 CFR 402.14(i)(1)(i).

The extent of incidental take will therefore be considered exceeded if either of the following occur:

a. Valley Water does not fully implement the Invasive Species Monitoring and Control Plan (Valley Water 2020a) as proposed during FOCP and ADSRP construction.
b. Valley Water does not lower (deflate) the Coyote Percolation Dam bladder dam when flows exceed 275 cfs as proposed.

Steelhead Passage and Migration

The ADP will result in injury and mortality of steelhead due to the reconstruction and maintenance of structures that impair steelhead passage conditions. Incidental take of steelhead from the ADP actions resulting in impaired passage and migration conditions cannot be accurately quantified as a specific number of steelhead individuals because the distribution of effects will occur over a large area and will vary widely depending on local habitat conditions and water year type. Moreover, the distribution and abundance of fish that may occur within the action area will be inconsistent over time, affected by habitat quality, interactions with other species, and other influences that cannot be accurately determined by monitoring or modeling. NMFS will therefore use the following incidental take surrogates pursuant to 50 CFR 402.14(i)(1)(i). The best available indicator of incidental take from effects associated with steelhead passage and migration will be surrogates associated with the operational and adaptive management of Coyote Percolation Dam and Anderson Dam. Valley Water has included operational and adaptive management components in the ADP that are intended to provide passage improvements and adaptive management for CCC steelhead in the ADP. NMFS will, therefore, use the following incidental take surrogate pursuant to 50 CFR 402.14(i)(1)(i).

The extent of incidental take will therefore be considered exceeded if any of the following occur:

a. Valley Water does not implement the Coyote Percolation Dam Phase 2 project; or the Coyote Percolation Dam Phase 2 project is not constructed and operated in such a way that it meets NOAA Fisheries West Coast Region Anadromous Salmonid Passage Design Manual guidelines (NMFS 2022); or steelhead passage monitoring is not implemented at the Coyote Percolation Dam; or the Coyote Percolation Dam passage study included in the AMP is not implemented; or adaptive management actions to improve passage conditions through the Coyote Percolation Dam facility, if needed as determined by the AMP Coyote Percolation Dam passage study, are not implemented.

b. Valley water does not implement an above-reservoir steelhead reintroduction program if, as included in the AMP, above-reservoir steelhead reintroduction is deemed necessary and feasible by the AMT.

c. Any ADP operation or measure creates an inadvertent persistent passage impairment and Valley Water does not take steps to remedy the passage impairment.

Flood Protection

NMFS determined that CCC steelhead will be adversely affected by the placement of flood protection structures resulting from the Coyote Creek Flood Protection Project portion of the FOCP (i.e., a subcomponent of the ADP), and that incidental take will occur in the form of harm to CCC steelhead resulting from habitat-related impacts. The precise number of CCC steelhead that are expected to be incidentally taken resulting from habitat-related impacts of the Coyote Creek Flood Protection Project portion of the FOCP cannot be accurately quantified because: 1) some life-stages of steelhead are relatively small (especially as eggs, alevins, and juveniles); 2) these species live in aquatic environments where visibility is often low, hiding cover is often available, and predators feed; and 3) we cannot precisely predict where and when habitat impacts may affect these species later in their life cycles.

In this circumstance, NMFS cannot provide an accurate amount of take that would be caused by the ADP, and instead uses one or more surrogates to estimate the extent of incidental take. Here, the best available surrogate for the extent of incidental take is related to the spatial extent of habitat affected by constraints to natural fluvial and geomorphic processes. NMFS will use the length of proposed ADP flood protection structures as a surrogate for the extent of incidental take that will result from the Coyote Creek Flood Protection Project portion of the FOCP (i.e., a subcomponent of the ADP). NMFS will, therefore, use the following incidental take surrogate pursuant to 50 CFR 402.14(i)(1)(i).

The extent of incidental take will therefore be considered exceeded if the following occurs:

a. ADP activities result in bank stabilization structures that exceed 8,654 linear feet or ADP flood protection structures are placed anywhere other than the 8,654 linear feet of developed urban and suburban portions of the Coyote Creek floodplain between Highway 280 and Oakland Road. This limit does not apply to ADP-related habitat restoration or enhancement actions that will be, or may be installed in Coyote Creek outside of the reach between Highway 280 and Oakland Road and may include flood protection, flood control, or bank stabilization components as part of an ADP conservation measure or habitat restoration or enhancement measure (e.g., Ogier Ponds, Live Oak Restoration, or similar).

2.9.2. Effect of the Take

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

2.9.3. Reasonable and Prudent Measures

"Reasonable and prudent measures" refer to those actions the Director considers necessary or appropriate to minimize the impact of the incidental take on the species (50 CFR 402.02).

1. Undertake measures to minimize harm to CCC steelhead and their habitat during and resulting from steelhead rescue and relocation during FOCP, ADSRP, and post-ADSRP operations and adaptive management.
2. Undertake measures to minimize harm to CCC steelhead and their habitat during and resulting from fish monitoring and sampling activities during FOCP, ADSRP, and post-ADSRP operations and adaptive management.

3. Undertake measures to minimize harm to CCC steelhead and their habitat resulting from planned instream flows and temperatures during FOCP, ADSRP, and post-ADSRP operations and adaptive management.
4. Undertake measures to minimize harm to CCC steelhead and their habitat during and resulting from suspended sediment concentration and sediment deposition during FOCP, ADSRP, and post-ADSRP operations and adaptive management.
5. Undertake measures to minimize harm to CCC steelhead and their habitat during and resulting from aquatic non-native species during FOCP, ADSRP, and post-ADSRP operations and adaptive management.
6. Undertake measures to minimize harm to CCC steelhead and their habitat during and resulting from Coyote Creek fish passage enhancement projects during FOCP, ADSRP, and post-ADSRP operations and adaptive management, and ensure they meet NMFS fish passage performance criteria.
7. Undertake measures to minimize harm to CCC steelhead and their habitat during and resulting from Coyote Creek streambank and riparian habitat projects during FOCP, ADSRP, and post-ADSRP operations and adaptive management.
8. Undertake monitoring and adaptive management measures to avoid and minimize harm to CCC steelhead and their habitat during ADSRP and post-ADSRP operations and adaptive management.
9. During the FOCP ongoing emergency action, ensure that measures will continue to be implemented that avoid and minimize harm to CCC steelhead and their habitat.

2.9.4. Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the federal action agency must comply (or must ensure that any applicant complies) with the following terms and conditions. The FERC and USACE or any applicant (Valley Water) has a continuing duty to monitor the impacts of incidental take and must report the progress of the action and its impact on the species as specified in this ITS (50 CFR 402.14). If the entity to whom a term and condition is directed does not comply with the following terms and conditions, protective coverage for the proposed action would likely lapse.

1. The following terms and conditions implement reasonable and prudent measure 1:
   a. Valley Water will retain qualified biologists with expertise in the area of anadromous salmonid biology, including handling, collecting, and relocating salmonids; salmonid/habitat relationships; and biological monitoring of salmonids for overseeing in-water work, dewatering, fish relocation, and implementation of adaptive management measures. Valley Water will ensure that all biologists working on projects are qualified to conduct fish collections in a manner which minimizes all potential risks to steelhead.
      i. Qualified biologists (including those specializing in fisheries) will be determined by a combination of academic training and professional experience in biological sciences and related resource management activities. Valley Water may also utilize appropriately experienced and/or trained environmental staff. Resumes of qualified biologists shall be made available to NMFS upon request.
   b. The biologists will monitor the construction sites during placement and removal of cofferdams and channel diversions to ensure that any adverse effects to salmonids are

minimized. The biologists will be on site during all dewatering events to capture, handle, and safely relocate steelhead to an appropriate location.

c. Fish handling will occur according to all applicable requirements included in Terms and Conditions Section 2.
d. Fish collection by electrofishing and netting will occur according to all applicable requirements included in Terms and Conditions Section 2.
e. PIT tagging will occur according to all applicable requirements included in Terms and Conditions Section 2.
f. Before fish relocation begins, a qualified biologist must identify the most appropriate release location(s). Release locations must include the following aspects: ample quality stream habitat for released fish; suitable water quality (e.g., temperature, turbidity, dissolved oxygen); avoiding the possibility of re-entry to the work area, and avoiding areas where individual fish could become impinged on the exclusion net or screen.
g. Any pumps used to divert live streamflow, outside the dewatered work areas, will be screened and maintained throughout the construction period to comply with NMFS Screen Design Specifications in Section 8.5 of the 2023 NOAA Fisheries WCR Anadromous Salmonid Design Manual (NMFS 2023c; https://www.fisheries.noaa.gov/resource/document/anadromous-salmonid-passage-facility-design-manual)
h. If any salmonids are found dead or injured, the biological monitor will contact the NMFS North Central Coast Office in Santa Rosa, California at (707) 575-6050, or Darren Howe, San Francisco Bay Branch Supervisor at (707) 575-3152, or biologist Brian Meux at (707) 575-1253 or brian.meux@noaa.gov. The purpose of the contact is to review the activities resulting in take, determine if additional protective measures are required, and to ensure appropriate collection and transfer of salmonid mortalities and tissue samples. All salmonid mortalities will be retained. Tissue samples are to be acquired from each salmonid mortality per the methods identified in the NMFS Southwest Fisheries Science Center Genetic Repository protocols (contact the above NMFS office at the phone number provided) and sent to: NOAA Coastal California Genetic Repository, Southwest Fisheries Science Center, 110 McAllister Way, Santa 50 Cruz, California 95060.
i. Any injuries or mortality that exceeds three percent during dewatering activities and two percent during relocations as conservation and adaptive measures shall be reported to the NMFS Santa Rosa Office by email within 48 hours and construction activities shall cease until a NMFS biologist approves avoidance and minimization measures to minimize harm, injury, and mortality during fish handling and relocation activities.
j. Valley Water will provide details in annual reports to NMFS by January 31 of each year regarding steelhead rescue and relocation activities performed in the prior year. The reports will be submitted electronically to NMFS North Central Coast Office, Attention: San Francisco Bay Branch Supervisor (darren.howe@noaa.gov), 777 Sonoma Avenue, Room 325, Santa Rosa, California, 95404-6528. The reports shall contain, at a minimum, the following information: a description of the rescue and relocation locations including photographs; the dates and times of the rescue and relocation efforts; a description of the equipment and methods; if an electrofisher was used for fish collection, a copy of the logbook must be included; the number of fish captured by species; the number of fish injured or killed by species and a brief narrative of the circumstances surrounding steelhead injuries or mortalities; and a description of any problems which may have

arisen during the rescue and relocation activities and a statement as to whether or not the activities had any unforeseen effects; description of data collected during rescue and relocation efforts.

2. The following terms and conditions implement reasonable and prudent measure 2:
    a. Valley Water will retain qualified biologists with expertise in the areas of anadromous salmonid biology, including handling, collecting, and relocating steelhead; salmonid/habitat relationships; and biological monitoring of steelhead. Valley Water will identify to NMFS the personnel designated to conduct the fish monitoring activities described in this opinion prior to commencement and confirm their experience through resumes or other evidence of their accomplishments.
    b. Valley Water will notify NMFS North Central Coast Office in Santa Rosa, CA, (San Francisco Bay Branch Supervisor Darren Howe, at darren.howe@noaa.gov, or biologist Brian Meux at brian.meux@noaa.gov) one week prior to capture activities in order to provide an opportunity for NMFS staff to observe the activities.
    c. Steelhead will be handled with extreme care and kept in water to the maximum extent possible during monitoring activities. All captured fish will be kept in cool, shaded, aerated water protected from excessive noise, jostling, or overcrowding any time they are not in the stream, and fish will not be removed from this water except when released. To avoid predation, the biologists will have at least two containers and segregate young-of-year from larger age classes and other potential aquatic predators. Captured steelhead will be relocated, as soon as possible, to a suitable instream location in which suitable habitat conditions are present to allow for adequate survival of transported fish and fish already present.
    d. No fish will be captured or handled if the instantaneous water temperature exceeds 70 degrees Fahrenheit at the capture site where any NOAA Fisheries ESA-listed fish may be present.
    e. Electrofishing, if used, will be performed by a qualified biologist and conducted according to the NMFS (2000), ‘Guidelines for Electrofishing Waters Containing Salmonids Listed Under the Endangered Species Act,’ (https://media.fisheries.noaa.gov/dam-migration/electro2000.pdf).
    f. Passive Integrated Transponder (PIT) tags will be 9 mm or less for juveniles 61 mm to 69 mm fork length, and 12 mm or less for juveniles longer than 70 mm fork length. Researchers will use a sterilized needle for each individual fish when injecting PIT tags.
    g. Fish must be anesthetized or immobilized prior to implanting PIT tags. The biologist shall take extreme care to use the minimum amount of substance necessary to immobilize juvenile ESA-listed steelhead for handling and sampling procedures. FDA guidelines must be followed and the sampling plans submitted to NMFS for review must clearly indicate which anesthetics will be used. Clove oil is not approved to anesthetize or immobilize steelhead. Adult steelhead will not be anesthetized.
    h. Fin clips from juveniles will be no greater than 1 mm x 1 mm for genetic samples and no greater than 2 mm x 2 mm for marking. No adipose fins will be clipped. If fin clips are proposed, the sampling plans submitted to NMFS for review must describe which fin is to be clipped, explain why clipping is necessary, and how tissue samples will be used and analyzed.

i. When targeting non-listed species or using gear that captures a mix of species, ESA-listed fish will be processed first.
j. NMFS Weir Guidelines (Weir Operating Plan: https://apps.nmfs.noaa.gov/docs/NOAA-WCR_Weir_Guidelines_Sept_2015.pdf) will be followed.
k. During monitoring surveys and fish sampling, Valley Water will document any instances of steelhead stranding, including mortalities. Any mortalities shall be identified to species, age class (length in mm), and enumerated. The date, time, location (mapped), photos, and habitat type shall be documented for all steelhead impacts.
l. There will be no intentional mortality of steelhead that will occur. In one monitoring season, incidental mortality is expected to be less than 5 percent of encountered and close to or at zero. If 5 percent mortality occurs in one monitoring season, NMFS will be notified immediately and sampling will cease.
m. Valley Water will provide details in annual reports to NMFS by January 31 of each year regarding steelhead monitoring and sampling activities performed in the prior year. The reports will be submitted electronically to NMFS North Central Coast Office, Attention: San Francisco Bay Branch Supervisor (darren.howe@noaa.gov), 777 Sonoma Avenue, Room 325, Santa Rosa, California, 95404-6528. The reports shall contain, at a minimum, the following information: a description of the locations monitored including photographs; the dates and times of the monitoring efforts; a description of the equipment and methods used to collect physical, chemical, or biological data; if an electrofisher was used for fish collection, a copy of the logbook must be included; the number of fish captured by species; the number of fish injured or killed by species and a brief narrative of the circumstances surrounding ESA-listed fish injuries or mortalities; and a description of any problems which may have arisen during the monitoring activities and a statement as to whether or not the activities had any unforeseen effects; a description of the physical, chemical, or biological data collected; and an evaluation of the physical, chemical, or biological data collected.
n. Valley Water will include details in annual reports regarding long-term steelhead monitoring results of data collected the prior year, including: adult salmonid relative abundance; juvenile steelhead density and condition; juvenile steelhead migration; steelhead population genetics; and fish species composition.

3. The following terms and conditions implement reasonable and prudent measure 3:
    a. Valley Water must ensure the ability to demonstrate in real time that streamflow (cfs) and temperature (C) criteria are being met at the points of compliance. Prior to the completion of the Ogier Ponds Restoration action, the point of compliance will be Tomcat Way (representing the downstream end of the FCWMZ). Following completion of the Ogier Ponds Restoration action, the point of compliance will be Golf Course Road (representing the downstream end of the CWMZ).
    b. No later than two years prior to Valley Water's planned completion of ADSRP, Valley Water will, in coordination with NMFS, prepare a Geomorphic Flows Plan as described in Section 3.6.3.3 of the BA. The plan must be submitted to NMFS for review and approval and must include a schedule for implementation and coordination with NMFS.
    c. If NMFS determines that more frequent coordination of the OWG or AMT is needed than annual meetings, such as in low storage and/or dry and very dry years, then Valley Water

will coordinate OWG or AMT meetings at a higher frequency that meets NMFS approval.

   d. Valley Water will provide details in annual reports to NMFS by January 31 of each year regarding instream flows and temperatures recorded in the prior year. The reports will be submitted electronically to NMFS North Central Coast Office, Attention: San Francisco Bay Branch Supervisor (darren.howe@noaa.gov), 777 Sonoma Avenue, Room 325, Santa Rosa, California, 95404-6528.

4. The following terms and conditions implement reasonable and prudent measure 4:
   a. To minimize effects to CCC steelhead that are expected to result from suspended sediment concentrations (SSC) and sediment deposition, Valley Water will include sediment monitoring and adaptive management measures in the Monitoring and Adaptive Management Plan (MAMP) included in Term and Condition 8 for post-ADSRP Anderson Dam operations. The sediment monitoring and adaptive management measures in the MAMP will include the following elements:
      i. long-term monitoring of SSC and sediment deposition;
      ii. modeling elevated SSC and sediment deposition impacts to all life stages of steelhead to determine post-ADSRP baseline conditions of SSC for Coyote Creek downstream of Anderson Dam, and SSCs and durations in Coyote Creek that are harmful to each life stage of steelhead for wet and dry seasons and all water year types;
      iii. measurable criteria that will trigger the implementation of adaptive management measures; and
      iv. adaptive management measures to avoid, minimize elevated SSC and sediment deposition impacts to steelhead that would be implemented if monitoring results indicate the occurrence of steelhead injury or mortality.
   b. If a minimum of 5 years of monitoring during post-ADSRP dam operations demonstrates that SSC levels are higher or occur longer than modeling has predicted, and those SSC levels are still protective of steelhead in the FCWMZ and are consistent with effects to steelhead considered in this opinion, then Valley Water may propose a modified MAMP (MAMP is included in Term and Condition 8) with revised monitoring, SSC levels and SSC durations in collaboration with NMFS. Final SSC levels and durations will be submitted to NMFS for review and approval.
   c. Valley Water will provide details in annual reports to NMFS by January 31 of each year regarding suspended sediment concentrations and sediment deposition recorded in the prior year. The reports will be submitted electronically to NMFS North Central Coast Office, Attention: San Francisco Bay Branch Supervisor (darren.howe@noaa.gov), 777 Sonoma Avenue, Room 325, Santa Rosa, California, 95404-6528.

5. The following terms and conditions implement reasonable and prudent measure 5:
   a. To minimize effects to CCC steelhead that are expected to result from aquatic non-native species, Valley Water must develop an Invasive Species Monitoring and Control Plan that will be implemented post-ADSRP during Anderson Dam operations that assesses and minimizes impacts of aquatic non-native species on steelhead. The Invasive Species Monitoring and Control Plan may be included as a section in the Monitoring and Adaptive Management Plan (MAMP) in Term and Condition 8 for post-ADSRP

Anderson Dam operations. The post-ADSRP Invasive Species Monitoring and Control Plan must include the following elements:

i. Regular monitoring of aquatic non-native species that accurately assess potential impacts to steelhead in Coyote Creek.
ii. If impacts are determined based on regular monitoring, then adaptive management measures must be taken by Valley Water to further reduce aquatic non-native species to abundance and distribution levels that will be approved by the AMT.

b. Valley Water will submit an annual report to NMFS by January 31 of each year that documents implementation of post-ADSRP Invasive Species Monitoring and Control Plan. This can be included as a section in a larger annual report of the MAMP described in Term and Condition 8.

6. The following terms and conditions implement reasonable and prudent measure 6:
   a. Coyote Percolation Dam studies should be conducted with marked/tagged juvenile salmonids to evaluate transit times and survival rates post-Phase 2 construction. The study should evaluate passage through the pond and across the dam under various operational scenarios (pond drained, pond full, bladder raised, and bladder lowered) and flow pathways (fish ladder, new bypass gates, and roughened channel). Coyote Percolation Dam studies may be included as a section in the Monitoring and Adaptive Management Plan (MAMP) in Term and Condition 8 for post-ADSRP Anderson Dam operations.
   b. Valley Water will provide details in annual reports to NMFS by January 31 of each year regarding fish passage and migration construction activities and steelhead passage conditions status in the prior year. The reports will be submitted electronically to NMFS North Central Coast Office, Attention: San Francisco Bay Branch Supervisor, 777 Sonoma Avenue, Room 325, Santa Rosa, California, 95404-6528. The reports shall contain, at a minimum, the following information: (1) the dates construction activities began and was completed; (2) a brief summary of activities completed, and photographs taken before, during, and after the activity from photo reference points; (3) a discussion of any unanticipated effects or unanticipated levels of effects on steelhead, a description of any and all measures taken to minimize those unanticipated effects and a statement as to whether or not the unanticipated effects had any effect on steelhead; and (4) the number of steelhead killed or injured during the project action.

7. The following terms and conditions implement reasonable and prudent measure 7:
   a. Applicable to all ADP components that include streambank and riparian habitat (temporary and recurring removal of emergent and riparian vegetation, Coyote Creek Flood Protection Project, Live Oak Restoration, Ogier Ponds CM, Sediment Augmentation, and Geomorphic Flows Plan), Valley Water shall submit a post-construction report to NMFS by January 31 of the year following construction of the proposed action. The construction activities report must be submitted electronically to NMFS North-Central Coast Office, Attention: San Francisco Bay Branch Supervisor (darren.howe@noaa.gov), 777 Sonoma Avenue, Room 325, Santa Rosa, California, 95404-6528. The report must contain, at a minimum, the following information:
      i. Dates construction began and was completed, a set of as-built designs, a description of the riparian plantings undertaken, a discussion of any unanticipated effects or

unanticipated levels of ADP-related effects on steelhead, a description of any and all measures taken to minimize those unanticipated effects and a statement as to whether or not the unanticipated effects had any effect on steelhead, the number of steelhead killed or injured during the Project action, and photographs taken before, during, and after the activity from photo reference points.

ii. Valley Water shall ensure that the performance of the construction and riparian plantings is monitored annually for a minimum period of ten (10) years following completion of construction of the Project.

iii. Valley Water will provide details in annual reports to NMFS by January 31 of each year regarding streambank and riparian habitat construction activities and steelhead passage conditions status in the prior year. The reports will be submitted electronically to NMFS North Central Coast Office, Attention: San Francisco Bay Branch Supervisor (darren.howe@noaa.gov), 777 Sonoma Avenue, Room 325, Santa Rosa, California, 95404-6528. Report components associated with monitoring will include:

1. discussion of performance of the constructed features of each project;
2. description of whether or not any new associated problems have arisen, such as unexpected settling or areas of erosion of banks or beds;
3. annual monitoring must assess the performance of riparian plantings;
4. summary of annual monitoring activities, including dates and a description of the locations for each specific monitoring activity with site photographs taken from photo reference points; a discussion of monitoring results; a review of previous monitoring findings, trends and changes observed; and a description of any problems which may have arisen during the monitoring of construction site performance.

8. The following terms and conditions implement reasonable and prudent measure 8:

a. To ensure minimization of impacts to steelhead during ADP implementation, additional specifics and clarity of adaptive management triggers and actions are needed in following AMP objective:

> "restore and maintain a healthy steelhead trout and salmon population in Coyote Creek watershed, by providing: (A) approximately five miles of spawning and rearing habitat below Anderson Dam and in Upper Penitencia Creek; and (B) adequate passage for adult steelhead trout and salmon to reach suitable spawning and rearing habitat, and for out-migration of juveniles."

Valley Water must develop a comprehensive monitoring and adaptive management plan (MAMP) in collaboration with the AMT that is specifically developed for the ADP. The MAMP must be submitted for NMFS review, must be completed by ADSRP Year 5, and must include the following:

i. Include management triggers and actions that may be implemented if adaptive management is required, based on monitoring results. Such adaptive management actions must consider the following key uncertainties and biological goals and objectives: (1) quality and quantity of habitat features that support successful adult and juvenile salmonid migration; (2) quality and quantity of habitat features that support successful spawning and fry emergence; (3) quality and quantity of habitat features that support successful fry and juvenile steelhead growth and survival; (4) quality and quantity of habitat conditions that minimize predation by non-native fish; (5) effective steelhead passage through Coyote Percolation Pond and at Coyote Percolation Dam; (6) quality and quantity of habitat conditions that support adequate food supply/benthic invertebrate productivity; and (7) the quality, quantity, and condition of habitat downstream of Anderson Dam and whether or not this downstream habitat will be adequate to support successful steelhead spawning, rearing, and migration.

ii. Monitoring sufficient to determine if habitat conditions in Coyote Creek downstream of Anderson Dam are adequate to support successful steelhead spawning, rearing, and migration in Coyote Creek downstream of Anderson Dam over the 10-year Phase 1 monitoring period.

iii. Include short-term and long-term goals and objectives related to the conservation of habitat conditions to support steelhead in Coyote Creek. Short-term goals should address the period during construction of the ADSRP, and the long-term goal must be the establishment of sufficient habitat and streamflow conditions in Coyote Creek to support steelhead spawning, rearing, and migration downstream of Anderson Dam following ADSRP construction activities.

iv. Describe the framework of how compliance monitoring, effectiveness monitoring, and status and trends monitoring together will help inform adaptive management actions.

v. Define clear compliance monitoring components, and ensure flexibility to add monitoring of any new actions that may be implemented as a result of adaptive management and include new methods that may arise with advances in technology or knowledge.

vi. Include effectiveness monitoring to assess the degree to which conservation actions are meeting the intended goals and objectives (e.g., the specific biological, physical, or habitat response) of the action.

vii. Include a goals-based approach that can help inform adaptive management actions for both the conservation action being assessed and the broader program.

viii. For status and trends monitoring, ensure the uncertainties related to the critical aspects of steelhead survival and recovery in Coyote Creek are addressed.

ix. Include streamgage maintenance plan to ensure that streamgages are installed and operational to effectively monitor and collect data for all habitat parameters in the MAMP.

x. Include specific measurable criteria that would be used by the AMT to determine if, when, and how above-reservoir steelhead reintroduction would be implemented as an AMP measure. The treatment of above-reservoir steelhead reintroduction in the MAMP must also identify studies that will be performed to further inform the timely, effective implementation of this AMP measure, should it be implemented.

Coordination with the AMT must occur throughout the development of these measurable criteria and studies.

xi. Include annual reporting submitted to NMFS by January 31 of each year. Reports will be submitted electronically to NMFS North Central Coast Office, Attention: San Francisco Bay Branch Supervisor (darren.howe@noaa.gov), 777 Sonoma Avenue, Room 325, Santa Rosa, California, 95404-6528.

9. Included below are NMFS recommendations provided to FERC during FOCP emergency consultation in an August 31, 2020, NMFS letter. NMFS confirms that, to date, Valley Water is in full compliance with the following:

Anderson Reservoir Drawdown and Operations

(1) Resource Agency FOCP Operations Work Group. Valley Water should establish an interagency work group that includes NMFS to support Valley Water's implementation of FOCP operations and minimize impacts to threatened CCC steelhead during the period of Anderson Reservoir drawdown. The operations work group should meet monthly, or more frequently if warranted, for the purpose of reviewing current information regarding Coyote Creek conditions (i.e., flow, temperature, water quality), steelhead distribution, imported water operations, and Valley Water's operational forecasts. Information shared real-time by Valley Water will allow NMFS to provide guidance regarding the effects of operational decisions on steelhead, determine if avoidance and minimization measures for steelhead are performing as anticipated, and support FOCP's goal of minimizing environmental impacts.

(2) Coyote Creek Temperature Monitoring and Suitability for Steelhead. Valley Water's Analysis of Effects on National Marine Fisheries Listed Species and Designated Critical Habitat from Anderson Dam Reservoir FERC Order Compliance Project defines water temperature as suitable for juvenile steelhead rearing if less than 22°C and proposes actions if habitat conditions are not suitable.1 Valley Water does not identify if the 22°C threshold is a daily average, daily maximum, or a multi-day running average. Based on published scientific literature, NMFS believes a lower threshold is appropriate to define suitable water temperatures for juvenile steelhead rearing. There is also a need to consider temperature suitability for egg incubation and smolt outmigration. We recommend Valley Water work with the Anderson Dam Seismic Retrofit Project Fisheries Technical Workgroup (ADSRP Fisheries TWG) and utilize published literature, such as the references below, to determine appropriate temperature suitability thresholds for all steelhead life stages in Coyote Creek.

(3) Aquatic Invasive Species Monitoring and Control. It is expected that invasive piscivorous fish currently present in Anderson Reservoir will be transported downstream during reservoir drawdown and take up residence in lower Coyote Creek. Valley Water should implement an invasive species control program for the benefit of steelhead and other native aquatic species in Coyote Creek below Anderson Dam during the FOCP. A draft plan should be developed and provided to NMFS for review by December 2021. It

is recommended that this plan include preventative, targeted, and opportunistic control, as well as a monitoring and reporting component to assess the program's effectiveness. Targeted control should focus on reaches expected to harbor exotic predatory species (e.g., Coyote Percolation Pond, Ogier Ponds, and other former gravel extraction sites). Opportunistic control should include events, such as dewatering for construction activities, monitoring/sampling activities, and fish rescues.

Anderson Dam Tunnel Project

(4) Adjustable Weirs at Anderson Dam Tunnel Project (ADTP) Outlet Structure. The fixed weirs proposed for installation in the northern and southern outlet channels below the ADTP outlet structure should be replaced or retrofitted with adjustable weirs prior to completion of the ADSRP. Installation of adjustable weirs will allow for the flow split between the two ADTP outlet channels to be modified in response to varying reservoir release rates, water temperature, fish behavior, and other changing conditions. Valley Water's Response to Comments on the FOCP Draft Reservoir Drawdown and Operations Plan states their commitment to work with NMFS in review of alternatives, including adjustable weirs in the outlet channels. NMFS recommends a formal process be established to facilitate our participation in the design of adjustable weirs, and provides for NMFS review and input on the 30-percent, 60-percent, 90-percent and final iterations of the design. The proposed operations manual, maintenance manual, and monitoring plans should also be developed in coordination with NMFS.

(5) Fish Monitoring in the Northern Outlet Channel. Monitoring of the northern outlet channel at the base of Anderson Dam should be conducted to evaluate fish use and stranding following ADTP construction and channel reopening. Surveys should be performed immediately following all flow events that re-water the northern outlet channel. A detailed survey plan for monitoring fish use and stranding should be developed and provided to NMFS for review prior to completion of ADTP. Monitoring results should be provided to NMFS within two weeks of each survey.

Coyote Percolation Pond Inflatable Dam Project

(6) Fish Passage at Coyote Percolation Dam Replacement Project. The new Coyote Percolation Dam facility should provide effective fish passage that meets current NMFS standards for the design, operation, and maintenance of fishways for anadromous salmonids. The new facility should be configured to provide for unimpeded fish passage when the bladder dam is deflated (i.e., passage through the channel opening created by the deflated bladder). For periods when the bladder dam is inflated, the ladder should be designed to provide satisfactory upstream and downstream passage that comports with NMFS' fishway facility design guidelines (NMFS 2022).

NMFS recommends a formal process be established to facilitate our participation in the design of the new facility. This process should include establishment of a focused work group that includes NMFS and meets monthly, or more frequently if warranted, for the purpose of collaboratively developing a solution to fish passage and incorporating design features that provide for safe, timely, and effective passage of steelhead at the new facility. The process should provide for NMFS review and input on the 30-percent, 60-percent, 90-percent and final iterations of the design. The proposed operations manual, maintenance manual, and monitoring plans should also be developed in coordination with NMFS. Project plans should include:

- Longitudinal profiles;
- Cross-sections;
- Planform drawings;
- Fish ladder configuration and data demonstrating how the facility comports with NMFS' fish passage guidance (NMFS 2011);
- Calculation of low and high fish passage design flows for juvenile and adult life stages with supporting hydrologic data;
- Operations plan that describes fish ladder, bladder dam, and radial gate operations with the expected frequency and timing of different operational scenarios.

Imported Water Releases and Cross Valley Pipeline Extension

(7) Steelhead and Water Quality Monitoring. Please see NMFS letter of August 14, 2020 with recommendations to monitor steelhead presence and habitat conditions in Coyote Creek during the FOCP's discharge of imported water to Coyote Creek and Anderson Reservoir operations pursuant to the drawdown plan. Water quality monitoring will provide information regarding performance of the chillers and the accuracy of Valley Water's streamflow/temperature forecasting tools. The results of this monitoring will be critical to support decisions regarding future fish rescue and relocation events.

Sediment Management and Monitoring

(8) Minimize Discharge of Sediments from Lowered Reservoir. Valley Water should develop and implement a plan to minimize the discharge of sediment and sediment-laden water from Anderson Reservoir during the FOCP. The plan should include actions to minimize suspended sediment conveyance during all discharges, and efficacy monitoring and reporting to inform adaptive management of these measures throughout the FOCP. This plan should be provided to NMFS for review in October 2020.

(9) Suspended Sediment Monitoring and Reporting. Valley Water should develop a plan to continuously monitor suspended sediment discharged from Anderson Reservoir during the FOCP and monitor the effects of these discharges on Coyote Creek downstream of Anderson Dam. This monitoring plan should be developed in coordination with the ADSRP Fisheries TWG and provided to NMFS for review in October 2020. Development of the plan should consider the following:

- Baseline suspended sediment concentration characterizations and/or comparison of above-reservoir sediment loads to below-reservoir sediment loads;

- Continuous suspended sediment monitoring throughout the duration of the FOCP;
- Water quality sampling;
- Provision of real-time data;
- Quantification of grain size and mass loads of sediment transported to evaluate and confirm estimates in the ADTP sediment transport model (URS 2020a);
- Selection of monitoring sites to assess effects to spawning gravel quality, egg incubation, juvenile rearing, and fish migration;
- Application of monitoring result to inform adaptive management of measures to minimize the discharge of suspended sediment (see Recommendation #8).

(10) Monitoring Impacts to steelhead spawning gravel. Valley Water should supplement their proposal for monitoring the impacts of sediment discharged from the lowered reservoir by leveraging the Habitat Criteria Mapping work already completed by Stillwater Sciences in the 4.5-mile reach below Anderson Dam (Stillwater Sciences Tech Memo, May 2020 [later developed into Stillwater Sciences 2021]). NMFS recommends mapping the spatial quantity and quality of spawning gravels suitable for steelhead prior to reservoir drawdown and annually during the FOCP drawdown period. Mapping should be conducted within the same 4.5-mile reach assessed by Valley Water and Stillwater Sciences for juvenile steelhead rearing, and the following methods applied:

- The aerial extent of suitable gravel patches should be mapped onto the aerial imagery developed for the Habitat Criteria Mapping study's 13 flatwater and 9 riffle habitat units.
- The criteria for determining suitable spawning patches should be those areas having a minimum area of 1.9 square meters with a dominant particle size (D50) in the range of 10 to 50 mm.
- To document existing conditions, baseline mapping should be completed in the fall of 2020 and prior to any potential sediment release.
- Beginning in 2021, Valley Water should remap the extent of suitable spawning patches on an annual basis.
- Suitable spawning areas should be digitized into a GIS and changes in spawning gravel area calculated on an annual basis.
- The percent embeddedness of 20 rocks within one suitable spawning gravel patch should be measured at each of the 22 habitat units during the baseline survey and subsequent annual surveys.

Minimization and Mitigation Actions

(11) Mitigation for Impacts of Sediment and Construction of the ADTP. As stated in materials provided by Valley Water, the FOCP is expected to result in impacts to steelhead designated critical habitat due to sediment released from the reservoir and result in the permanent loss of 3.95 acres of perennial stream habitat below Anderson Dam from construction of the ADTP. Additional temperature related impacts are also expected to occur with the loss of the cold water pool in Anderson Reservoir and increases in imported water discharge rates into Coyote Creek below Anderson Dam. It is also likely

that invasive, non-native fish present in Anderson Reservoir will be transported downstream during reservoir dewatering and operations at deadpool. Valley Water has proposed mitigation for FOCP effects (e.g., remediation of Singleton Road Low Flow Crossing). However, due to the magnitude and duration of expected impacts, NMFS recommends additional compensatory mitigation by implementing a gravel augmentation program and completing one or more large-scale channel and floodplain restoration actions on Coyote Creek. The gravel augmentation program should take advantage of accumulated course gravels from the dewatered Anderson Reservoir basin and utilize these materials to enhance spawning gravels below the dam. The channel and floodplain restoration actions should be of sufficient size to enhance and restore fluvial processes, and habitat conditions for steelhead spawning and rearing. NMFS recommends restoration actions occur within the reach of Coyote Creek between Anderson Dam and Metcalf Road and, within this reach, the approximately one-mile-long Ogier Ponds complex is our highest priority for channel and habitat restoration. Restoration actions should be designed to restore geomorphic processes, reconnect and reactive flood terraces and floodplains, enhance riparian conditions, enhance channel complexity with placement of large wood and coarse sediment, and barrier removal. These mitigation actions should be developed in coordination with NMFS and the ADSRP Fisheries TWG, and be completed prior to November 2028.

(12) Minimize Construction-Related Effects of the FOCP. Valley Water should develop and implement measures to avoid and minimize construction-related impacts to steelhead and critical habitat when building the ADTP, CVP extension, and replacement of the Coyote Percolation Dam. Measures should be designed to avoid and minimize effects from dewatering, fish relocation, discharge of sediment, construction debris, and other potential construction-related impacts. Site-specific avoidance and minimization measures should be provided to NMFS for review prior to initiation of construction activities in Coyote Creek.

Reporting

a. Valley Water will electronically submit an annual report to NMFS by January 31 of each year that documents implementation of FOCP construction activities, and measures to avoid and minimize construction-related impacts to steelhead and critical habitat. The reports will be submitted electronically to NMFS North Central Coast Office, Attention: San Francisco Bay Branch Supervisor (darren.howe@noaa.gov), 777 Sonoma Avenue, Room 325, Santa Rosa, California, 95404-6528.

2.10. Conservation Recommendations

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

2.11. Reinitiation of Consultation

This concludes formal consultation for the Anderson Dam Program (ADP).

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

2.12. "Not Likely to Adversely Affect" Determinations

Under the ESA, "effects of the action" are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (50 CFR 402.02). When evaluating whether the proposed action is not likely to adversely affect listed species or critical habitat, NMFS considers whether the effects are expected to be completely beneficial, insignificant, or discountable. Completely beneficial effects are contemporaneous positive effects without any adverse effects to the species or critical habitat. Insignificant effects relate to the size of the impact and should never reach the scale where take occurs. Effects are considered discountable if they are extremely unlikely to occur.

The FERC and USACE have determined that the proposed ADP may affect, but is not likely to adversely affect (NLAA) the following species and their designated critical habitat. This determination is based on the inclusion of avoidance and minimization measures and the limited use of the habitat in the action area for listed species. Available information indicates the following listed species or Distinct Population Segments [DPS]) under the jurisdiction of NMFS may be affected by the proposed Project:

North American green sturgeon southern DPS *(Acipenser medirostris)*
threatened (71 FR 17757; April 7, 2006)
critical habitat (74 FR 52300; October 9, 2009).

The life history of green sturgeon in California is summarized in NMFS (2018, 2021). The southern DPS (sDPS) of North American green sturgeon spawn in the deep turbulent sections of the upper reaches of the Sacramento River. The sDPS green sturgeon are anadromous, making migrations as adults to the Sacramento River in the spring (Moyle et al. 1995). As juvenile green sturgeon age, they migrate downstream and live in the lower delta and bays of the San Francisco Estuary, spending up to four years there before entering the ocean. Within the San Francisco Estuary, information provided by Kelly et al. (2007) suggests depths less than 10 meters (33 feet) may be preferred during foraging and migration. Adult green sturgeon return from the ocean every few years to spawn, and generally show fidelity to their upper Sacramento River spawning sites. Adult sDPS green sturgeon enter the San Francisco Estuary in late winter through early spring, and juvenile, subadult, and adult sDPS green sturgeon may be present in the San Francisco Estuary and in the tidal portions of the action area year-round.

Within the action area, the tidally-influenced reaches of lower Coyote Creek, its tributaries, and other tidal areas within San Francisco Bay provide rearing habitat for juvenile, subadult, and adult sDPS green sturgeon. Critical habitat for sDPS green sturgeon includes all tidally influenced areas of San Francisco Bay and extends up to the elevation of mean higher high water. The PBFs of designated critical habitat for sDPS green sturgeon in estuarine areas include food resources, water flow, water quality, migratory corridor, water depth, and sediment quality.

As described above (Section 2.5), effect categories occurring solely in freshwater portions of the action area include: fish handling, capture, and relocation; altered instream flows and temperature; pollution from hazardous materials and contaminants; aquatic non-native species introductions; streambank, channel, and riparian habitat; modified fish passage and migration. These effects are not expected to occur in tidally-influenced reaches (estuarine) of lower Coyote Creek and south San Francisco Bay where sDPS green sturgeon may occur and where sDPS critical habitat is designated. Based on the above, the likelihood that these effects will co-occur with sDPS green sturgeon is considered to be discountable.

The effects of proposed ADP activities that may affect sDPS green sturgeon and their critical habitat are limited to the extent of elevated suspended sediment concentrations (SSC) in estuarine waters of lower Coyote Creek. As described above (Section 2.5), elevated SSC and deposited sediment levels are expected in the lower reaches and estuarine waters of Coyote Creek during and immediately following storm events. Extended periods of high suspended sediment levels in the water column may reduce the primary productivity of an aquatic area (Cloern 1987) and fish exposed to high suspended sediment levels may suffer reduced feeding ability and be prone to fish gill injury (Benfield and Minello 1996; Nightingale and Simenstad 2001). However, ADP-related SSC and sediment deposition levels expected in the lower Coyote Creek and south San Francisco Bay portions of the action area are not expected to rise to the level of these effects. Previously described modeling (Section 2.5) indicates that SSC will be highest during and immediately following storm events, SSC will be highest in the reach of Coyote Creek between Anderson Dam and the upstream end of Ogier Ponds, and SSC will decrease as distance from the dam increases. Because the estuarine portions of the action area are a large distance from Anderson Reservoir, significantly less suspended sediment is expected to reach these areas than is expected in the upstream reaches of Coyote Creek (AECOM 2021). Additionally, SSC would be expected to return to background levels within a few tidal cycles and green sturgeon are well-adapted to environments with high suspended sediment concentrations. Green sturgeon life history includes utilization of turbid estuary waters, and green sturgeon possess physiological adaptations to waters with high background levels of suspended sediment and dynamic sediment fluctuations such as those that occur in the San Francisco Bay tidal zone, including the tidal portions of the action area.

Sediment deposition within the tidal portion of the action area could affect the benthic community in the action area; potentially resulting in the temporary loss of prey resources for foraging green sturgeon and affecting PBFs of critical habitat related to food resources and sediment quality. However, benthic habitat quality would be expected to return to background conditions within a few tidal cycles, the benthic community would be expected to recover quickly, and any green sturgeon in the area would be able to utilize large areas of high quality habitats in south San Francisco Bay within and adjacent to the affected area. Based on the above, effects on sDPS green sturgeon and designated critical habitat from elevated SSC and sediment deposition during ADP is considered to be insignificant.

Based on this analysis, NMFS concurs with the FERC and USACE that the proposed action is not likely to adversely affect sDPS green sturgeon and designated critical habitat.

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 associated physical, chemical, and biological 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 may result from actions occurring within EFH or outside of it and may include direct, indirect, site-specific or habitat-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 (50 CFR 600.905(b))].

This analysis is based, in part, on the EFH assessment provided by the FERC and Valley Water (BA Section 8), and descriptions of EFH for Pacific Coast Groundfish (PFMC 2023), Coastal Pelagic Species (CPS) (PFMC 1998, 2024) and Pacific Coast Salmon (PFMC 2014) contained in the fishery management plans (FMPs) developed by the PFMC and approved by the Secretary of Commerce.

3.1. EFH Affected by the Proposed Action

Within the freshwater portions of the ADP action area, Coyote Creek is designated as EFH under the Pacific Coast Salmon Fishery Management Plan (FMP). Within estuarine portions of the ADP action area, lower Coyote Creek and San Francisco Bay is designated as EFH under Pacific Coast Salmon, Coastal Pelagic Species, and Pacific Coast Groundfish FMPs. The FERC and USACE have determined that the ADP may adversely affect EFH. This determination is based on expected short-term adverse effects on EFH that are expected to occur during construction activities.

In addition, the effects of the ADP will occur in areas designated as Habitat Areas of Particular Concern (HAPC) for various species of fish within the Pacific Coast Groundfish and Pacific Coast Salmon FMPs. Salmon HAPC located in areas affected by the ADP include complex channels and floodplains, thermal refugia, and spawning habitat. Estuaries are designated HAPC for both Groundfish and Salmon FMPs. HAPC are described in the regulations as subsets of EFH which are rare, particularly susceptible to human-induced degradation, especially ecologically important, or located in an environmentally stressed area. Designated HAPC are not afforded any additional regulatory protection under the MSA; however, federal projects with potential adverse impacts on HAPC will be more carefully scrutinized during the consultation process.

3.2. Adverse Effects on EFH

NMFS determined the ADP would adversely affect EFH for various life stages of fish species managed under the Pacific Coast Salmon FMP, the Coastal Pelagic Species (CPS) FMP, and the Pacific Coast Groundfish FMP, including complex channels and floodplains, thermal refugia, and spawning habitat HAPC under the Salmon FMP, and estuaries HAPC under the Groundfish FMP.

Adverse effects to estuarine Salmon, Groundfish, and CPS EFH are limited to elevated suspended sediment concentrations and deposition, and are expected to occur in a similar manner as presented above for green sturgeon critical habitat (Section 2.13) and the estuary portion of CCC steelhead critical habitat (Section 2.5) during and after ADP construction activities. The remaining effects pathways listed above are expected to be restricted to freshwater portions of Coyote Creek. As described above (Section 2.13 and 2.5), the effects of elevated SSC and deposition are expected to have minimal effects on estuarine habitat of lower Coyote Creek; and, additional practical measures are not available to further minimize adverse effects.

Adverse effects to freshwater Salmon EFH and HAPCS will occur in a similar manner as presented above for steelhead critical habitat in Section 2.5 of this opinion during and after ADP construction activities, including the following effects pathways: instream flows and temperatures; elevated suspended sediment concentrations (SSC) and deposition; pollution from hazardous materials and contaminants; aquatic non-native species introductions; modified fish passage and migration conditions; and streambank, channel, and riparian habitat modifications. Regarding pollution from hazardous materials and contaminants, the ADP includes best management practices that are expected to effectively avoid and minimize effects to EFH, and additional practical measures are not available to further minimize adverse effects.

Improved habitat conditions to freshwater Salmon EFH are expected post-construction in the same manner as described above resulting from the following: improved flows post-ADSRP during implementation of the FAHCE-Plus Modified Rule Curves; habitat restoration and enhancements; and improved fish passage conditions.

3.3. EFH Conservation Recommendations

NMFS determined that the following conservation recommendations are necessary to avoid, minimize, mitigate, or otherwise offset adverse effects of ADP implementation (FOCP, ADSRP, and post-ADSRP) on freshwater Salmon EFH.

1. To address adverse effects that may result from instream flows and temperatures, implement Terms and Conditions identified to implement Reasonable and Prudent Measure 3.
2. To address adverse effects that may result from elevated SSCs and deposition, implement Terms and Conditions identified to implement Reasonable and Prudent Measure 4.
3. To address adverse effects that may result from aquatic non-native species, implement Terms and Conditions identified to implement Reasonable and Prudent Measure 5.
4. To address adverse effects that may result from Coyote Creek fish passage enhancement projects, implement Terms and Conditions identified to implement Reasonable and Prudent Measure 6.
5. To address adverse effects that may result from Coyote Creek streambank and riparian habitat projects, implement Terms and Conditions identified to implement Reasonable and Prudent Measure 7.
6. To address adverse effects that may result from ADP implementation, undertake monitoring and adaptive management according to Terms and Conditions identified to implement Reasonable and Prudent Measure 8.
7. To address adverse effects that may result from FOCP implementation, implement Terms and Conditions identified to implement Reasonable and Prudent Measure 9.

3.4. Statutory Response Requirement

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

3.5. Supplemental Consultation

The FERC and USACE 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 the FERC and USACE. Other interested users could include Valley Water. Individual copies of this opinion were provided to the FERC and USACE. 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

62 FR 43937. 1997. Endangered and threatened species: listing of several evolutionarily significant units (ESUs) of west coast steelhead. Federal Register 62:43937-43954.

69 FR 33102. 2004. Endangered and threatened species: proposed listing determinations for 27 ESUs of West Coast salmonids. Federal Register 69:33102-33179.

70 FR 52488. 2005. Endangered and Threatened Species; Designation of Critical Habitat for Seven Evolutionarily Significant Units of Pacific Salmon and Steelhead in California; Final Rule. Federal Register 70: 52488-52536. September 2, 2005.

71 FR 834. 2006. National Marine Fisheries Service. Final rule: Listing Determinations for 10 Distinct Population Segments of West Coast Steelhead. Federal Register 71: 834-862. January 5, 2006.

71 FR 17757. 2006. Endangered and Threatened Wildlife and Plants: Threatened Status for Southern Distinct Population Segment of North American Green Sturgeon. Federal Register 71: 17757-17766. April 7, 2006

74 FR 52299. 2009. Final Rule: Endangered and Threatened Wildlife and Plants: Final Rulemaking To Designate Critical Habitat for the Threatened Southern Distinct Population Segment of North American Green Sturgeon. Federal Register 74:52300-52351.

79 FR 20802. 2014. Endangered and Threatened Wildlife; Final Rule to Revise the Code of Federal Regulations for Species Under the Jurisdiction of the National Marine Fisheries Service. Federal Register 79: 20802-20817. April 14, 2014.

81 FR 7214. 2016. Fish and Wildlife Service and the National Oceanographic and Atmospheric Administration. Final Rule. Interagency Cooperation-Endangered Species Act of 1973, as Amended. Definition of destruction or adverse modification of critical habitat. Federal Register 81: 7214-7226. February 11, 2016.

81 FR 7414. 2016. Listing endangered and threatened species and designating critical habitat; implementing changes to the regulations for designating critical habitat. Federal Register 81:7414-7440.

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

85 FR 81822. 2020. Revisions to Hatchery Programs Included as Part of Pacific Salmon and Steelhead Species Listed Under the Endangered Species Act. Federal Register 85:81822-81837.

Abdul-Aziz, O.I., N.J. Mantua, and K.W. Myers. 2011. Potential climate change impacts on thermal habitats of Pacific salmon (*Oncorhynchus* spp.) in the North Pacific Ocean and adjacent seas. Canadian Journal of Fisheries and Aquatic Sciences 68(9):1660-1680.

AECOM. 2021. Update to April 30, 2021 memo on Sediment Deposition in Coyote Creek above Ogier Ponds and Discharge to Estuary. Prepared for Santa Clara Valley Water District.

Alexander, G. R., and E. A. Hansen. 1986. Sand bed load in a brook trout stream. North American Journal of Fisheries Management 6:9-23.

Anderson, J. H., G. R. Pess, R. W. Carmichael, M. J. Ford, T. D. Cooney, C. M. Baldwin, and M. M. McClure. 2014. Planning Pacific salmon and steelhead reintroductions aimed at long-term viability and recovery. North American Journal of Fisheries Management 34: 72–93.

Barnhart, R. A. 1986. Species profiles: life histories and environmental requirements of coastal fishes and invertebrates (Pacific Southwest), steelhead. United States Fish and Wildlife Service Biological Report 82 (11.60).

Bauersfeld, K., 1978. Stranding of juvenile salmon by flow reductions at Mayfield Dam on the Cowlitz River, 1976. State of Washington, Department of Fisheries.

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

Becker, G. S., Reining, I. J., Asbury, D. A., & Gunther, A. 2007. San Francisco Estuary Watersheds Evaluation. Identifying Promising Locations for Steelhead Restoration in Tributaries of the San Francisco Estuary.

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

Benfield, M. C., and T. J. Minello. 1996. Relative effects of turbidity and light intensity on reactive distance and feeding of an estuarine fish. Environmental Biology of Fish 46(2):211-216.

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

Bilby, R.E., B.R. Fransen, and P.A. Bisson. 1996. Incorporation of nitrogen and carbon from spawning coho salmon into the trophic system of small streams: evidence from stable isotopes. Canadian Journal of Fisheries and Aquatic Sciences 53: 164-173.

Bilby, R.E., B.R. Fransen, P.A. Bisson and J.K. Walter. 1998. Response of juvenile coho salmon (*Oncorhynchus kisutch*) and steelhead (*Oncorhynchus mykiss*) to the addition of salmon carcasses to two streams in southwestern Washington, USA. Canadian Journal of Fisheries and Aquatic Sciences 55:1909-1918.

Bjorkstedt, E.P., B.C. Spence, J.C. Garza, D.G. Hankin, D. Fuller, W.E. Jones, J.J. Smith, and R. Macedo. 2005. An analysis of historical population structure for evolutionarily significant units of Chinook salmon, coho salmon, and steelhead in the north-central California coast recovery domain. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Fisheries Science Center. 210 pages.

Bjornn, T. C., M. A. Brusven, M. P. Molnau, J. H. Milligan, R. A. Klamt, E. Chacho, and C. Schaye. 1977. Transport of granitic sediment in streams and its effect on insects and fish. University of Idaho, College of Forestry, wildlife and Range Sciences, Forest, Wildlife and Range Experiment Station Bulletin 17, Moscow, ID.

Bjornn, T.C., and D.W. Reiser. 1991. Habitat requirements of salmonids in streams. Pages 83-138 in W.R. Meehan, editor. Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats. American Fisheries Society Special Publication 19. American Fisheries Society. Bethesda, Maryland. 751 pages.

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

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

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

Buchan, L. A. J. & Randall, P. J. 2003. Assessment of Stream Ecosystem Functions for the Coyote Creek Watershed Coyote Creek Watershed Integrated Pilot Assessment Final Report.

Busby, P.J., T.C. Wainwright, G.J. Bryant., L. Lierheimer, R.S. Waples, F.W. Waknitz and I.V. Burgner, R.L., J.T. Light, L. Margolis, T. Okazaki, A. Tautz, and S. Ito. 1992. Distribution and origins of steelhead trout in offshore waters of the North Pacific Ocean. International North Pacific Fisheries Commission, Bulletin #51, Vancouver, B.C.

Busby, P. J., T. C. Wainwright, G. J. Bryant, L. J. Lierheimer, R. S. Waples, F. W. Waknitz, and I. V. Lagomarsino. 1996. Status review of west coast steelhead from Washington, Idaho, Oregon, and California.

Bustard, D. R., and D. W. Narver. 1975. Aspects of the winter ecology of juvenile coho salmon (*Oncorhynchus kisutch*) and steelhead trout (*Salmo gairdneri*). Journal of the Fisheries Research Board of Canada 32(5):667-680.

Caltrans 2000. First Flush Study 1999-2000 Report, CTSW-RT-00-016, June 2000, 289 pages, https://dot.ca.gov/-/media/dot-media/programs/environmental-analysis/documents/env/ctsw-rt-00-016-a11y.pdf

Caltrans 2003a. Storm Water Monitoring & Data Management Discharge Characterization Study Report, CTSW-RT-03-065.51.42, Nov. 2003, 93 pages, https://dot.ca.gov/-/media/dot-media/programs/environmental-analysis/documents/env/ctsw-rt-03-065-a11y.pdf

Caltrans 2003b. Roadside Vegetated Treatment Sites (RVTS) Study, CTSW-RT-03- 028, Caltrans Division of Environmental Analysis, Nov. 2003, 63 pages, https://dot.ca.gov/-/media/dot-media/programs/environmental-analysis/documents/env/ctsw-rt-03-028-a11y.pdf

Carey, M. P., B. L. Sanderson, T. A. Friesen, K. A. Barnas, and J. D. Olden. 2011. Smallmouth bass in the Pacific Northwest: a threat to native species; a benefit for anglers. Reviews in Fisheries Science 19: 305–315.

Cayan, D. R., M. Tyree, M. D. Dettinger, H. Hidalgo, and T. Das. 2012. Climate change and sea level rise scenarios for California vulnerability and adaptation assessment, California Energy Commission Report CEC-500-2012-008, California Energy Commission, Sacramento, California.

CDFW (California Department of Fish and Wildlife). 2005. Report to the National Marine Fisheries Service for Fisheries Restoration Grant Program Projects conducted under Department of the Army Regional General Permit No. 12 (Corps File No. 27922N) within the United States Army Corps of Engineers, San Francisco District, January 1, 2004 through December 31, 2004. March 1, 2005.

CDFW (California Department of Fish and Wildlife). 2006. Annual Report to the National Marine Fisheries Service for Fisheries Restoration Grant Program Projects conducted under Department of the Army Regional General Permit No. 12 (Corps File No. 27922N) within the United States Army Corps of Engineers, San Francisco District, January 1, 2005 through December 31, 2005. March 1, 2006, CDFW Region 1, Fortuna Office. 58

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

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

CDFW (California Department of Fish and Wildlife). 2009. Annual Report to the National Marine Fisheries Service for Fisheries Restoration Grant Program Projects conducted under Department of the Army Regional General Permit No. 12 (Corps File No. 27922N) within the United States Army Corps of Engineers, San Francisco District, January 1, 2008 through 8 December 31, 2008. March 1, 2009, CDFW Region 1, Fortuna Office.

CDFW (California Department of Fish and Wildlife). 2010. Annual Report to the National Marine Fisheries Service for Fisheries Restoration Grant Program Projects conducted under Department of the Army Regional General Permit No. 12 (Corps File No. 27922N) within the United States Army Corps of Engineers, San Francisco District, January 1, 2009 through 8 December 31, 2009. March 1, 2010, CDFW Region 1, Fortuna Office.

CDFW and USACE (California Department of Fish and Wildlife and U.S. Army Corps of Engineers). 2021. Hatchery and Genetic Management Plan Russian River Steelhead Integrated Harvest Hatchery Program, California. Appendix A – Alternatives Analysis, conducted on the current Warm Springs/Coyote Valley Hatchery steelhead program. Prepared for: National Oceanic and Atmospheric Administration-National Marine Fisheries Service, Santa Rosa, California. Prepared by: CDFW and USACE, July 2021.

CEFWG (California Environmental Flows Working Group). 2021. California Environmental Flows Framework. California Water Quality Monitoring Council Technical Report.

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

Collins, B. W. 2004. Annual report to the National Marine Fisheries Service for scientific research activities conducted under ESA section 10, Permit 1067 California Department of Fish and Game, Fortuna, California.

Cordone, A. J., and D. W. Kelley. 1961. The influences of inorganic sediment on the aquatic life of streams. California Fish and Game 47(2):189-228.

Cloern, J. E. 1987. Turbidity as a control on phytoplankton biomass and productivity in estuaries. Continental Shelf Research 7:1367-1381.

Cloern, J. E., N. Knowles, L. R. Brown, D. Cayan, M. D. Dettinger, T. L. Morgan, D. H. Schoellhamer, M. T. Stacey, M. v. d. Wegen, R. W. Wagner, and A. D. Jassby. 2011. Projected evolution of California's San Francisco Bay-Delta-River system in a century of climate change. PLoS One 6(9):13.

Cross, W. F., C. V. Baxter, K. D. Donner, E. J. Rosi-Marshall, R. A. Kennedy, R. O. Hall Jr., H. A. Wellard Kelly, R. S Rogers. 2011. Ecosystem ecology meets adaptive management: food web response to a controlled flood on the Colorado River, Glen Canyon. Ecological applications 21: 2,016–2,033.

Curtis, R., and G. Scoppettone, California Department of Fish and Game (i.e., CDFW). 1977. Stream Survey Coyote Creek. Report dated May 19.

Crouse, M. R., C. A. Callahan, K. W. Malueg, and S. E. Dominguez. 1981. Effects of fine sediments on growth of juvenile coho salmon in laboratory streams. Transactions of the American Fisheries Society 110:281-286.

Crozier, L. G., McClure, M. M., Beechie, T., Bograd, S. J., Boughton, D. A., Carr, M., Cooney, T. D., Dunham, J. B., Greene, C. M., Haltuch, M. A., Hazen, E. L., Holzer, D. M., Huff, D. D., Johnson, R. C., Jordan, C. E., Kaplan, I. C., Lindley, S. T., Mantua, N. J., Moyle, P. B., Myers, J. M., Nelson, M. W., Spence, B. C., Weitkamp, L. A., Williams, T. H., & Willis-Norton, E. 2019. Climate vulnerability assessment for Pacific salmon and steelhead in the California Current Large Marine Ecosystem. PLoS ONE 14(7): e0217711.

Cushman, R.M. 1985. Review of ecological effects of rapidly varying flows downstream from hydroelectric facilities. North American Journal of Fisheries Management. 5: 330-339.

Demgen, F., and K. Dorsey. 1999. Stormwater Environmental Indicators Demonstration Project. Santa Clara Valley Urban Runoff Pollution Prevention Program, Santa Clara.

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

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

Dudley, P. 2021. Updated Population Estimate Memo. May 28, 2021.

Dunne, T., and L. B. Leopold. 1978. Water in environmental planning. Freeman and Company, New York, NY.

DWR (California Department of Water Resources). 2013. San Francisco Bay Hydrologic Region, State of California Natural Resource Agency Department of Water Resources, Sacramento, California.

ESA (Environmental Science Associates). 2023. Water quality services in support of Ogier Ponds Project planning. Draft Technical Report. Prepared by Valley Water, San Jose, California.

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

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

FERC (Federal Energy Regulatory Committee). 2020a. Interim risk reduction measures – dam safety directives. Project No. 5737. Letter to Mr. Christopher Hakes [Deputy Operating Officer, Dam Safety and Capital Delivery Division, Santa Clara Valley Water District] from David E. Capka, P.E [Director, FERC Division of Dam Safety and Inspections] dated February 20, 2020. Washington, D.C.

Florsheim, J. L., J. F. Mount, and A. Chin. 2008. Bank erosion as a desirable attribute of rivers. AIBS Bulletin 58(6):519-529.

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

Fukushima, L., and E. W. J. Lesh. 1998. Adult and juvenile anadromous salmonid migration timing in California streams. California Fish and Game 84(3):133-145.

Furniss, M. J., T. D. Roelofs, and C. S. Yee. 1991. Road construction and maintenance. Pages 297-324 in W. R. Meehan, editor. Influences of forest and rangeland management on salmonid fishes and their habitats. American Fisheries Society Special Publication 19, Bethesda, MD.

Garza, J. C., and D. E. Pearse. 2008. Population genetic structure of *Oncorhynchus mykiss* in the Santa Clara Valley Region. Final Report to the Santa Clara Valley Water District.

GEI Consultants. 2024. Draft Environmental Impact Report Coyote Creek Flood Protection Project. Available at https://fta.valleywater.org/dl/wGPrmgttAW

Gilpin, M. E., and M. E. Soule. 1986. Minimum Viable Populations: Processes of Species Extinction. Pages 19-34 in M. E. Soule, editor. Conservation Biology. Sinauer Associates, Massachusetts.

Good, J. C. 1993. Roof runoff as a diffuse source of metals and aquatic toxicity in stormwater. Water Science and Technology 28(3–5):317–321.

Good, T.P., R.S. Waples, and P.B. Adams, 2005. Updated status of federally listed ESUs of West Coast salmon and steelhead. U.S. Dept. Commerce, NOAA, NMFS

Gregory, R., and T. Northcote. 1993. Surface, planktonic, and benthic foraging by juvenile chinook salmon (*Oncorhynchus tshawytscha*) in turbid laboratory conditions. Canadian Journal of Fisheries and Aquatic Sciences 50(2):233-240.

Gresh, T., J. Lichatowich, and P. Schoonmaker. 2000. An estimation of historic and current levels of salmon production in the northeast pacific ecosystem. Fisheries 15(1):15-21.

Grossinger, RM, RA Askevold, CJ Striplen, E Brewster, S Pearce, KN Larned, LJ McKee, and JN Collins, 2006. Coyote Creek Watershed Historical Ecology Study: Historical Condition, Landscape Change, and Restoration Potential in the Eastern Santa Clara Valley, California. Prepared for the Santa Clara Valley Water District. A Report of SFEI's Historical Ecology, Watersheds, and Wetlands Science Programs, SFEI Publication 426, San Francisco Estuary Institute, Oakland, CA.

Halleraker, J. H., S. J. Saltveit, A. Harby, J. V. Arnekleiv, H.-P. Fjeldstad, and B. Kohler. 2003. Factors influencing stranding of wild juvenile brown trout (*Salmo trutta*) during rapid and frequent flow decreases in an artificial stream. River Research and Applications 19: 589–603.

Harder, A. M., W. R. Arden, A. N. Evans, M. H. Futia, C. E. Kraft, J. E. Marsden, C. A. Richter, J. Rinchard, D. E. Tillitt, and M. R. Christie. 2018. Thiamine deficiency in fishes: causes, consequences, and potential solutions. Reviews in Fish Biology and Fisheries 28:865–886.

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

Hayes, D. B., C.P. Feixeri, and W.W. Taylor. 1996. Active fish capture methods. Pages 193-220 in B. R. Murphy, and D. W. Willis, editors. Fisheries Techniques, 2nd edition, American Fisheries Society. Bethesda, Maryland.

Hayes, S.A., M.H. Bond, C.V. Hanson, E.V. Freund, J.J. Smith, E.C. Anderson, A.J. Ammann, and B.R. MacFarlane. 2008. Steelhead growth in a small central California watershed: Upstream and estuarine rearing patterns. Transactions of the American Fisheries Society 137: 114-128.

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

HDR. 2016. Draft Anderson Dam and Coyote Dam Fish Passage Feasibility Evaluation. Prepared by HDR for Santa Clara Valley Water District, San Jose, California.

Herbert, D. M. W., and J. C. Merkens. 1961. The effects of suspended mineral solids on the survival of trout. International Journal of Air and Water Pollution 5: 46–55.

Hokanson, K. E. F., C. F. Kleiner, and T. W. Thorslund. 1977. Effects of constant temperatures and diel temperature fluctuations on specific growth and mortality rates and yield of juvenile rainbow trout, *Salmo gairdneri*. Journal of the Fisheries Research Board of Canada 34:639- 648.

Hubert, W. A. 1996. Passive capture techniques, American Fisheries Society, Suite 110, 5410 Grosvenor Lane, Bethesda, Maryland 20814-2199, USA.

Hunter, M. A. 1992. Hydropower flow fluctuations and salmonids: a review of the biological effects, mechanical causes and options for mitigation. Technical Report. State of Washington Department of Fisheries, Olympia, Washington.

Iwamura, T. I. 1999. Geology of the Watersheds. Comprehensive Reservoir Watershed Report. Review Draft. Santa Clara Valley Water District.

Kadir, T., Mazur, L., Milanes, C., & Randles, K. 2013. Indicators of Climate Change in California. California Environmental Protection Agency, Office of Environmental Health Hazard Assessment Sacramento, CA.

Keeley, E. R. 2003. An experimental analysis of self-thinning in juvenile steelhead trout. Oikos 102:543-550.

Kelly, J. T., A. P. Klimley, and C. E. Crocker. 2007. Movements of green sturgeon, *Acipenser medirostris*, in the San Francisco Bay estuary, California. Environmental Biology of Fishes 79:281-295.

Kiernan, J. D., P. B. Moyle, and P. K. Crain. 2012. Restoring native fish assemblages to a regulated California stream using the natural flow regime concept. Ecological Applications 22: 1,472–1,482.

Kittleson, G., B. Hecht, and D. O. Holmes. 1996. Sedimentation and channel dynamics of the Searsville Lake watershed and Jasper Ridge Biological Preserve, San Mateo County, California. Prepared by Balance Hydrologics for Jasper Ridge Biological Preserve, Stanford University.

Kock, T. J., J. W. Ferguson, M. L. Keefer, and C. B. Shreck. 2021. Review of trap-and-haul for managing Pacific salmonids (Oncorhynchus spp.) in impounded river systems.

Kondolf, G. M. 1997. Hungry water: effects of dams and gravel mining on river channels. Environmental Management 21(4):533-551.

Lagomarsino. 1996. Status review of west coast steelhead from Washington, Idaho, Oregon and California. United States Department of Commerce, National Oceanic and Atmospheric Administration Technical Memorandum NMFS-NWFSC-27. 261 pages.

Leicester, M. A. & Smith, J. J. 2014. Fish Population Sampling in Fall 2014 on Coyote Creek.

Leicester, M. A. & Smith, J. J. 2015. Fish Population Sampling in 2015 on Coyote Creek.

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

Leopold, L. B. 1968. Hydrology for urban land planning: A guidebook on the hydrologic effects of urban land use, volume 554. US Geological Survey.

Lindley, S.T., R.S. Schick, E. Mora, P.B. Adams, J.J. Anderson, S. Greene, C. Hanson, B.P. May, D.R. McEwan, R.B. MacFarlane, C. Swanson, and J.G. Williams. 2007. Framework for assessing viability of threatened and endangered Chinook salmon and steelhead in the Sacramento-San Joaquin Basin. San Francisco Estuary and Watershed Science, 5(1):26.

Linville, R.G., S.N. Luoma, L.S. Cutter, G.A. Cutter. 2002. Increased selenium threat as a result of invasion of the exotic bivalve *Portamocorbula amurensis* into the San Francisco Bay-Delta. Aquatic Toxicology, 57; 51-64.

Lisle, T. E. 1986. Effects of woody debris on anadromous salmonid habitat, Prince of Wales Island, Southeast Alaska. North American Journal of Fisheries Management 6:538-550.

McClure, M., J. Anderson, G. Pess, T. Cooney, R. Carmichael, C. Baldwin, J. Hesse, L. Weitkamp, D. Holzer, M. Sheer, and S. Lindley. 2018. Anadromous Salmonid Reintroductions: General Planning Principles for Long-Term Viability and Recovery. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-NWFSC-141. https://doi.org/10.7289/V5/TM-NWFSC-141

McCullough, D. A. 1999. A review and synthesis of effects of alterations to the water temperature regime on freshwater life stages of salmonids, with special reference to Chinook salmon. Columbia River Inter-Tribal Fish Commission, United States Environmental Protection Agency, Water Division, EPA-910-R-99-010, Seattle, WA.

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

Meehan, W.R., and T.C. Bjornn. 1991. Salmonid distribution and life histories. Pages 47-82 in Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats.

W.R. Meehan, editor. American Fisheries Society Special Publication 19. American Fisheries Society. Bethesda, Maryland. 751 pages.

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

Moser, S., J. Ekstrom, and G. Franco. 2012. Our Changing Climate 2012 Vulnerability and Adaptation to the Increasing Risks from Climate Change in California. A Summary Report on the Third Assessment from the California Climate Change Center. July. CEC-500-20102- 007S.

Moyle, P.B. 1976. Inland fishes of California. University of California Press, Berkeley, California. 405 pages.

Moyle, P. B., R. M. Yoshiyama, J. E. Williams, and E. D. Wikramanayake. 1995. Fish species of special concern in California. California Department of Fish and Game, Davis.

Moyle, P.B. 2002. Inland Fishes of California. Revised and expanded. University of California Press, Berkeley, California. 502 pages.

Moyle, P.B., J.A. Israel, and S.E. Purdy. 2008. Salmon, steelhead, and trout in California; status of an emblematic fauna. Report commissioned by California Trout. University of California Davis Center for Watershed Sciences, Davis, CA.

Murphy, M. L., and W. R. Meehan. 1991. Stream ecosystems. Pages 17-46 in W. R. Meehan, editor. Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats. American Fisheries Society, Special Publication Number 19. American Fisheries Society, Bethesda, MD.

Myrick, C., and J.J. Cech, Jr. 2005. Effects of temperature on the growth, food consumption, and thermal tolerance of age-0 nimbus-strain steelhead. North American Journal of Aquaculture 67: 324-330.

Newcomb, T. W., and T. A. Flagg. 1983. Some effects of Mt. St. Helens volcanic ash on juvenile salmon smolts. Marine Fisheries Review 45(8-12).

Newcombe, C. P., and J. O. Jensen. 1996. Channel suspended sediment and fisheries: a synthesis for quantitative assessment of risk and impact. North American Journal of Fisheries Management 16(4):693-726.

Nightingale, B., and C. A. Simenstad. 2001. Dredging activities: marine issues. Washington State Transportation Center, University of Seattle, Seattle, WA 98105.

NMFS (National Marine Fisheries Service). 1997. Update for Deferred and Candidate ESUs of West Coast Steelhead. December 18, 1997. NMFS-NWFSC Status Review Update Memo.

NMFS (National Marine Fisheries Service). 2000. Guidelines for Electrofishing Waters Containing Salmonids Listed Under the Endangered Species Act. https://media.fisheries.noaa.gov/dam-migration/electro2000.pdf

NMFS (National Marine Fisheries Service). 2016. NOAA Fisheries Service Coastal Multispecies Recovery Plan. California Coast Chinook salmon, Northern California steelhead, Central California Coast steelhead. October 2016. https://www.fisheries.noaa.gov/resource/document/final-coastal-multispecies-recovery-plan-california-coastal-chinook-salmon

NMFS (National Marine Fisheries Service). 2016a. 5-Year Review: Summary and Evaluation of Central California Coast Steelhead. National Marine Fisheries Service West Coast Region. April 2016.

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

NMFS (National Marine Fisheries Service). 2020. 2019 Coyote Creek Above-Reservoir Reconnaissance, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, West Coast Region California Coastal Office, North-Central Coast.

NMFS (National Marine Fisheries Service). 2021. 5-Year Review: Summary and Evaluation of Southern Distinct Population Segment of North American Green Sturgeon. United States. National Marine Fisheries Service. West Coast Region, pp. 61.

NMFS (National Marine Fisheries Service). 2022. NOAA Fisheries West Coast Region Anadromous Salmonid Passage Design Manual, National Marine Fisheries Service, West Coast Region, Portland, Oregon. https://www.fisheries.noaa.gov/resource/document/anadromous-salmonid-passage-facility-design-manual

NMFS (National Marine Fisheries Service). 2024. 5-Year Review: Summary & Evaluation of Central California Coast Steelhead. National Marine Fisheries Service, West Coast Region, pp. 82.

NMFS (National Marine Fisheries Service). 2024a. Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Issuance of Two Section 10(a)(1)(A) Enhancement of Survival Permits, National Marine Fisheries Service. NMFS Consultation ECO Number: WCRO-2024-02866.

NMFS (National Marine Fisheries Service). 2024b. Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion Issuance of ESA Section 10(a)(1)(A) Permit 28026 to the California Department of Fish and Wildlife for the Yuba Reintroduction Program, National Marine Fisheries Service. NMFS Consultation ECO Number: WCR 2024-01521.

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

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

PFMC (Pacific Fishery Management Council). 1998. Appendix D Description and Identification of Essential Fish Habitat for the Coastal Pelagic Species Fishery Management Plan, 7700 NE Ambassador Place, Suite 101, Portland, OR 97220.

PFMC (Pacific Fishery Management Council). 2014. Appendix A to the Pacific Coast Salmon Fishery Management Plan as modified by Amendment 18 to the Pacific Coast Salmon Plan, 7700 NE Ambassador Place, Suite 101, Portland, OR 97220.

PFMC (Pacific Fishery Management Council). 2023. Pacific Coast Groundfish Fishery Management Plan, 7700 NE Ambassador Place, Suite 101, Portland, OR 97220.

PFMC (Pacific Fishery Management Council). 2024. Coastal Pelagic Species Fishery Management Plan, as Amended through Amendment 21, 7700 NE Ambassador Place, Suite 101, Portland, OR 97220.

Phinney, D. E. 1974. Growth and survival of fluorescent-pigment-marked and fin clipped salmon. The Journal of Wildlife Management 38: 132–137.

Pimm, S. L., H. L. Jones, and J. Diamond. 1988. On the risk of extinction. American Naturalist 132(6):757-785.

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

Poole, G. C., and C. H. Berman. 2001. An ecological perspective on in-stream temperature: Natural heat dynamics and mechanisms of human-caused thermal degradation. Environmental Management 27(6):787-802.

Reeves, G.H., Hall, J.D., Roelofs, T.D., Hickman, T.L., Baker, C.O. 1991. Habitat rehabilitation. In Meehan, W.R. (Ed), Influences of forest and rangeland management on salmonid fishes and their habitats, pp. 519-557. American Fisheries Society Special Publication 19.

Reiser, D. W., and T. C. Bjornn. 1979. Habitat requirements of anadromous salmonids. Influence of forest and rangeland management on anadromous fish habitat in western United States and Canada. United States Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station; University of Idaho, Idaho Cooperative Fishery Research Unit, PNW-96, Portland.

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

Satterthwaite, W.H., M.P. Beakes, E.M. Collins, D.R. Swank, J.E. Merz, R.G. Titus, S.M. Sogard, and M. Mangel. 2009. Steelhead life history on California's Central Coast: Insights from a state-dependent model. Transactions of the American Fisheries Society 138: 532–548.

Scavia, D., J.C. Field, D.F. Boesch, R.W. Buddemeier, V. Burkett, D.R. Cayan, M. Fogarty, M.A. Harwell, R.W. Howarth, C. Mason, D.J. Reed, T.C. Royer, A.H. Sallenger, and J.G. Titus. 2002. Climate Change Impacts on U.S. Coastal and Marine Ecosystems. Estuaries, volume 25(2): 149-164.

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

Servizi, J. A., and D. W. Martens. 1992. Sublethal responses of coho salmon (Oncorhynchus kisutch) to suspended sediments. Canadian Journal of Fisheries and Aquatic Sciences 49(7):1389-1395.

Shapovalov, L., and A.C. Taft. 1954. The life histories of the steelhead rainbow trout (*Salmo gairdneri gairdneri*) and silver salmon (*Oncorhynchus kisutch*) with special reference to Waddell Creek, California, and recommendations regarding their management. California Department of Fish and Game, Fish Bulletin 98:1-375.

Sharpe, C. S., D. A. Thompson, H. Lee Blankenship, and C. B. Schreck. 1998. Effects of routine handling and tagging procedures on physiological stress responses in juvenile Chinook salmon. The Progressive Fish-Culturist 60(2):81-87.

Shirvell, C. S. 1990. Role of instream rootwads as juvenile coho salmon (*Oncorhynchus kisutch*) and steelhead trout (*O. mykiss*) cover habitat under varying streamflows. Canadian Journal of Fisheries and Aquatic Sciences. Vol. 47, Number 5: 852-861.

Sigler, J. W., T. C. Bjornn, and F. H. Everest. 1984. Effects of chronic turbidity on density and growth of steelheads and coho salmon. Transactions of the American Fisheries Society 113(2):142-150.

Smith, A.K. 1973. Development and application of spawning velocity and depth criteria for Oregon salmonids. Transactions of the American Fisheries Society 102: 312- 316.

Smith, J. J. 1998. Steelhead and other fish resources of Western Mt. Hamilton streams. Department of Biological Sciences, San Jose State University, San Jose, CA.

Smith, J. J. 2016. Fish Population Sampling in 2016 on Coyote Creek.

Smith, J. J. 2017. Fish Population Sampling in 2017 on Coyote Creek.

Smith, J. J. 2018. Fish Population and Environmental Sampling in 2014-2018 on Coyote Creek.

Smith, J. J. 2020. Fish Population and Environmental Sampling in 2014-2020 on Coyote Creek.

Snyder, J. O., 1905. Notes on the Fishes of the Streams Flowing into San Francisco Bay. Pages 329-338 in Fisheries, U.S. Bureau of, editor. Report of the Commissioner of Fisheries to the Secretary of Commerce and Labor for the Fiscal Year Ending June 30, 1904 and special papers. Government Printing Office, Washington, D.C.

Sogard, S.M., J.E. Merz, W.H. Satterthwaite, M.P. Beakes, D.R. Swank, E.M. Collins, R.G. Titus, and M. Mangel. 2012. Contrasts in habitat characteristics and life history patterns of *Oncorhynchus mykiss* in California's Central Coast and Central Valley. Transactions of the American Fisheries Society 141: 747-760.

Sorenson, D., M. M. McCarthy, E. J. Middlebrooks, and D. B. Porcella. 1977. Suspended and dissolved solids effects on freshwater biota: a review, U. S. Environmental Protection Agency, Ecol. Res. Serv. EPA-600/3-77-042.

Spence, B. C., G. A. Lomnnicky, R. M. Hughes, and R. P. Novitzki. 1996. An ecosystem approach to salmonid conservation, TR-4501-96-6057, ManTech Environmental Research Services, Inc., Corvallis, Oregon.

Spence, B.C., E.P. Bjorkstedt, J.C. Garza, J.J. Smith, D. G. Hankin, D. Fuller, W.E. Jones, R. Macedo, T.H. Williams, E. Mora. 2008. A framework for assessing the viability of threatened and endangered salmon and steelhead in the North-Central California Coast recovery domain. NOAA-TM-NMFS-SWFSC-423. NOAA Technical Memorandum NMFS. 194 pages.

Spence, B.C., Bjorkstedt E.P., Paddock, S. and L. Nanus. 2012. Updates to biological viability criteria for threatened steelhead populations in the North-Central California Coast Recovery Domain. National Marine Fisheries Service. Southwest Fisheries Science Center, Fisheries Ecology Division. March 23.

Spence, B. C. 2016. North-Central California Coast Recovery Domain. Pages 26 – 47 in T.H. Williams, B.C. Spence, D.A. Boughton, R.C. Johnson, L. Crozier, N. Mantua, M.

O’Farrell, and S.T. Lindley. 2016. Viability Assessment for Pacific Salmon and Steelhead Listed Under the Endangered Species Act: Southwest. 2 February 2016 Report to National Marine Fisheries Service – West Coast Region from Southwest Fisheries Science Center, Fisheries Ecology Division 110 Shaffer Road, Santa Cruz, California 95060.

Stillwater Sciences. 2020a. Anderson Dam Tunnel Project: Fish Rescue and Relocation Plan Supplement. Prepared by Stillwater Sciences, Berkeley, California for Santa Clara Valley Water District, San Jose, California.

Stillwater Sciences. 2020b. Sediment Deposition Monitoring Plan in Coyote Creek Downstream of Anderson Dam. Prepared by Stillwater Sciences on behalf of the Santa Clara Valley Water District. Federal Energy Regulatory Commission Order Compliance (P-5737-007). November 2020.

Stillwater Sciences. 2021. Coyote Creek Instream Flow Assessment. Prepared by Stillwater Sciences, Berkeley, California for Santa Clara Valley Water District, San Jose, California.

Stillwater Sciences. 2023. Ecological Feasibility Evaluation of Steelhead Passage at Anderson and Coyote Dams. Revised Final Technical Memorandum. Prepared by Stillwater Sciences, Berkeley, California for Santa Clara Valley Water District, San Jose, California.

Stober, Q. J., B. D. Ross, C. L. Melby, P. A. Dinnel, T. H. Jagielo, and E. O. Salo. 1981. Effects of suspended volcanic sediment on coho and Chinook salmon in the Toutle and Cowlitz rivers. Technical Completion Report FRI-UW-8124. University of Washington, Fisheries Research Institute, Seattle, Washington.

Sutphin, Z., S. Durkacz, M. Grill, L. Smith, and P. Ferguson. 2019. Adult Spring-Run Chinook Salmon Monitoring, Trap and Haul and Rescue Actions in the San Joaquin River Restoration Area, 2019 Monitoring and Analysis Report. San Joaquin River Restoration Program Annual Technical Report. San Joaquin River Restoration Program.

Sutphin, Z. 2025. Adult Spring-run Chinook Salmon Monitoring and Trap and Haul, 2025 Administrative Draft Proposal. San Joaquin River Restoration Program.

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

Swain, D. L., Langenbrunner, B., Neelin, J. D., and Hall, A. 2018. Increasing precipitation volatility in twenty-first-century California. Nature Climate Change 8(5): 427-433.

SWFSC (Southwest Fisheries Science Center). 2023. Viability assessment for Pacific salmon and steelhead listed under the Endangered Species Act: Southwest. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-SWFSC-686. https://doi.org/10.25923/039q-q707

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

Thompson, A. M., R. R. O'Connor, M. A. Timko, L. S. Sullivan, S. E. Rizor, J. H. Hannity, C. D. Wright, C. A. Fitzgerald, M. M. Meagher, J. D. Stephenson, J. R. Skalski, and R. L. Townsend. 2012. Evaluation of downstream juvenile steelhead survival and predator-prey interactions using JSATS through the Priest Rapids Reservoir in 2011. Report prepared for Public Utility District No. 2 of Grant County, Washington by Blue Leaf Environmental, Inc., Ellensburg, Washington.

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

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

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

URS. 2020a. Anderson Dam Tunnel Project Sediment Transport Modeling. Technical Memorandum, Version #2.1. Prepared by URS Corporation, Oakland, California for Santa Clara Valley Water District, San Jose, California.

URS. 2020b. Anderson Dam Seismic Retrofit Project Sediment Transport Modeling, Coyote Creek Modifications. Prepared for Santa Clara Valley Water District.

USEPA (U.S. Environmental Protection Agency). 2001. Issue Paper 5: Summary of technical literature examining the effects of temperature on salmonids. Region 10, Seattle, WA. EPA 910-D-01-005. 113pp.

Valley Water. 2008. Mid-Coyote Creek Flood Protection Project. Baseline Fisheries Monitoring Report Year 1 (2007).

Valley Water. 2009. Mid-Coyote Creek Flood Protection Project. Baseline Fisheries Monitoring Report Year 2 (2008).

Valley Water. 2019a. Transmittal of Anderson Dam Seismic Retrofit (ADSR) Project Description and Geographic Scope. Prepared by Valley Water, San Jose, California for Federal Energy Regulatory Commission, Washington, D.C.

Valley Water. 2019b. Water Year 2018 Exploratory Juvenile *Oncorhynchus mykiss* Sampling in Coyote Creek. Prepared by Valley Water, San Jose, California.

Valley Water. 2020. 2019 Coyote Creek Watershed Fisheries Monitoring. Compilation report including: 2019 Juvenile *Oncorhynchus mykiss* Rearing Monitoring in the Coyote Creek Watershed; Coyote Creek 2018-2019 Adult Salmonid Migration Monitoring Using the Vaki Riverwatcher Passive Monitoring System at the Coyote Percolations Facility. Prepared by Valley Water, San Jose, California.

Valley Water. 2020a. FERC Order Compliance Project for Anderson Reservoir and Dam: Invasive Species Monitoring and Control Plan. November 2020. Prepared by Valley Water, San Jose, California.

Valley Water. 2021a. Anderson Reservoir Outlet Fyke Trapping Operations Report. Prepared by Valley Water, San Jose, California.

Valley Water. 2021b. Coyote Creek 2019-2020 Adult Salmonid Migration Monitoring Using the Vaki Riverwatcher Passive Monitoring System at the Coyote Percolation Dam Fish Ladder. Prepared by Valley Water, San Jose, California.

Valley Water. 2021c. Coyote Creek Fish Rescue and Relocation. Prepared by Valley Water, San Jose, California. Prepared by Valley Water, San Jose, California.

Valley Water. 2021d. 2020 Coyote Creek Watershed Fisheries Monitoring. Compilation report includes: 2020 Juvenile *Oncorhynchus mykiss* Rearing Monitoring in Upper Penitencia Creek; 2020 Upper Penitencia Creek Juvenile *Oncorhynchus mykiss* Fish Collection; Coyote Creek 2019-2020 Adult Salmonid Migration Monitoring Using the Vaki Riverwatcher Passive Monitoring System at the Coyote Percolation Dam Fish Ladder; and Coyote Creek Watershed *Oncorhynchus mykiss* 2019-2020 Migration Monitoring Using Passive Integrated Transponder Tags. Prepared by Valley Water, San Jose, California.

Valley Water. 2021e. FERC Order Compliance Project for Anderson Reservoir and Dam Water Temperature and Fisheries Monitoring Plan B(6) and B(10) Annual Report for reporting Year of 2021 Including Data Collected from September 2020 to June 2021. Prepared by Valley Water, San Jose, California.

Valley Water. 2021f. Juvenile *Oncorhynchus mykiss* Rearing Monitoring in Coyote Creek. Prepared by Valley Water, San Jose, California.

Valley Water. 2022a. Anderson Reservoir Outlet Fyke Trapping Operations Report - 2022. Prepared by Valley Water, San Jose, California.

Valley Water. 2022b. 2021 Coyote Watershed Fisheries Monitoring. Compilation report includes: 2021 Juvenile Oncorhynchus mykiss Rearing Monitoring in Coyote Creek; 2021 Juvenile Oncorhynchus mykiss Rearing Monitoring in Upper Penitencia Creek; Coyote Creek Watershed Oncorhynchus mykiss 2020 – 2021 Migration Monitoring Using Passive Integrated Transponder Tags; Coyote Creek 2020 – 2021 Adult Salmonid Migration Monitoring Using the Vaki Riverwatcher Passive Monitoring System at the Coyote Percolation Dam Fish Ladder. Prepared by Valley Water, San Jose, California.

Valley Water. 2022c. FERC Order Compliance Project for Anderson Reservoir and Dam Water Temperature and Fisheries Monitoring Plan B(6) and B(10) Annual Report for Reporting Year of 2022 Including Data Collected from July 2021 to June 2022. Prepared by Valley Water, San Jose, California.

Valley Water. 2023a. 2022 Coyote Watershed Fisheries Monitoring. Compilation report includes: 2022 Juvenile *Oncorhynchus mykiss* Rearing Monitoring in Coyote Creek; 2022 Juvenile *Oncorhynchus mykiss* Rearing Monitoring in Upper Penitencia Creek; Coyote Creek *Oncorhynchus mykiss* 2021 – 2022 Migration Monitoring Using Passive Integrated Transponder Tags; Coyote Creek 2021 – 2022 Adult Salmonid Migration Monitoring Using the Vaki Riverwatcher Passive Monitoring System at the Coyote Percolation Dam Fish Ladder; and Exploratory Electrofishing in Arroyo Aguague – 2022. Prepared by Valley Water, San Jose, California.

Valley Water. 2023b. FERC Order Compliance Project for Anderson Reservoir and Dam Water Temperature and Fisheries Monitoring Plan B(6) and B(10) Annual Report for reporting Year of 2023 Including Data Collected from July 2022 to June 2023. Prepared by Valley Water, San Jose, California.

Valley Water. 2023c. Fish and Aquatic Habitat Collaborative Effort Final Program Environmental Impact Report. Prepared by Valley Water, San Jose, California. https://fta.valleywater.org/dl/4pYN44WANr

Valley Water. 2024a. Coyote Creek Watershed Monitoring Program 2022-2023 Monitoring Season Results. Prepared by Valley Water, San Jose, California.

Valley Water. 2024b. eDNA Sampling – Coyote Creek May 2024. Prepared by Valley Water, San Jose, California.

Valley Water. 2024c. eDNA Sampling – Coyote Creek June 2024. Prepared by Valley Water, San Jose, California.

Valley Water. 2024d. eDNA Sampling – Coyote Creek July/August 2024. Prepared by Valley Water, San Jose, California.

Valley Water. 2024e. eDNA Sampling – Coyote Creek September 2024. Prepared by Valley Water, San Jose, California.

Valley Water. 2024f. FERC Order Compliance Project for Anderson Reservoir and Dam Water Temperature, Fisheries Monitoring, Passive Integrated Transponder and Fyke Trap Plan B(6) and B(10) and Paragraph C Annual Report for Reporting Year of 2023 Including Data Collected from July 2023 to June 2024. Prepared by Valley Water, San Jose, California.

Valley Water. 2024g. Final Biological Evaluation for National Marine Fisheries Service Listed Species and Designated Critical Habitat Potentially Affected by the Anderson Dam Program, No. 5737. Prepared for Federal Energy Regulatory Commission, Army Corps of Engineers, and the National Marine Fisheries Service. Submitted by Santa Clara Valley Water District 5750 Almaden Expressway San Jose, CA 95118-3686 and Stillwater Sciences 2855 Telegraph Avenue, Suite 400 Berkeley, CA 94705. May 2024.

Valley Water. 2025. Anderson Dam Seismic Retrofit Project Final Environmental Impact Report. Santa Clara Valley Water District. SCH # 2013082052. Volumes 1-3. February 24, 2025.

Valley Water. 2025a. Coyote Creek Watershed Monitoring Program 2023-2024 Monitoring Season Results. Prepared by Valley Water, San Jose, California.

Valley Water and Stillwater Sciences. 2020. Federal Energy Regulatory Commission Order Compliance Project Coyote Creek Fish Rescue and Relocation. Prepared by Valley Water, San Jose, California and Stillwater Sciences, Berkeley, California.

Velagic, E. 1995. Turbidity Study (A Literature Review): A report to Delta Planning Branch Department of Water Resources, State of California. Centers for Water and Wildland Resources, University of California, Davis, California.

Waters, T. F. 1995. Sediment in streams: sources, biological effects, and control. American Fisheries Society Monograph 7.

Wesche, T. A., C. M. Goertler, and C. B. Frye. 1987. Contribution of Riparian Vegetation to Trout Cover in Small Streams. North American Journal of Fisheries Management 7:151153.

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

Williams, T. H., Lindley, S. T., Spence, B. C. & Boughton, D. A. 2011. Status review update for Pacific salmon and steelhead listed under the Endangered Species Act: Southwest. NOAA's National Marine Fisheries Service, Southwest Fisheries Science Center, Santa Cruz, CA

Williams, T.H., B.C. Spence, D.A. Boughton, R.C. Johnson, L. Crozier, N. Mantua, M. O'Farrell, and S.T. Lindley. 2016. Viability assessment for Pacific salmon and steelhead listed under the Endangered Species Act: Southwest. 2 February 2016 Report to National Marine Fisheries Service – West Coast Region from Southwest Fisheries Science Center, Fisheries Ecology Division 110 Shaffer Road, Santa Cruz, California 95060. 182 pages.

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

Williams, A.P., E. R. Cook, J. E. Smerdon, B. I. Cook, J. T. Abatzoglou, K. Bolles, S. H. Baek, A. M. Badger, and B. Livneh. 2020. Large contribution from anthropogenic warming to an emerging North American megadrought. Science 268, 314-318. April 17.

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

Wurtsbaugh, W.A., and G.E. Davis. 1977. Effects of temperature and ration level on the growth and food conversion efficiency of *Salmo gairdneri*, Richardson. Journal of Fish Biology 11: 87-98.

Zedonis, P.A. and T.J. Newcomb. 1997. An evaluation of flow and water temperatures during the spring for protection of salmon and steelhead smolts in the Trinity River, California. United States Fish and Wildlife Service, Arcata, CA.