UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
650 Capitol Mall, Suite 5-100
Sacramento, California 95814-4700

Refer to NMFS No: ECO # WCRO-2021-00556

May 17, 2021

Ms. Kelly McNally
Environmental Branch Chief
Office of Environmental Management
District 3, North Region
California Department of Transportation
703 B Street
Marysville, California 95901

Re: Endangered Species Act Section 7(a)(2) Biological Opinion, and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Sacramento River Butte City Bridge Replacement Reinitiation 2021.

Dear Ms. McNally:

Thank you for your communication of March 12, 2021, requesting reinitiation of consultation with the 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 Sacramento River Butte City Bridge Replacement Project (Project). This consultation was conducted in accordance with the 2019 revised regulations that implement section 7 of the ESA (50 CFR 402, 84 FR 45016). Thank you, also, for your request for consultation pursuant to the essential fish habitat (EFH) provisions in Section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA)(16 U.S.C. 1855(b)) for this action.

This biological opinion (BO) is based on the final revised 2021 Biological Assessment (BA) for this Project located in Glenn County, California. Where relevant, we have adopted the information and analyses you have provided and/or referenced, but only after our independent, science-based evaluation confirmed that they meet our regulatory and scientific standards. Specifically, we incorporate by reference here the following documents that have been provided by Caltrans, either in the initiation package that accompanied the original request for consultation, or in the subsequent correspondence with NMFS through electronic mail (email) during the course of the consultation process:

- The Butte City Bridge Replacement Project BA submitted with the request for consultation (Caltrans 2021a)
- The Butte City Bridge Replacement Project Habitat Restoration Plan (Caltrans 2021b)

The above referenced documents have been incorporated into the administrative record for this consultation on file at our California Central Valley Office in Sacramento, California, and can be made available upon request.

Based on the best available scientific and commercial information, the BO concludes that the Project is not likely to jeopardize the continued existence of the federally listed threatened California Central Valley steelhead (*Oncorhynchus mykiss*), Central Valley spring-run Chinook salmon (*O. tshawytscha*), Sacramento River winter-run Chinook salmon (*O. tshawytscha*), or the Southern distinct population segment of North American green sturgeon (*Acipenser medirostris*) and is not likely to destroy or adversely modify their designated critical habitats. NMFS has included an incidental take statement with reasonable and prudent measures and nondiscretionary terms and conditions that are necessary and appropriate to avoid, minimize, or monitor incidental take of listed species associated with the Project.

NMFS recognizes that Caltrans has assumed the Federal Highway Administration's (FHWA) responsibilities under Federal environmental laws for this project as allowed by a Memorandum of Understanding (NEPA Assignment) with the FHWA effective December 23, 2016. As such, Caltrans serves as the lead Federal Action Agency for the proposed project.

Please contact Lyla Pirkola at the California Central Valley Office of NMFS at (916) 930-5615 or via email at Lyla.Pirkola@noaa.gov if you have any questions concerning this section 7 consultation, or if you require additional information.

Sincerely,

A. Catherine Marcinkevage

Cathy Marcinkevage
Assistant Regional Administrator
California Central Valley Office

Enclosure

cc: To the file 151422-WCR2020-SA0033

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
650 Capitol Mall, Suite 5-100
Sacramento, California 95814-4700

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

Sacramento River Butte City Bridge Replacement

NMFS Consultation Number: WCRO-2021-00556

Action Agency: California Department of Transportation (Caltrans)

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species?	Is Action Likely To Jeopardize the Species?	Is Action Likely to Adversely Affect Critical Habitat?	Is Action Likely To Destroy or Adversely Modify Critical Habitat?
Sacramento River winter-run Chinook salmon (*Oncorhynchus tshawytscha*)	Endangered	Yes	No	Yes	No
Central Valley spring-run Chinook salmon (*O. tshawytscha*)	Threatened	Yes	No	Yes	No
California Central Valley steelhead (*O. mykiss*)	Threatened	Yes	No	Yes	No
Southern distinct population segment of North American green sturgeon (*Acipenser medirostris*)	Threatened	Yes	No	Yes	No

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

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

Issued By: A. Catherine Marcinkevage

Cathy Marcinkevage
Assistant Regional Administrator for California Central Valley Office

Date: **May 17, 2021**

TABLE OF CONTENTS

1 INTRODUCTION

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

1.1 Background

The National Marine Fisheries Service (NMFS) prepared the biological opinion (BO) and incidental take statement (ITS) portions of this document in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973 (16 USC 1531 *et seq.*), and implementing regulations at 50 CFR 402.

We also completed an essential fish habitat (EFH) consultation on the proposed action, in accordance with section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1801 *et seq.*) and implementing regulations at 50 CFR 600.

We reviewed Caltrans consultation request document and related materials. Where relevant, we have adopted the information and analyses provided and/or referenced only after our independent, science-based evaluation confirmed they meet our regulatory and scientific standards.

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

1.2 Consultation History

- On August 25, 2017, NMFS received a letter requesting initation of formal consultation and a Biological Assessment (BA) from Caltrans.
- Over the next few months, various dialogues were exchanged about Project effects and Caltrans priorities.
- On June 19, 2018, Caltrans contacted NMFS and asked to prioritize the Project, consultation was initiated.
- On October 5, 2018, NMFS issued a BO for the Project.
- On July 27, 2020, Caltrans requested reinitiation of consultation for project changes regarding pile driving.
- On August 13, 2020, NMFS responded with a letter stating that reinitiation is not warranted because the effects of the proposed project changes were consistent with the effects analyzed in the BO.
- On March 12, 2021, Caltrans requested reinitiation of consultation for project changes including updates to the mitigation and restoration plan. NMFS determined sufficient information was provided and consultation was reinitiated at this time.

1.3 Proposed Federal Action

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

This Caltrans Project proposes to replace the Sacramento River Butte City Bridge (Bridge No. 11-001 7) and the connecting viaduct in a new northern alignment. The Project is located at river mile 168.5 on State Route 162 in Glenn County, California at post mile 76.3-78.6 in the Butte City and Princeton 7.5 Quadrangles. Under MSA, Federal action means any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken by a Federal Agency (50 CFR 600.910).

The existing bridge does not meet current operational seismic safety design. The replacement structure will have a standard shoulder width of 8 feet in both directions of travel. The slope north of the highway would be likely built-up with imported material to reroute the driveway from the highway back onto the levee.

Dewatering may be needed in the active channel to prepare for driving piles and cofferdams. Tree, debris, and sediment that may have accumulated against the bents (transverse ridged frames) may need to be removed prior to placing cofferdams or sediment barriers.

Caltrans is also proposing to replace the existing viaduct across the Sacramento River floodplain from post mile 76.7 to 77.45 (a total length of 3,200 feet). The existing viaduct spans 35 feet between column rows and the new viaduct would span 45 feet between column rows. The viaduct slab depth would be about 2 feet. Span length would be in the 40-45 foot range. Each bent would consist of 24-inch cast-in-steel-shell (CISS) piles, each with a concrete extension to the superstructure. The CISS pile shell would be installed using conventional pile driving equipment to an approximate depth of 60 feet. None of the piles would be adjacent to water and the closest pile would be 79 feet from the river. The soil from inside the driven piles would be removed from the steel shell using a drill. Soil would be removed from the site or placed in the new embankment. Groundwater would likely be encountered during drilling requiring dewatering operations. After the pile is poured, individual columns would be formed and poured using steel or cardboard forms. Following column pour, falsework would be erected. Falsework would consist of steel stringers on timber posts and pads. Construction would likely progress in a linear fashion from one end to the other, probably starting at abutment 1 on the west end of the viaduct.

Other work includes new ditches that would be constructed for roadside runoff using extended or new culverts and over drains, new bridge approach guardrail, levee road connections, and realigning the County Road 61/SR 162 intersection. The bridge approach embankment slopes would be generally 4:1 or less, but no steeper than 2:1.

Any traffic count census loops within existing pavement would be replaced due to the highway realignment and/or shoulder widening. Through Butte City, a curb, gutter, and sidewalk would be constructed on one side of SR 162, along with curb ramps, and new driveways. After repairing failed pavement areas within the lanes and shoulders, the highway would then be overlaid with new asphalt

concrete (AC). AC pavement grindings would be disposed of in conformance with the provisions in the Standard Specifications. Erosion control measures would be used to manage disturbed soil areas. The storm-water treatment best management practice (BMP) strategy is to treat 100% of the water quality volume/water quality flow by maximizing site perviousness and the deployment of biofiltration consistent with the ability to convey bridge runoff to the abutments for treatment.

Some minimization measures in the Storm Water Pollution Prevention Plan require wetting of stock piles, disturbed areas, and road surfaces for dust abatement. Water would potentially be drafted from the Sacramento River from the dewatering of the piles and cofferdams. Should water drafting become necessary for dust suppression or other activities, it would be conducted in accordance with NMFS guidelines for water drafting.

Vegetation Removal

Temporary access roads would be required to access work below the bridge. These proposed temporary roads would most likely be located on the north and south sides of the new bridge and viaduct. Minor vegetation removal would occur as needed to remove the existing abutments and piers and to construct a small portion of the temporary access roads, the new bridge, and the viaduct abutments and piers.. Removal of the existing bridge and viaduct would provide an additional area within the Project area for possible replanting of riparian species.

The proposed project would permanently remove 0.37 acres and temporarily remove 0.56 acres of riparian habitat. Any areas of the river banks that are disturbed during construction would be returned to as near pre-construction conditions as feasible following construction. Trees and shrubs proposed for removal are in locations that conflict with the proposed new bridge structure and where access is necessary to facilitate the demolition and removal of the existing bridge structure. These trees and shrubs are located along the banks of the Sacramento River and parallel to the existing structures within the Project area. The trees along the banks have the potential to provide shade and contribute nutrients to the river. Existing and adjacent native plant communities located within the Project limits and/or adjacent to the Project area would be surrounded during construction by protective fencing. This is intended to prevent unnecessary removal of additional riparian vegetation. Where feasible, rapidly sprouting plants, such as willows, would be cut off at ground level leaving the root system intact to promote regeneration.

Caltrans would concurrently restore 4 acres of a California State Parks parcel adjacent to the project to mitigate for the permanent loss of 0.37 acres of riparian habitat. This parcel borders the Sacramento River and has flooded approximately every 10 years (1997, 2006, and 2017). It is located 0.5 miles east of a levee surrounded by U.S. Fish and Wildlife Service (USFWS) refuge property. Restoration details are included in the Caltrans 2021 Butte City Bridge Replacement Project Habitat Restoration Plan (Restoration Plan).

Trestle Installation

Temporary work platforms (trestles) are required for construction of the new bridge and removal of the existing bridge. A total of two trestles would be used; one to construct the new bridge and one for the removal of the existing bridge. Temporary work trestles would be built either both upstream or both downstream of the proposed and existing bridges. Both trestles would be constructed during the in-water work window between June 1 and October 15. The trestles would be placed between 20 and 75 feet from the new and old structures, respectively. The first trestle would be used as a work

platform to build and support the structure for the new bridge. The second trestle would be used as a work platform to remove the existing structure.

The trestles would be elevated and supported on temporary piles to avoid blocking flow. The contractor would determine the final number and size of piles but the contract would specify that piles will not exceed steel pipe or H-piles greater than 24-inches in diameter. The temporary trestles could be up to 30-50 feet wide with a maximum length of approximately 530 feet. Trestle piles would be placed in the river in groups of 5 to 10 in line with the flow of the river. Typically, the spacing between piles would be between 25 to 35 feet wide. A section of the river would remain open between the piles throughout the duration of construction to allow for fish passage.

The trestles can be designed to resist any flow requirement set by the permitting agency. If it is necessary to be left in the river over the winter, the deck of the temporary trestle could be removed during the rainy season so the structure does not interfere with high flows. While the piles of the temporary trestle are in place in the water, they would be monitored so that any accumulated debris would be removed at least daily, or more often as necessary, to protect the temporary structure.

Although not anticipated, the temporary piles may remain in the river for up to two winters and three summers. The piles used to support the second temporary trestle (used to remove the existing bridge) are anticipated to remain in the water for one season. Trestles would be removed after the new bridge is completed and the existing bridge is removed. To minimize disturbance to the river, the trestles would likely be constructed using top down methods where steel piles are first placed along the shoreline, then topped with the bridge deck units before moving sequentially out into the river. No equipment would operate in the water.

Pile Installation in Water

Approximately 220, 24-inch diameter or smaller temporary trestle piles would be installed in order to construct two trestles crossing the river. A pile driving crane with a D-36 diesel impact hammer and/or vibratory hammer would be used to drive the chosen pile into the ground. A vibratory hammer would be used over an impact hammer whenever feasible. Each temporary trestle pile would be under 60 feet in length. The depth of piles driven may vary depending on substrate composition but is assumed to be approximately 40 feet deep. It is estimated that a maximum of 15 piles per day would be placed. Each pier would be constructed with 4 to 6 piles. Driving piles would take place between June 1 and October 15 when the Sacramento River is at its lowest. With an estimated 20 to 100 strikes per foot of embedment with 40 feet estimated embedment and up to 15 24-inch diameter piles being driven in a day, a maximum of 60,000 strikes per day would be calculated. However, the pile drivers are limited to 40 to 50 strikes per minute with an estimated maximum of 4 hours a day of operational time, so engineers estimate an expected 6,000 strikes per day. At 6,000 strikes per day, trestle pile driving is estimated to last 20 to 40 days.

Falsework would be used to support the bridge structure while under construction. The temporary falsework would be supported by the trestles' steel beams and steel piles that are approximately 16- to 20-inch diameter. With an estimated 20 to 100 strikes per foot of embedment with 40 feet estimated embedment and twenty 16- to 20-inch diameter piles being driven in a day, a maximum of 80,000 strikes per day is estimated. However, the pile drivers are limited to 40 to 50 strikes per minute with an estimated maximum of 4 hours a day of operational time. As such, engineers expect an estimated 12,000 strikes per day.

Eight 6-foot diameter CISS piles would be driven in water or directly adjacent (within 17 feet of the water). Two 6-foot diameter piles are driven to construct each pier with one pile per bent. Both impact and vibratory hammers would be used. A D-100 diesel hammer is expected to be used for the 6-foot diameter piles. Depending upon pile length and capacity, there is expected to be between 20 and 100 strikes per foot of embedment. The estimated length for the 6-foot diameter piles is between 80 to 120 feet. The expected depth the piles would be driven in the riverbed is between 80 to 100 feet. With an estimated 20 to 100 strikes per foot of embedment with 100 feet estimated embedment and one 6-foot diameter pile being driven in a day, a maximum of 10,000 strikes per day is estimated. CISS pile driving is estimated to last 8 to 16 days. Pile driving for the viaduct, at its closest 140 feet from the river, has the potential to occur simultaneous with pile driving in the water. However, 6-foot diameter and 24-inch diameter piles in the water would not be driven simultaneously.

A dewatered casing is the most likely method of attenuation for the 6-foot diameter piles.
Seat casings would be installed with a vibratory hammer, allowed to sink with its own weight, or with an excavator. A cofferdam may also be utilized at the contractor's discretion.

Cofferdams
Cofferdams would likely be used for removal of the existing bridge piers, removal of existing fenders, and attenuation for the driving of 72-inch diameter CISS piles. Cofferdams would be placed by vibrating or impact driving of steel sheet piles into the streambed. It is likely that the cofferdams would need to be dewatered. Cofferdams would most likely be in the range of 700-2,400 square feet. There is a small chance the contractor would elect to remove the fenders and draw rests inside a cofferdam. Such an operation would increase the cofferdam sizes to a maximum of 19,000 square feet.

Sheet piles would be installed if cofferdams are needed. It is estimated that 10 to 15 pairs would be installed each day over 10 to 40 days. This would amount to approximately 500 linear feet of temporary sheet pile driven into the riverbed. Sheet piles would be installed with a vibratory hammer if feasible.

Demolition
The contractor would be required to construct a catchment device to collect all demolition debris. No demolition debris would be allowed to fall within the river.

Staging Areas
The main equipment and staging areas are located within the wide temporary construction easement areas on and beyond the east and west banks of the river. Parking, staging, and storage of equipment and materials would take place in previously disturbed open areas including existing pullouts devoid of trees or ground vegetation within the Project limits.

Construction Schedule
The proposed Project is scheduled as a four season Project, anticipated to take place between 2021 and 2024. Construction would last approximately 772 working days. Construction activities above the ordinary high water mark (OHWM) would occur outside of the in-water work window. In-water work activities would occur during the dry season (June 1-October 15). In-water work activities in the Sacramento River would be confined to three summer seasons. Construction in and over the water would be conducted during daylight hours. Lighting that might be necessary for construction

activities above the OHWM, would be directed away from the Sacramento River to minimize the impact to migrating fish.

The first construction season will consist of clearing and grubbing, initiating phase 1 mitigation planting, driving the first trestle piles and building the trestle, building cofferdams if needed, installing seat casings, and removing fenders and woody debris. The second season will consist of driving piles for the new bridge and viaduct, driving falsework piles (may occur in the first season as well). Season three work consists of building the falsework and superstructure for both the bridge and viaduct. The fourth and final season will consist of driving piles for and building the second trestle, building cofferdams if needed, completing the bridge and viaduct superstructure, and demolishing the existing viaduct and bridge.

1.4 Avoidance and Minimization Measures

Aquatic Sound Attenuation Devices
This measure consists of furnishing, installing, operating, maintaining, and removing an aquatic sound attenuation system to reduce noise generated by driving piles in the water.

Approved aquatic sound attenuation systems would include one or more of the following. Each would attenuate equal to or greater than 5dB:

1) Air bubble curtain used with isolation casing (confined air bubble curtain).

With approval from NMFS, USFWS, and CDFW, the following aquatic sound attenuation systems may be used:

2) Dewatered isolation casing
3) Dewatered cofferdam

Caltrans would require the contractor to submit working drawings and the supplement for the sound attenuation system to the Caltrans engineer, including the following:

1) Complete details of the system including mechanical and structural details
2) Details of anchorage components, air compressors, supply lines, distribution manifolds, aeration pipes, and frames
3) Details of proposed means of isolating noise-producing systems on the driving platform
4) Details of meters, gauges, and recording devices
5) Details of the manufacturer's recommendations for the installation of the flow meters in conditions of laminar flow and non-laminar flow.
6) A hydroacoustic monitoring plan (details in Caltrans 2021 BA Section 4.1.1.1.)

The engineer would be required to inspect the sound attenuation system for proper operation before each deployment and as necessary during deployment. Proper operation during deployment would be determined by the gauges in the monitoring system and by other methods determined by the engineer. Air pressure and air flow meters and gauges would be calibrated by a private laboratory approved by the Caltrans engineer prior to use in the air bubble curtain system. The condition of the sound attenuation system would be monitored and daily inspection reports would be prepared during pile installation operations and no less than every other day during periods of no activity.

The approved sound attenuation system would be operating prior to beginning pile driving at any given pile location. If the attenuation system fails, pile driving would immediately stop and would not resume at that location until it is again operating. A sound attenuation system is not required for pile or casing installation using a vibratory hammer, since noise levels would not exceed noise thresholds. Pile driving equipment would be isolated from the platform it is on and the pile driving operation is not transmitted through the platform to the water. The platform supporting the pile driving equipment would not be contained within the attenuation system.

The initial strikes of all in-water piles, or piles that occur within 200 linear feet of the water's edge in the active channel in which injurious sound levels to listed species could reach the water, will occur at less than full impact force for a period of 15 seconds followed by 30 seconds of no activity. This action will be repeated two additional times and impact will be gradually brought up to full force blows to reduce the initial sound level and provide warning blows to allow fish adequate time to leave the project area.

In Stream Work Window:
The in-water work window is June 1 to October 15, which is expected to avoid the timing of most listed salmonids and green sturgeon in the Sacramento River. Therefore, it is recommended that any work occurring below the OHWM of the Sacramento River within the Project area, including barge operation, cofferdam installation and removal, and removal and installation of piles and the new fender system, would occur between this work window of each construction season, unless earlier or later dates are approved by CDFW, USFWS, and NMFS. By requiring contractors to adhere to these dates for in-channel construction, the Project proponent would avoid and minimize Project effects on listed fish species. If night work is necessary, lighting will be selectively placed, shielded, and directed away from the river. Night work will be restricted to activities that are not in-water to ensure listed fish are allowed to migrate upstream and downstream.

Construction Site Best Management Practices:
The contractor would implement avoidance and minimization measures to contain construction-related material in manageable locations, and prevent debris from entering surface waters during in-water work, and for construction operations outside of receiving waters. BMPs used for erosion control would be implemented and in place prior to, during, and after construction to ensure that no silt or sediment enters receiving waters. Areas where soil disturbance has occurred would be stabilized appropriately and approved by the Central Valley Regional Water Quality Control Board (RWQCB) prior to filing the Notice of Termination.

Compliance with all construction site BMPs, specified in the approved Water Pollution Control Program and any other permit conditions, is mandatory to avoid and minimize the introduction of construction-related contaminants and sediment to receiving waters. In order to achieve this and reduce the potential for discharge, the contractor would follow all applicable guidelines and requirements in the 2010 Caltrans Standard Specifications (2010 CSS), section 13, regarding water pollution control and general specifications for preventing, controlling, and abating water pollution in streams, waterways, and other bodies of water. Project specific BMPs would address soil stabilization, sediment control, wind erosion control, vehicle tracking control, non-storm water management, and waste management practices and would be based on the best conventional and best available technology.

Caltrans staff and the contractor would perform routine inspections of the construction area to verify that field BMPs are properly implemented, maintained, and are operating effectively and as designed. Caltrans expects selected BMPs and mitigation measures to meet the standards and objectives to minimize water pollution impacts set forth in the 2010 CSS and would include (but not be limited to) the following:

1) Conduct all in-water work within streams that provide habitat for special status fish species (Sacramento River) between June 1 and October 15 only.
2) Use only equipment in good working order and free of dripping or leaking engine fluids.
3) Conduct any necessary equipment washing where water is prevented from flowing into drainage conveyance systems and receiving waters.
4) In case of an accidental spill, an emergency response plan would be prepared and submitted to NMFS and CDFW for review and approval at least 14 days prior to conducting any construction work. A spill prevention control and countermeasures plan would be onsite and in place to handle any topside spills. The plan would include strict onsite handling rules to keep construction and maintenance materials from entering the river, including procedures related to refueling, operating, storing, and staging construction equipment, as well as preventing and responding to spills. The plan also would identify the parties responsible for monitoring the spill response.
5) During construction, any spills would be cleaned up immediately according to the spill prevention and countermeasure plan.
6) BMPs for spill containment measures (plastic sheeting, absorbent pads, and/or other containment devices) would be used during all barge-mounted construction activities. BMPs would be deployed around and beneath all over-water or barge-mounted construction equipment. Supplemental equipment would be on-site to collect and remove any spills.
7) Prevent discharge of turbid water to the Sacramento River during any construction activities by filtering the discharge first using a filter bag, diverting the water to a settling tank or infiltration areas, and/or treating the water in a manner to ensure that discharges conform to the water quality requirements of the waste discharge permit issued by the Central Valley RWQCB prior to entering receiving waters.

Turbidity in the Sacramento River:
Caltrans would require the construction contractor to monitor turbidity levels in the Sacramento River during in-water construction activities (*e.g.* pile driving, extraction of temporary sheet piles used for cofferdams, placement of rock slope protection [RSP]). Turbidity would be measured using standard techniques upstream and downstream of the construction area to determine whether changes in ambient turbidity levels exceed 20%, the threshold derived from the Sacramento and San Joaquin Rivers Basins Plan (Central Valley Regional Water Quality Control Board 2011). If it is determined that turbidity levels exceed the 20% threshold, then Caltrans and/or their contractors would adjust work to ensure that turbidity levels do not exceed the 20% threshold.

Dewatering Activities - Water Quality:
To prevent the potential discharge of turbid water into the Sacramento River that may result from temporary dewatering activities, water removed from the dewatered areas would be filtered and/or treated in a manner to ensure conformance with the water quality requirements of the approved 401 permit, issued by the Central Valley RWQCB, prior to being discharged into the aforementioned receiving waters.

Pile Removal BMPs:
The purpose of the following BMPs is to control turbidity and sediment re-entering the water column during pile removal (removal of existing fender timber piles, temporary trestle piles, and sheet pile cofferdams) and prescribe debris capture and disposal of removed piles and debris.

1) Vibratory extraction is the preferred method of pile removal.
2) Crane operator will be trained to remove pile slowly. This would minimize turbidity in the water column as well as sediment disturbance.
3) Operator to "wake up" pile to break up bond with sediment.
4) Vibrate to break the skin friction bond between pile and soil. Bond breaking avoids pulling out a large block of soil - possibly breaking off the pile in the process. Usually, there is little or no sediment attached to the skin of the pile during withdrawal. In some cases, material may be attached to the pile tip, in line with the pile.
5) Extraction equipment would be kept out of the water.
6) A creosote release to the environment may occur if broken off or if equipment (*e.g.* bucket, steel cable, vibratory hammer) pinches a creosoted piling below the water line. Piling must not be broken off intentionally by twisting, bending, or other deformation. Work surface on barge deck or pier will include a containment basin for pile and any sediment removed during pulling. Upon removal from substrate the pile would be moved expeditiously from the water into a containment basin. The pile will not be shaken, hosed off, stripped or scraped off, left hanging to drip or any other action intended to clean or remove adhering material from the pile.
7) Pulled pile would be placed in a containment basin to capture any adhering sediment. This should be done immediately after the pile is initially removed from the water.
8) Work surface and containment basin would be cleaned by disposing of sediment or other residues along with removed piling in a manner complying with applicable Federal and state regulations.

Environmental Awareness Training for Construction Personnel:
Before any work occurs in the Project area, including grading and tree removal, the Project proponent would retain a qualified biologist familiar with the resources to be protected to conduct a contractor/worker environmental awareness training for construction personnel. The awareness training would be provided to all construction crew and contractors to brief them on the need to avoid and minimize effects to sensitive biological resources (*e.g.*, jurisdictional waters, special-status species, roosting bats, and nesting birds) within construction areas and the penalties for not complying with applicable state and Federal laws and permit requirements. The biologist would inform all construction personnel about the life history and habitat requirements of special-status species with potential for occurrence onsite, the importance of maintaining habitat, and the terms and conditions of the BO or submitted to the Project proponent, and other overseeing agencies (*i.e.*, CDFW, USFWS, and NMFS), as appropriate. The environmental training would cover general restrictions and guidelines that must be followed by all construction personnel to reduce or avoid effects on sensitive biological resources during Project construction. The training also would include identifying the BMPs written into construction specifications for avoiding and minimizing the discharge of construction materials or other contaminants into jurisdictional waters.

Establish Environmentally Sensitive Areas:
Additional direct and indirect impacts to special status biological resources, including wetland and terrestrial resources, throughout the Project area would be avoided or minimized by designating these features outside of the construction impact area as "environmentally sensitive areas" on Project plans and in Project specifications. Environmentally sensitive area information would be shown on contract

plans and discussed in the special provisions. All areas outside of the Butte City Bridge Replacement Project area would be considered as environmentally sensitive areas for biological resources. Contractor encroachment into environmentally sensitive areas would be prohibited (including the staging/operation of heavy equipment or casting of excavated materials). Environmentally sensitive area provisions would be implemented as a first order of work and remain in place until all construction activities are complete.

Limit Vegetation Removal:
Removal of riparian vegetation along the banks of the Sacramento River within the environmentally sensitive area would be avoided or preserved unless removal is required to facilitate construction.

Restoration of Temporarily Impacted Riparian Habitat:
Any disturbed riparian vegetation would be replanted at a 1:1 ratio with native trees and shrubs. Rapidly sprouting plants, such as willows, would be cut off at ground level and root systems left intact.

Dewatering Activities - Fish Relocation:
Caltrans would require contractors to submit a fish relocation plan to NMFS and CDFW for approval prior to the start of in-water work. The plan would include a description of any anticipated fish relocation activities, including the number, frequency, and environmental or construction conditions that may trigger the need for fish relocation actions. A fish capture and relocation report would be prepared and submitted to CDFW, NMFS, and USFWS within 5 business days following completion of the fish relocation.

If flowing water is present or reasonably anticipated, Caltrans will submit for written approval a detailed dewatering plan to NMFS and CDFW no later than 60 business days prior to commencingdewatering. Caltrans and/or their contractors may not commence dewatering activities without written approval from NMFS and CDFW. During all dewatering activities, the qualified biologist will monitor within dewatering areas and within adjacent river reaches to ensure no aquatic species are stranded or in distress. The applicant will take immediate remedial actions if any conditions causing or contributing to stress and/or injury of listed species are observed. After any water diversion structures are in place and before dewatering is initiated, qualified fish biologists who have authorization from NMFS and CDFW will be on-site to capture and relocate fish from areas to be dewatered. During dewatering, water will be incrementally diverted from the cofferdam, with diversion progressively increasing over a four-hour period in the following increments: 50%, 75%, 90%, and 100%. Incremental reduction in flow allows fish that elude initial capture to move to deeper habitats where they can be captured and relocated before affected stream segments are completely dewatered. The biologists will relocate fish to suitable habitat outside of the construction area. The methods of removal and relocation of fish captured during the dewatering of the construction areas will be implemented in close coordination with NMFS and CDFW.

If water pumps are to be used, adequate screening measures would be implemented. All water pumping or withdrawal from the river will comply with NMFS' 1997 Fish Screening Criteria for Anadromous Salmonids, where applicable, to avoid entrainment of fish. The criteria include but are not limited to the following:

- Screen design must provide for uniform flow distribution over the surface of the screen;
- Screen material openings will not exceed 3/32 inches for fry sized salmonids and will not exceed 1/4 inches for fingerling sized salmonids;

- Where physically practical, the screen will be constructed at the diversion entrance. The screen face should be generally parallel to river flow and aligned with the adjacent riverbank;
- The design approach velocity will not exceed 0.33 feet per second for fry sized salmonids or 0.8 feet per second for fingerling sized salmonids; and
- The screen design must provide for uniform flow distribution over the surface of the screen.

Cofferdam Restrictions:
The extent of the cofferdam footprints would be limited to the minimum necessary to support construction activities. Sheet piles used for cofferdams would be installed and removed using a vibratory pile driver. Cofferdams would be installed and removed only during the proposed in-water work window (June 1 - October 15). Cofferdams would not be left in place over winter where they could be overtopped by winter/spring flows and when juveniles of listed species are most likely to be present in the construction area. All pumps used during dewatering of cofferdams would be screened according to CDFW and NMFS guidelines for fish screens. Cofferdam de-watering and fish capture/relocation from within cofferdams would commence immediately following cofferdam closure.

Prevention of the Spread or Introduction of Aquatic Invasive Species:
Caltrans or its contractors would coordinate with the CDFW invasive species program to ensure that the appropriate BMPs are implemented to prevent spread or introduction of aquatic invasive species (AIS). Educate construction supervisors and managers about the importance of controlling and preventing the spread of AIS. Train vessel and equipment operators and maintenance personnel in the recognition and proper prevention, treatment, and disposal of AIS. To the extent feasible, prior to departure of vessels from their place of origin and before in-water construction equipment is allowed to operate within waters of the Sacramento River, thoroughly inspect and remove and dispose of all dirt, mud, plant matter, and animals from all surfaces that are submerged or may become submerged, or places where water can be held and transferred to the surrounding water.

Mitigation for Impact on Critical Habitat
Permanent impacts on critical habitat (bank and substrate below the OHWM and water column habitat), totaling 0.003 acres will be mitigated through the removal of 0.477 acres of fenders and existing piers from the river.

Compensation for the Temporary and Permanent Loss of Riparian Habitat Cover
Caltrans will compensate for the permanent loss of 0.37 acres of riparian habitat through the onsite restoration of 4 acres of riparian habitat along the Sacramento River. Any unavoidable temporary loss of riparian habitat will be replanted. Onsite compensation will be first priority; however, in order to achieve no net loss of riparian habitat and shaded riverine aquatic (SRA) cover habitat, offsite compensation or purchase of mitigation credits above will offset permanent loss of riparian habitat and SRA cover. For onsite replacement plants, Caltrans will prepare a revegetation plan. This plan will include a list of species, planting locations, and maintenance requirements. The composition of planted species will include all native riparian species similar to those removed from the project impact area.

The parcel Caltrans is proposing to restore, as mitigation for the Project, is currently owned by California State Parks and Recreation. Restoration efforts will start prior to and concurrent with

construction as funding security for the BO and the consistency determination as well as acknowledgments from state and Federal agencies involved in the title transfer. All restoration plan details can be found in Caltrans 2021b. Title to the parcel will be transferred to USFWS and incorporated into the USFWS refuge system. The parcel will be managed consistent with the Sacramento National Wildlife Refuge Comprehensive Conservation Plan (USFWS 2005) Confirmation of the title/deed transfer of the State park parcels to USFWS for possession/management will be submitted to NMFS and CDFW. Caltrans will submit annual mitigation monitoring reports for 5 years post-construction to NMFS and CDFW. These reports will monitor the performance of the restoration effort. Details on report contents and scheduling can be found in the restoration plan section 7.0. Caltrans will submit a final report at the end of construction to NMFS and CDFW. The report details may be found in section 7.6 and 7.7 of the restoration plan.

For the purposes of this consultation, NMFS adopts by reference the complete project description as it is presented in the BA (Caltrans 2021a) and the Restoration Plan (Caltrans 2021b).

2 ENDANGERED SPECIES ACT: BIOLOGICAL OPINION AND INCIDENTAL TAKE STATEMENT

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

2.1 Analytical Approach

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

The designations of critical habitat for some of the listed species analyzed in this BO use the term primary constituent element (PCE) or essential features. The 2016 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 BO, we use the term PBF to mean PCE or essential feature, as appropriate for the specific critical habitat.

The 2019 regulations define effects of the action using the term "consequences" (50 CFR 402.02). As explained in the preamble to the regulations (84 FR 44977), that definition does not change the scope of our analysis and in this BO 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 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 BO examines the status of each species that would be adversely affected by the proposed action. The status is determined by the level of extinction risk that the listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This informs the description of the species' likelihood of both survival and recovery. The species status section also helps to inform the description of the species' current "reproduction, numbers, or distribution" as described in 50 CFR 402.02. The BO also examines the condition of critical habitat throughout the designated area, evaluates the value of the various watersheds and coastal and marine environments that make up the designated area, and discusses the function of the PBFs that are essential for the conservation of the species. See Table 1 for species and Table 2 for critical habitat information.

Table 1. - Description of species, current ESA listing classification and summary of species status.

Species	Listing Classification and Federal Register Notice	Status Summary
Sacramento River winter-run Chinook salmon evolutionarily significant unit (ESU)	Endangered, 70 FR 37160; June 28, 2005	According to the NMFS 2016, 5-year species status review, the overall status of Sacramento River winter-run Chinook salmon has declined since the 2010 status review, with the single spawning population on the mainstem Sacramento River no longer at a low risk of extinction. New information indicates an increased extinction risk to winter-run Chinook salmon. The larger influence of the hatchery broodstock in addition to the rate of decline in abundance over the past decade has placed the population at a moderate risk of extinction and because there is only one remaining population, the extinction risk for the ESU has increased from moderate risk to high risk of extinction.
Central Valley (CV) spring-run Chinook salmon ESU	Threatened, 70 FR 37160; June 28, 2005	According to the NMFS 2016, 5-year species status review, the status of the CV spring-run Chinook salmon ESU, until 2015, has improved since the 2010 5-year species status review. The improved status is due to extensive restoration, and increases in spatial structure with historically extirpated populations (Battle, Clear creeks) trending in the positive direction. Recent declines of many of the dependent populations, high pre-spawn and egg mortality during the 2012 to 2015 drought, uncertain juvenile survival during the drought are likely increasing the ESU's extinction risk.
California Central Valley (CCV) steelhead distinct population segment (DPS)	Threatened, 71 FR 834; January 5, 2006	According to the NMFS 2016, 5-year species status review, the status of CCV steelhead appears to have changed little since the 2011 status review that concluded that the DPS was in danger of extinction. Most wild CCV populations are very small, are not monitored, and may lack the resiliency to persist for protracted periods if subjected to additional stressors, particularly widespread stressors such as climate change. The genetic diversity of CCV steelhead has likely been impacted by low population sizes and high numbers of hatchery fish relative to wild fish. The life-history diversity of the DPS is mostly unknown, as very few studies have been published on traits such as age structure, size at age, or growth rates in CCV steelhead.

Species	Listing Classification and Federal Register Notice	Status Summary
Southern DPS(sDPS) of North American green sturgeon	Threatened, 71 FR 17757; April 7, 2006	According to the NMFS 2015, 5-year species status review, some threats to the species have recently been eliminated, such as take from commercial fisheries and removal of some passage barriers, but the species viability continues to be constrained by factors such as a small population size, lack of multiple populations, and concentration of spawning sites into just a few locations. The species continues to face a moderate risk of extinction.

Table 2. - Description of critical habitat, designation details and status summary.

Species	Designation Date and Federal Register Notice	Status Summary
Sacramento River winter-run Chinook salmon ESU	June 16, 1993, 58 FR 33212	Designated critical habitat includes the Sacramento River from Keswick Dam (river mile (RM) 302) to Chipps Island (RM 0) at the westward margin of the Sacramento-San Joaquin Delta (Delta); all waters from Chipps Island westward to the Carquinez Bridge, including Honker Bay, Grizzly Bay, Suisun Bay, and the Carquinez Strait; all waters of San Pablo Bay westward of the Carquinez Bridge; and all waters of San Francisco Bay north of the San Francisco-Oakland Bay Bridge from San Pablo Bay to the Golden Gate Bridge. The designation includes the river water, river bottom, and adjacent riparian zones used by fry and juveniles for rearing. PBFs considered essential to the conservation of the species include: access from the Pacific Ocean to spawning areas; availability of clean gravel for spawning substrate; adequate river flows for successful spawning, incubation of eggs, fry development and emergence, and downstream transport of juveniles; water temperatures at 5.8–14.1°C (42.5–57.5°F) for successful spawning, egg incubation, and fry development; riparian and floodplain habitat that provides for successful juvenile development and survival; and access to downstream areas so that juveniles can migrate from spawning grounds to the San Francisco Bay and the Pacific Ocean. Although the current conditions of PBFs for SR winter-run Chinook salmon rangewide critical habitat are significantly limited and degraded, the habitat remaining is considered highly valuable.

Species	Designation Date and Federal Register Notice	Status Summary
CV spring-run Chinook salmon ESU	September 2, 2005, 70 FR 52488	Critical habitat for CV spring-run Chinook salmon includes stream reaches of the Feather, Yuba, and American Rivers, Big Chico, Butte, Deer, Mill, Battle, Antelope, and Clear Creeks, the Sacramento River, as well as portions of the northern Delta. Critical habitat includes the stream channels in the designated stream reaches and the lateral extent as defined by the ordinary high-water line. In areas where the ordinary high-water line has not been defined, the lateral extent will be defined by the bankfull elevation. PBFs considered essential to the conservation of the species include: spawning habitat; freshwater rearing habitat; freshwater migration corridors; and estuarine areas. Although the current conditions of PBFs for CV spring-run Chinook salmon rangewide critical habitat are significantly limited and degraded, the habitat remaining is considered highly valuable.
CCV steelhead DPS	September 2, 2005, 70 FR 52488	Critical habitat for CCV steelhead includes stream reaches of the Feather, Yuba, and American Rivers, Big Chico, Butte, Deer, Mill, Battle, Antelope, and Clear Creeks, the Sacramento River, as well as portions of the northern Delta. Critical habitat includes the stream channels in the designated stream reaches and the lateral extent as defined by the ordinary high-water line. In areas where the ordinary high-water line has not been defined, the lateral extent will be defined by the bankfull elevation. PBFs considered essential to the conservation of the species include: spawning habitat; freshwater rearing habitat; freshwater migration corridors; and estuarine areas. Although the current conditions of PBFs for CCV steelhead rangewide critical habitat are significantly limited and degraded, the habitat remaining is considered highly valuable.

Species	Designation Date and Federal Register Notice	Status Summary
sDPS of North American green sturgeon	October 9, 2009, 74 FR 52300	Critical habitat includes the stream channels and waterways in the Delta to the ordinary high water line. Critical habitat also includes the mainstem Sacramento River upstream from the I Street Bridge to Keswick Dam, the Feather River upstream to the fish barrier dam adjacent to the Feather River Fish Hatchery, and the Yuba River upstream to Daguerre Point Dam. Coastal marine areas include waters out to a depth of 60 fathoms, from Monterey Bay in California, to the Strait of Juan de Fuca in Washington. Coastal estuaries designated as critical habitat include San Francisco Bay, Suisun Bay, San Pablo Bay, and the lower Columbia River estuary. Certain coastal bays and estuaries in California (Humboldt Bay), Oregon (Coos Bay, Winchester Bay, Yaquina Bay, and Nehalem Bay), and Washington (Willapa Bay and Grays Harbor) are also included as critical habitat for sDPS green sturgeon. PBFs considered essential to the conservation of the species for freshwater and estuarine habitats include: food resources, substrate type or size, water flow, water quality, migration corridor; water depth, sediment quality. Although the current conditions of PBFs sDPS green sturgeon rangewide critical habitat are significantly limited and degraded, the habitat remaining is considered highly valuable.

2.2.1 Global Climate Change

One major factor affecting the rangewide status of the threatened and endangered anadromous fish in the Central Valley and aquatic habitat at large is climate change. Warmer temperatures associated with climate change reduce snowpack and alter the seasonality and volume of seasonal hydrograph patterns (Cohen *et al.* 2000). Central California has shown trends toward warmer winters since the 1940s (Dettinger and Cayan 1995). Projected warming is expected to affect Central Valley Chinook salmon. Because the runs are restricted to low elevations as a result of impassable rim dams, if climate warms by 5°C (9°F), it is questionable whether any Central Valley Chinook salmon populations can persist (Williams 2006).

For winter-run Chinook salmon, the embryonic and larval life stages that are most vulnerable to warmer water temperatures occur during the summer, so this run is particularly at risk from climate warming. Spring-run Chinook salmon adults are vulnerable to climate change because they over-summer in freshwater streams before spawning in autumn (Thompson *et al.* 2011).

Spring-run Chinook salmon spawn primarily in the tributaries to the Sacramento River, and those tributaries without cold water refugia (usually input from springs) will be more susceptible to impacts of climate change. Although steelhead will experience similar effects of climate change to Chinook salmon, as they are also blocked from the vast majority of their historic spawning and rearing habitat, the effects may be even greater in some cases, as juvenile steelhead need to rear in the stream for one to two summers prior to emigrating as smolts. In the Central Valley, summer and fall temperatures below the dams in many streams already exceed the recommended temperatures for optimal growth of juvenile steelhead, which range from 14°C to 19°C (57°F to 66°F). The Anderson Cottonwood Irrigation Dam (ACID) is considered the upriver extent of green sturgeon passage in the Sacramento River. The upriver extent of green sturgeon spawning, however, is approximately 30 kilometers downriver of ACID where water temperatures are higher than at ACID during late spring and summer. Thus, if water temperatures increase with climate change, temperatures adjacent to ACID may remain within tolerable levels for the embryonic and larval life stages of green sturgeon, but temperatures at spawning locations lower in the river may be more affected.

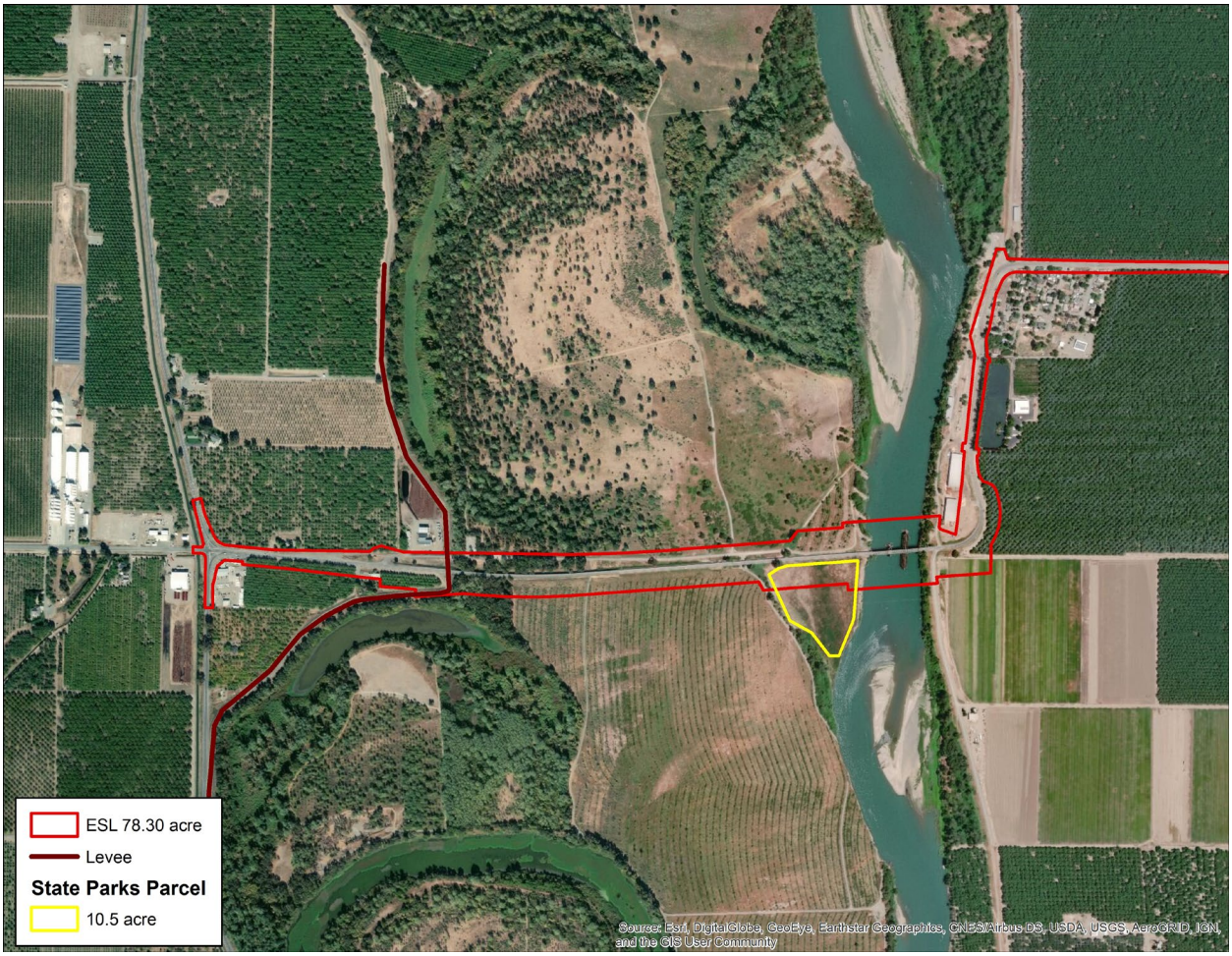
In summary, observed and predicted climate change effects are generally detrimental to the species (McClure 2011, Wade *et al.* 2013), so unless offset by improvements in other factors, the status of the species and critical habitat is likely to decline over time. The climate change projections referenced above cover the time period between the present and approximately 2100. While there is uncertainty associated with projections, which increases over time, the direction of change is relatively certain (McClure *et al.* 2013).

2.3 Action Area

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

The Project is located along a one-mile stretch of State Route 162 as it crosses the Sacramento River near Butte City in Glenn County, California. The action area covers the 44.22 acre construction footprint, the 78.30 acre environmental study limit (ESL), the 10.5 acre state parks parcel, and the downstream and upstream extent to which construction effects from turbidity, hydroacoustic effects, or pollution may occur (Figure 1). The action area ranges from 67 to 99 feet above mean sea level. The center of the proposed new bridge will lie approximately in position 39.457287°, -121.995168° at RM 169.
The action area encompasses 1,000 meters around the bridge, which is approximately 55 acres of the Sacramento River. The action area includes the portion of the river determined to likely experience effects resulting from the Project including sedimentation, turbidity, and hydroacoustic impacts.

Figure 1. ESL and Mitigation Area



2.4 Environmental Baseline

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

2.4.1 Hydrology

Flows in the Sacramento River are regulated by Shasta Dam and again, just downstream at Keswick Dam. Water stored in the reservoirs during the winter and spring is released in the summer and fall for municipal and industrial supply, irrigation, water quality, power generation, recreation, and fish and wildlife purposes. Historically, the upper Sacramento River was highly

responsive to periodic precipitation events and seasonal variation. Since completion of the dams, flows are now lower in the winter and spring and higher in the summer and fall. During July, August, and September, the mean monthly flows of the Sacramento River at Keswick since 1963 are nearly 400 percent higher than the mean monthly flows prior to 1943 (Department of Water Resources 1981, as cited in the Sacramento River Conservation Area Forum (SRCAF) handbook (2003).

2.4.2 Water Quality

The main sources of water in the Sacramento River below Keswick Dam are rain and snowmelt that collect in upstream reservoirs and are released in response to water needs or flood control. The quality of surface water downstream of Keswick Dam is also influenced by other human activities along the Sacramento River downstream of the dam, including historical mining, agricultural, and municipal and industrial activities. The quality of water in the Sacramento River is relatively good; only during conditions of stormwater-driven runoff are water quality objectives typically not met (Domagalski et al. 2000). Water quality issues within the upper Sacramento River include the presence of mercury, pesticides such as organochlorine, trace metals, turbidity, and toxicity from unknown origin (CALFED 2000).

Water temperature in the Sacramento River is controlled by releases from Shasta, Whiskeytown, and Keswick Reservoirs. NMFS issued an opinion on the long-term operation of the CVP and SWP (NMFS 2009), which included upper Sacramento River water temperature requirements to protect listed anadromous fish and their critical habitats. However, the ability to meet temperature requirements has proven extremely difficult during drought years.

2.4.3 Predation

Sacramento pikeminnow and striped bass congregate downstream of the dam and prey on juvenile salmon in the tailwaters. The Sacramento pikeminnow is a species native to the Sacramento River basin and has co-evolved with the anadromous salmonids in this system. However, rearing conditions in the Sacramento River today (e.g., warm water, low-irregular flow, standing water, water diversions, and presence of overwater and in-water structures) compared to its natural state and function decades ago in the pre-dam era, are more conducive to warm water species, such as Sacramento pikeminnow and striped bass than to native salmonids. Tucker et al. (1998) reported that predation during the summer months by Sacramento pikeminnow on juvenile salmonids increased to 66 percent of the total weight of stomach contents in the predatory pikeminnow. Additionally the current Butte City Bridge structure provides habitat for non-native predators such as stripped bass which prey on listed fish within the action area. The result has been the reduction in quantity and quality of several essential features of migration and rearing habitat required by juveniles to grow and survive.

2.4.4 SR winter-run Chinook salmon

The distribution of SR winter-run Chinook salmon spawning and rearing is currently limited to the upper Sacramento River, with managed flows out of Shasta Dam. Approximately, 299 miles of tributary spawning habitat in the upper Sacramento River above the dams is now inaccessible to SR winter-run Chinook salmon (NMFS 2014). The proportion of the SR winter-run Chinook salmon spawning above ACID has increased since the ladder improvements in 2001 (CDFW 2014 unpublished aerial redd counts). Data on the temporal distribution of SR winter-run

Chinook salmon upstream migration suggest that in wet years about 50 percent of the run has passed the RBDD by March, and in dry years, migration is typically earlier, with about 72 percent of the run having passed the RBDD by March (Poytress et al. 2014).

The upper Sacramento River contains the only remaining habitat that is currently used by spawning SR winter-run Chinook salmon. As reported by NMFS (2014a), historical SR winter-run Chinook salmon population estimates were as high as over 230,000 adults in 1969, but declined to under 200 fish in the 1990s (Good et al. 2005). A rapid decline occurred from 1969 to 1979 after completion of the RBDD. Over the next 20 years, the population eventually reached a low point of only 186 adults in 1994. At that point, SR winter-run Chinook salmon were at a high risk of extinction, as defined by Lindley et al. (2007). However, several conservation actions, including a very successful conservation hatchery and captive broodstock program at Livingston Stone National Fish Hatchery (LSNFH), construction of a temperature control device (TCD) on Shasta Dam, maintaining the RBDD gates up, and restrictions in ocean harvest, have likely prevented the extinction of natural-origin SR winter-run Chinook salmon. LSNFH, which is located at the base of Keswick Dam, annually supplements the in-river production by releasing on average 180,000 SR winter-run Chinook salmon smolts into the upper Sacramento River. The LSNFH operates under strict guidelines for propagation that include genetic testing of each pair of adults and spawning no more than 10 percent of the hatchery returns. This program and the captive broodstock program (phased out in 2007) were instrumental in stabilizing the SR winter-run Chinook salmon population following very low returns in the 1990s.

Since carcass surveys began in 2001, the highest adult escapement occurred in 2005 and 2006 with 15,839 and 17,296, respectively. Since 2007 SR winter-run Chinook salmon have declined in abundance with a low of 827 spawning adults in 2011 (NMFS 2016c). As reported in the most recent 5-year status review (NMFS 2016c), the 10-year trend in run size is -0.15 which suggests an annual 15% population decline. This declining trend is likely due to a combination of factors such as poor ocean productivity (Lindley et al. 2009), drought conditions from 2007 to 2009 and 2012 to 2015, and low in-river survival (NMFS 2016c).

The 2012 to 2015 drought increased water temperatures in the Sacramento River. This caused significantly higher mortality (95-97%) in the upper spawning area. Due to the lower than average survival in the drought, hatchery production from the LSNFH conservation program was increased to offset the impact on the naturally spawning fish. Adult SR winter-run Chinook salmon returns in 2016 to 2018 were low, as expected, due to poor in-river conditions for juveniles from brood years 2013-2015 during drought years. The 2018 adult SR winter-run Chinook salmon escapement estimate (2,458) improved from 2017 (1,155), though was similarly dominated by hatchery-origin fish. An estimated 85 percent of the adult SR winter-run Chinook salmon spawners in 2017 were hatchery-origin fish from LSNFH (K. Offill, USFWS, Red Bluff, CA, unpublished data), evidence that the emergency measures enacted at LSNFH were successful at avoiding a complete year-class failure and substantially benefited the abundance of spawners in 2017.

2.4.5 CV spring-run Chinook salmon

The mainstem of the Sacramento River serves as a primary upstream and downstream migratory corridor for CV spring-run Chinook salmon populations in Clear, Battle, and Cottonwood

Creeks. Within the mainstem Sacramento River upstream of RBDD, the CV spring-run Chinook salmon population appears to have declined from a high of 25,000 in the 1970s to an average low of less than 800 counted at RBDD beginning in 1991. Significant hybridization with fall-run has made identification of a CV spring-run Chinook salmon population in the mainstem very difficult to determine, and there is speculation as to whether a true CV spring-run Chinook salmon population still exists below Keswick Dam within the mainstem of the Sacramento River. This shift may have been an artifact of the manner in which CV spring-run Chinook salmon were identified at RBDD. More recently, fewer CV spring-run Chinook salmon were counted at RBDD because an arbitrary date, September 1, was used to determine CV spring-run Chinook salmon, and, beginning in 2012, gates are open year-round (NMFS 2014). The extent of non-hybridized CV spring-run Chinook salmon spawning in the Sacramento River mainstem is unknown. However, the physical habitat conditions in the mainstem Sacramento River are capable of supporting CV spring-run Chinook salmon, although in some years high water temperatures can result in substantial levels of egg mortality. Additionally, even though habitat conditions may be suitable for CV spring-run Chinook salmon occupancy, CV spring-run Chinook salmon depend on spatial segregation and geographic isolation from fall-run Chinook salmon to maintain genetic diversity. With the onset of fall-run Chinook salmon spawning occurring at the same time and place as potential CV spring-run Chinook salmon spawning, it is likely to have caused extensive introgression between the populations (CDFW 1998).

2.4.6 CCV steelhead

CCV steelhead are well-distributed throughout the Central Valley below the major rim dams (Good et al. 2005). The mainstem of the Sacramento River serves as a primary migratory corridor for both upstream and downstream migration for all Sacramento River Basin populations, connecting spawning habitat within the Sacramento River and tributaries to the San Francisco Bay estuary and the Pacific Ocean. Adults can be found in the mainstem Sacramento River primarily during the fall and winter seasons while juveniles occupy the river year-round. Juvenile rearing tends to occur in areas with cool, clear fast-moving water where riffle habitat is predominant over pool habitat (Moyle 2002). Therefore, it is more likely that juveniles found within the action area will be migrating rather than rearing.

United States Fish and Wildlife Service (USFWS) staff operate a weir on Battle Creek that controls all upstream fish movement and steelhead counts at this weir provide a decent data source for CCV steelhead (NMFS 2016a). In the two years prior to the 2016 5-year status review, steelhead returns averaged 2,895 fish (NMFS 2016a). Many of these fish are hatchery origin fish, but the numbers of wild adults remained relatively steady from 2003 to 2014 with about 200-300 fish each year (NMFS 2016a).

Estimates of adult CCV steelhead abundance in the mainstem Sacramento River historically used the RBDD counts for historical trend data. Due to changes in dam operations, counts stopped being collected at RBDD in 1993 (NMFS 2016a). Actual estimates of CCV steelhead spawning in the mainstem Sacramento River below Keswick Dam have never been made due to high flows and poor visibility during the wintertime.

2.4.7 sDPS green sturgeon

The upper mainstem Sacramento River is the only area where consistent annual spawning by sDPS green sturgeon has been confirmed via the presence of eggs and larvae (Poytress et al. 2015). A migratory corridor is needed for returning adults to access spawning habitat upstream of the action area. The mainstem Sacramento River serves as spawning habitat, juvenile rearing habitat, and as a primary migration corridor for the sDPS of green sturgeon. There is insufficient information available on how long juveniles rear in the mainstem Sacramento River, but it is likely that at least some juvenile rearing occurs in the river prior to their entry into the Delta. Therefore, the exact mechanisms of habitat utilization by juveniles within the action area is unknown, but we do expect subadult green sturgeon could be present in the action area year-round.

In June and July of 2010-2015, Mora et al. (2018) estimated that there were between 1,246 and 2,966 sDPS green sturgeon in the reproductive portion of the population. Approximately 45 percent on average (141 fish), of green sturgeon distribution and abundance in the Sacramento River from 2010 to 2014, were observed above RBDD (Mora). Although observations of green sturgeon have been found as far upstream as near the mouth of Cow Creek (RM 280), spawning occurring above RBDD has only been documented as far upstream as the confluence with Ink's Creek (RM 265), and is mostly concentrated in the mid-April to mid-June time period (Poytress et al. 2013). Other confirmed spawning sites are at the mouth of Payne's Creek (RM 267), and at the RBDD. Rotary screw trap monitoring of juveniles fish passing RBDD has incidentally captured juvenile green sturgeon between May and the end of August, since 2002, but numbers have been highly variable, with a median of 193 fish (Poytress et al. 2014).

2.4.8 Status of Critical Habitat

Designated critical habitat occurs within the mainstem Sacramento River for all four listed species discussed in this BO. The action area contains PBFs that support rearing and migration for Chinook salmon, steelhead, and sturgeon. The Sacramento River has a high value for the conservation of the species, because it supports several life stage functions for each of the four listed species.

2.4.9 Factors Affecting Species and Critical Habitat

The PBFs of critical habitat for salmonids and sturgeon within the action area include: freshwater rearing habitat, and freshwater migration corridors, containing adequate substrate, water quality, water quantity, water temperature, water velocity, shelter, food; riparian vegetation, space, and safe passage conditions. Habitat within the action area primarily is used as freshwater rearing and migration for juveniles and as freshwater migration for adults. The conservation value of the action area is high because its entire length is used for extended periods of time by federally listed fish species. These features have been affected by human activities, such as water management, flood control, agriculture, and urban development throughout the action area.

2.4.10 Climate Change

One major factor affecting threatened and endangered anadromous fish in the Central Valley and aquatic habitat at large is climate change.

Warmer temperatures associated with climate change reduce snowpack and alter the seasonality and volume of seasonal hydrograph patterns (Cohen et al. 2000). Central California has shown trends toward warmer winters since the 1940s (Dettinger and Cayan 1995). An altered seasonality results in runoff events occurring earlier in the year due to a shift in precipitation falling as rain rather than snow (Roos 1991, Dettinger et al. 2004). Specifically, the Sacramento River basin annual runoff amount for April-July has been decreasing since about 1950 (Roos 1987, Roos 1991). Increased temperatures influence the timing and magnitude patterns of the hydrograph.

The magnitude of snowpack reductions is subject to annual variability in precipitation and air temperature. The large spring snow water equivalent (SWE) percentage changes, late in the snow season, are due to a variety of factors including reduction in winter precipitation and temperature increases that rapidly melt spring snowpack (VanRheenen et al. 2004). Factors modeled by VanRheenen et al. (2004) show that the melt season shifts to earlier in the year, leading to a large percent reduction of spring SWE (up to 100% in shallow snowpack areas). Additionally, an air temperature increase of 2.1°C (3.8°F) is expected to result in a loss of about half of the average April snowpack storage (VanRheenen et al. 2004). The decrease in spring SWE (as a percentage) would be greatest in the region of the Sacramento River watershed, at the north end of the Central Valley, where the snowpack is shallower than in the San Joaquin River watersheds to the south.

Projected warming is expected to affect Central Valley Chinook salmon. Because the runs are restricted to low elevations as a result of impassable rim dams, if temperatures rise by 5°C (9°F), it is questionable whether any Central Valley Chinook salmon populations can persist (Williams 2006). Based on an analysis of an ensemble of climate models and emission scenarios and a reference temperature from 1951- 1980, the most plausible projection for warming over Northern California is 2.5°C (4.5°F) by 2050 and 5°C by 2100, with a modest decrease in precipitation (Dettinger 2005). Chinook salmon in the Central Valley are at the southern limit of their range, and warming will shorten the period in which the low elevation habitats used by naturally-producing fall-run Chinook salmon are thermally acceptable. This would particularly affect fish that emigrate as fingerlings, mainly in May and June, and especially those in the San Joaquin River and its tributaries.

For SR winter-run Chinook salmon, the embryonic and larval life stages that are most vulnerable to warmer water temperatures occur during the summer, so this run is particularly at risk from climate warming. The only remaining population of SR winter-run Chinook salmon relies on the cold water pool in Shasta Reservoir, which buffers the effects of warm temperatures in most years. The exception occurs during drought years, which are predicted to occur more often with climate change (Yates et al. 2008). Additionally, air temperature appears to be increasing at a greater rate than what was previously analyzed (Lindley 2008, Beechie et al. 2012, and Dimacali 2013). These factors will compromise the quantity and/or quality of SR winter-run Chinook salmon habitat available downstream of Keswick Dam. It is imperative for additional populations of SR winter-run Chinook salmon to be re-established into historical habitat in Battle Creek and above Shasta Dam for long-term viability of the ESU (NMFS 2014).

CV spring-run Chinook salmon adults are vulnerable to climate change, because they over-summer in freshwater streams before spawning in autumn (Thompson et al. 2011). CV spring-run Chinook salmon spawn primarily in the tributaries to the Sacramento River, and those tributaries without cold water refugia, usually provided by springs, will be more susceptible to impacts of climate change. In years of extended drought and warming water temperatures, unsuitable conditions may occur even in tributaries with cool water springs. Additionally, juveniles often rear in the natal stream for one to two summers prior to emigrating and would be susceptible to warming water temperatures. In Butte Creek, fish are limited to low elevation habitat that is currently thermally marginal, as demonstrated by high summer mortality of adults in 2002 and 2003, and will become intolerable within decades if the climate warms as expected. Ceasing water diversion for power production from the summer holding reach in Butte Creek resulted in cooler water temperatures, more adults surviving to spawn, and extended population survival time (Mosser et al. 2013).

Although steelhead will experience similar effects of climate change to Chinook salmon, as they are also blocked from the vast majority of their historic spawning and rearing habitat, the effects may be even greater in some cases, as juvenile steelhead need to rear in the stream for one to two summers prior to emigrating as smolts. In the Central Valley, summer and fall temperatures below the dams in many streams already exceed the recommended temperatures for optimal growth of juvenile steelhead, which range from 14°C to 19°C (57°F to 66°F). Several studies have found that steelhead require colder water temperatures for spawning and embryo incubation than salmon (McCullough et al. 2001). In fact, McCullough et al. (2001) recommended an optimal incubation temperature at or below 11°C to 13°C (52°F to 55°F). Successful smoltification in steelhead may be impaired by temperatures above 12°C (54°F), as reported in Richter and Kolmes (2005). As stream temperatures warm due to climate change, the growth rates of juvenile steelhead could increase in some systems that are currently relatively cold, but potentially at the expense of decreased survival due to higher metabolic demands and greater presence and activity of predators. Stream temperatures that are currently marginal for spawning and rearing may become too warm to support wild CCV steelhead populations.

The sDPS green sturgeon spawn primarily in the Sacramento River in the spring and summer. ACID is considered the upriver extent of green sturgeon passage in the Sacramento River. The upriver extent of green sturgeon spawning, however, is approximately 30 kilometers downriver of ACID where water temperatures are higher than at ACID during late spring and summer. Thus, if water temperatures increase with climate change, temperatures adjacent to ACID may remain within tolerable levels for the embryonic and larval life stages of green sturgeon, but temperatures at spawning locations lower in the river may be more affected. It is uncertain, however, if green sturgeon spawning habitat exists closer to ACID, which could allow spawning to shift upstream in response to climate change effects. Successful spawning of green sturgeon in other accessible habitats in the Central Valley (i.e., the Feather River) is limited, in part, by late spring and summer water temperatures. Similar to salmonids in the Central Valley, green sturgeon spawning in the major lower river tributaries to the Sacramento River are likely to be further limited if water temperatures increase and suitable spawning habitat remains inaccessible.

In summary, observed and predicted climate change effects are generally detrimental to the species (McClure 2011, Wade et al. 2013), so unless offset by improvements in other factors, the

status of the species and critical habitat is likely to decline over time. The climate change projections referenced above cover the time period between the present and approximately 2100. While there is uncertainty associated with projections, which increases over time, the direction of change is relatively certain (McClure et al. 2013).

2.4.11 Species Survival and Recovery in the Action Area

SR winter-run Chinook salmon, CV spring-run Chinook salmon, CCV steelhead, and sDPS green sturgeon utilize the Sacramento River. The Sacramento River has a high value for the conservation of these species because of the location and the habitat features provided that are essential to meeting freshwater life history requirements of these species. Improving population trends and ongoing habitat improvements to the Sacramento River is needed for these species to continue to survive and recover within the action area. The recovery plan for SR winter-run Chinook salmon, CV spring-run Chinook salmon, and CCV steelhead identifies the mainstem Sacramento as a core 1 population for SR winter-run Chinook salmon, a core 2 population for CV spring-run Chinook salmon, and a core 2 population for CCV steelhead (NMFS 2014). Core 1 populations have a known ability or potential to support independent viable populations (NMFS 2014). Core 1 populations form the foundation of the recovery strategy and must meet the population-level biological recovery criteria for low risk of extinction, as described in the Recovery Plan (NMFS 2014). Core 2 populations are assumed to have the potential to meet the moderate risk of extinction criteria. Core 2 populations are of secondary importance for recovery efforts. The Sacramento River is known migration and rearing habitat used by sDPS green sturgeon. Adults, larvae, and juveniles can occur in the action area during rearing periods, and usually move out of the area with environmental cues such as increased flow (NMFS 2018). Restoring habitat below Keswick Dam is a priority recovery action; suitable spawning and rearing habitat downstream of Keswick is needed (NMFS 2018).

2.5 Effects of the Action

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

The proposed action includes activities that may impact winter-run Chinook salmon, CV spring-run Chinook salmon, CCV steelhead, and sDPS green sturgeon and the critical habitat of these species. The following is an analysis of the potential effects to listed fish species and/or their critical habitat that may occur because of implementing the Butte City Bridge Replacement Project.

2.5.1 Construction Related Effects

Construction-related activities have the potential to result in injury or death to listed fish species. Construction-related effects may include debris falling into the active channel, interactions with

the construction barge, tools and/or equipment falling into the active channel, or noise generated by displaced rock and sediment and the operation of construction machinery. Noise generated during pile driving activity is discussed separately below. Adult CCV steelhead, CV spring-run Chinook, and Sacramento River winter-run Chinook are known to migrate through the action area; juvenile CCV steelhead and CV spring-run Chinook are known to rear in and migrate through the action area; and both adult and juvenile life stages of sDPS green sturgeon are known to utilize the action area as a migration corridor and may exhibit rearing behavior there as well. Any of these species/life stages may be present during the scheduled in-water work window and may be adversely affected by construction-related effects. BMPs and avoidance and minimization techniques will be implemented, minimizing the probability of construction-related effects in the action area.

Species that migrate downstream may be exposed to short-term noise and disturbance caused by construction activities, which may cause stress from being displaced from their rearing area. As such, listed species may experience crowding and competition with resident fish for food and habitat, which can lead to reduced growth. Further, listed species may be subject to increased predation risk while they are locating new rearing areas, leading to reduced survival. However, we expect displaced fish will likely relocate to areas downstream that have suitable habitat and low competition. Since only a small number of listed species are likely to be in the action area and temporarily displaced by the proposed Project actions, it is not expected that these actions will negatively impact the survival chances of individual fish nor the population as a whole.

Instream construction activities may cause mortality or reduce abundance of benthic aquatic macroinvertebrates within the footprint of the bridge repairs, due to coarse sediment smothering. These effects to aquatic macroinvertebrates are expected to be temporary, as rapid recolonization (about 2 weeks to 2 months) is expected (Merz and Chan 2005). Furthermore, downstream drift is expected to temporarily benefit any downstream, drift-feeding organisms, including juvenile listed species. The amount of food available for juvenile salmonids and green sturgeon is therefore expected to return to at least pre-Project conditions.

Although listed fish may be exposed to construction areas with reduced prey base, listed fish will be able to retreat to adjacent suitable habitat, and food resources will only be temporarily impacted. Therefore, effects of instream construction activities are expected to be minor, resulting in behavioral modifications, and are unlikely to result in injury or death.

2.5.2 Fish Entrapment in Cofferdams

Cofferdams will be used for the removal of the existing bridge piers. It is also possible that they will be used for removal of existing fenders as well as attenuation for the pile driving. The exact area to be dewatered is unknown so NMFS is analyzing the greatest possible extent that would be required, 19,000 square feet or 0.436 acres. The potential exists for entrapment and mortality of fish following closure and dewatering of the cofferdam. The proposed timing of cofferdam installation (June) would avoid the migration period of most listed species; however, the potential would remain for some special-status fish species to become entrapped. This risk is minimized by relocating fish and limiting cofferdam footprints.

Caltrans will require the contractor to submit a fish relocation plan to NMFS for approval prior to the start of in-water work. The plan will include a description of any anticipated fish relocation activities, including the number, frequency, and environmental or construction conditions that may trigger the need for fish relocation actions. A fish capture and relocation report will be prepared and submitted to NMFS within five business days following completion of the fish relocation. After any water diversion structures are in place and before dewatering is initiated, qualified fish biologists who have authorization from NMFS will be on site to capture and relocate fish from areas to be dewatered. During dewatering, water will be incrementally diverted from the cofferdam, with diversion progressively increasing over a four-hour period in the following increments: 50%, 75%, 90%, and 100%. Incremental reduction in flow allows fish that elude initial capture to move to deeper habitats where they can be captured and relocated before affected stream segments are completely dewatered. The biologists will relocate fish to suitable habitat outside of the construction area downstream and immediately after capture.

The fish capture/relocation is included in this Project in order to avoid or minimize injury or death to fish due to dewatering. However, the handling of fish rescue itself may cause stress, injury, or death, even though it will be conducted by a qualified fish biologist and done according to a NMFS-approved relocation plan.

During dewatering, up to 19,000 square feet or 0.436 acres of critical habitat in the Sacramento River will be temporarily lost. The majority of this critical habitat will be regained once the cofferdams are removed and those portions of the river re-flooded. The extent of the cofferdam footprints will be limited to the minimum necessary to support construction activities. Cofferdams will be installed and removed only during the proposed in-water work window (June 1-October 15). Cofferdams will not be left in place over winter where they could be overtopped by winter/spring flows and when juveniles of listed species are most likely to be present in the construction area. All pumps used during dewatering of cofferdams will be screened according to NMFS guidelines for screens. Cofferdam dewatering and fish capture/relocation from within cofferdams will commence immediately following cofferdam closure.

2.5.3 Acoustic Effects

Piles that are driven into riverbed substrate propagate sound through the water, which can damage a fish's swim bladder and other organs by causing sudden rapid changes in pressure, rupturing or hemorrhaging tissue in the bladder (Gisiner 1998, Popper *et al.* 2006). The swim bladder is the primary physiological mechanism that controls a fish's buoyancy. A perforated or hemorrhaged swim bladder has the potential to compromise the ability of a fish to orient itself both horizontally and vertically in the water column. This can result in a diminished ability to feed, migrate, and avoid predators. Sensory cells and other internal organ tissue may also be damaged by noise generated during pile driving activities as sound reverberates through a fish's viscera (Gaspin 1975). In addition, morphological changes to the form and structure of auditory organs (sensory cilia and inner ear otoliths within the saccule, utricle, and lagenae) have been observed after intense noise exposure (Hastings 1995). It is important to note that acute injury resulting from acoustic impacts should be scaled based on the mass of a given fish. Juveniles and fry have less inertial resistance to a passing sound wave and are therefore more at risk for non-auditory tissue damage (Popper and Hastings 2009). Fish can also be injured or killed when exposed to lower sound pressure levels for longer periods of time. Hastings (1995) found death rates of 50 percent and 56 percent for gouramis (*Trichogaster* sp.) when exposed to continuous

sounds at 192 Db (decibel) (re 1 µPa) at 400 Hz and 198 dB (re 1 µPa) at 150 Hz, respectively, and 25 percent for goldfish (*Carassius auratus*) when exposed to sounds of 204 dB (re 1 µPa) at 250 Hz for 2 hours or less. Hastings (1995) also reported that acoustic "stunning," a potentially lethal effect resulting in a physiological shutdown of body functions, immobilized gourami within 8 to 30 minutes of exposure to the aforementioned sounds.

Multiple studies have shown responses in the form of behavioral changes in fish due to human produced noise (Wardle *et al.* 2001, Slotte *et al.* 2004, Popper and Hastings 2009). Instantaneous behavioral responses may range from slight variations, a mild awareness, to a startle response. Fish may also vacate their normally-occupied positions in their habitat for short or long durations. Depending on the behavior that is being disrupted, the direct and indirect negative effects could vary. Behavioral effects could affect juvenile fish more than adults, as there are essential behaviors to their maturation and survival, such as feeding, sheltering, and migration. An example of a significant, direct negative effect would be interruption or alteration of migratory behavior. In the context of the proposed action, the migratory behavior of juvenile salmonids and green sturgeon may be affected by various pile driving and acoustic impacts. Though pile driving may affect migratory behavior, it is not expected to prevent salmonids and sturgeon from passing upstream or downstream because pile driving will not be continuous through the day (maximum 13,000 strikes per day), and will not occur at night, when the majority of fish migrate.

The permanent piles for the bridge abutments will be installed on land using a vibratory hammer over an impact hammer until an impact hammer is necessary. The proposed action includes installation of six, 6-foot diameter CISS piles. According to the Caltrans amended hydroacoustic memorandum dated July 14, 2020, the installation of 6-foot diameter CISS piles with an impact hammer in the water without attenuation will result in single-strike sound levels of 214 dB_{peak} and 189 $dB_{root\ mean\ square\ (RMS)}$ at 10 meters (32.8 feet) from the pile with an estimated sound exposure level (SEL) of 182 dB. The installation of 6 foot CISS piles with the use of an impact hammer on land will result in single-strike sound levels of 209 dB_{peak} and 185 dB_{RMS} at 10 meters (32.8 feet) from the pile with an estimated SEL of 175 dB.

The piles for the temporary trestle will be installed in the water using a vibratory hammer over an impact hammer until an impact hammer is necessary. The proposed action includes installation of 220 piles for the temporary trestle. Piles will either be 24-inch diameter steel pipe. According to Caltrans, the installation of 24-inch diameter steel piles will result in single-strike sound levels of 205 dB_{peak} and 188 dB_{RMS} at 10 meters (32.8 feet) from the pile with an estimated SEL of 173 dB. According to Caltrans, the in-water installation of 15-inch H piles will result in single-strike sound levels of 200 dB_{peak} and 183 dB_{RMS} at 10 meters (32.8 feet) from the pile with an estimated SEL of 170 dB. The installation of 16 to 20-inch diameter steel in-water falsework will result in single-strike sound levels of 208 dB_{peak} and 187 dB_{RMS} at 10 meters (32.8 feet) from the pile with an estimated SEL of 176 dB. The 24-diameter CISS piles for the viaduct will result in on land single-strike sound levels of 185 dB_{peak} and 169 dB_{RMS} at 34 meters (111.5 feet) from the pile with an estimated SEL of 158 dB. The 24-diameter abutments will result in on land single-strike sound levels of 190 dB_{peak} and 164 dB_{RMS} at 55 meters (180.4 feet) from the pile with an estimated SEL of 153 dB.

For the water-driven 72-inch CISS piles and the 16- to 20-inch steel falsework piles, the estimated non-attenuated peak sound level (210 dB and 208 dB respectively) is above the interim threshold (206 dB) for fish injury for a single strike. Cumulative acoustic effects are expected for any situation in which multiple strikes are being made to an object with a single strike peak dB level above the effective quiet threshold of 150 dB. This is the case for all pile driving associated with this Project.

Sheet piles will be installed using a vibratory driver. No impact driving will be used for the sheet piles. Vibratory hammers are expected to cause injury to fish. This is because the injury threshold for fish is higher using these machines because the shape of the sound is different. NMFS currently uses a dual metric criteria to assess onset of injury for fish exposed to pile driving sounds (Fisheries Hydroacoustic Working Group 2008). Specifically, this includes a peak level of 206 dB and an accumulated SEL of 187 dB for fish equal to or greater than 2 grams. If either threshold is exceeded, then physical injury is assumed to occur. There is uncertainty as to the decibel level at which fish exhibit behavioral response to high levels of underwater sound produced when driving piles in or near water. Based on the information currently available, and until new data indicate otherwise, NMFS uses a 150 dB RMS threshold for behavioral responses in salmonids and green sturgeon. Though the dB value is the same, the 150 dB RMS threshold for behavioral effects is unrelated to the 150 dB effective quiet threshold.

Distances to the thresholds for unattenuated acoustic effects under the different construction scenarios are summarized in Table 3.

Table 3. Acoustic Impacts

						Distance (m) to Threshold			
						Onset of Physical Injury			
							Cumulative SEL dB		
						Peak dB	Fish >2g	Fish <2g	Behavior RMS dB
Pile type	Land/water	Total strikes /day	Peak	SEL	RMS	206 dB	187dB	183 dB	150 dB
72 in CISS	water	13,000	214	182	189	34	1,359	1,359	3,981
72 in CISS	land	13,000	209	175	185	16	464	464	2,154
Temp Trestle	water	6,000	209	173	187	16	341	341	2,929
Falsework	water	8,000	209	173	187	16	341	341	2,929
H pile	water	6,000	194	165	175	10	100	100	464
Viaduct	land	13,000	204	170	180	10	215	215	1,000
Abutment	land	15,000	190	153	164	10	16	16	86

Sound has the ability to injure fish physically by damaging a fish's swim bladder and other organs by causing sudden rapid changes in pressure, rupturing or hemorrhaging tissue in the bladder. Additionally, it can harass fish by instigating behavioral changes. These behavioral changes can also lead to injury or death, such as fish being scared into higher predation areas. The calculations above state that there is the potential for the cumulative acoustic effects to exceed the effective quiet threshold allowing for injury or behavioral changes.

Based on the acoustic effects analysis (Table 3), peak sound pressures are estimated to be above the thresholds for injury and/or mortality of listed fish within 0 to 34 meters of the pile driving, depending on the size of piles used. Peak sound pressures are not estimated to be above the threshold for injury and/or mortality of listed fish >34 meters (or 59 feet) from the pile driving. Cumulative sound exposure levels are expected to exceed the 187 dB threshold for physical injury for fish greater than 2 grams, from 16 to 1,359 meters of the pile, depending on the size of piles used (Table 3). Non-injurious behavioral effects are expected to occur from 86 to 3,981 meters of the pile, depending on the size of pile used (Table 3).

Number of strikes per day is listed in Table 3 and pile driving will occur during the June 1 to October 15 in-water work window. Listed species present during the in-water work window such as adult CCV steelhead, CV spring-run Chinook salmon, and Sacramento River winter-run Chinook; juvenile CCV steelhead and CV spring-run Chinook; and both adult and juvenile sDPS green sturgeon.

Avoidance and minimization measures for pile driving include the seasonal work window which will avoid many sensitive life stages, limiting pile driving to daylight hours to allow migration through the area at night, vibrating piles prior to using an impact driver, the use of a vibratory driver for the sheet piles, and the use of attenuation methods such as installing inside a dewatered cofferdam.

One of the following sound attenuation methods will be used: 1) Air bubble curtain with isolation casing, 2) Dewatered attenuation casing, 3) Dewatered cofferdam. Piles will be installed using a vibratory hammer over an impact hammer as possible. Use of attenuation is assumed to provide a minimum 5 dB of sound reduction for all sound levels. However, because the specifics of the attenuation method used for installation are not yet known, NMFS has analyzed the effects of pile driving without attenuation. Even with avoidance and mitigation measures in place, the acoustic noise will cause significant behavioral effects and physical injury to listed fish located in the action area during pile driving.

2.5.4 Sedimentation and Turbidity Effects

Increased sedimentation and turbidity in the Sacramento River may result from a number of sources associated with the proposed Project. Site clearing, earthwork, driving of permanent piles, driving and removal of piles for the temporary trestles, vibrating and removal of sheet piles for cofferdams, vegetation removal and planting, and placement of RSP will result in disturbance of soil and riverbed sediments and therefore temporary increases in turbidity and suspended sediments. Non-soluble contaminants known to be present in the Sacramento River include polychlorinated biphenyls (PCBs), mercury, pesticides and insecticides, and other unknown toxicities (State Water Resources Control Board 2011). Disturbance of sediments during in-water construction could lead to a degradation of water quality. In addition, dewatering and soil removal from the inside of the cofferdams could result in temporary increases in turbidity and suspended sediments in the river, if water from within the cofferdams is not properly disposed of or contained and treated before being discharged back to the river. Increased exposure to contaminants and elevated levels of suspended sediments have the potential to result in physiological, behavioral, and habitat effects. The severity of these effects depends on the extent of the disturbance, duration of exposure, and sensitivity of the affected life stage. Based on the

types and duration of proposed in-water construction methods, short-term increases in turbidity and suspended sediment may disrupt feeding activities or result in avoidance or displacement of fish from preferred habitat.

Salmonids have been observed to avoid streams that are chronically turbid (Lloyd 1987) or move laterally or downstream to avoid turbidity plumes (Sigler *et al.* 1984). Chronic exposure to high turbidity and suspended sediment may also affect growth and survival by impairing respiratory function, reducing tolerance to disease and contaminants, and causing physiological stress (Waters 1995). Any increase in turbidity associated with instream work is likely to be brief and occur only near the site, attenuating downstream as suspended sediment settles out of the water column. Temporary spikes in suspended sediment may result in behavioral avoidance of the site by fish; several studies have documented active avoidance of turbid areas by juvenile and adult salmonids (*e.g.*, Sigler *et al.* 1984, Lloyd 1987, Servizi and Martens 1992).

Although less is known about the timing of rearing and migration of sDPS green sturgeon, both adult and juvenile life stages are known to utilize the action area as a migration corridor and may exhibit rearing behavior there as well. Less is known about the specific detrimental physical and physiological effects of sedimentation and turbidity to sturgeon. However, it is thought that high levels of turbidity can generally result in gill fouling, reduced temperature tolerance, reduced swimming capacity and reduced forage capacity in lotic fishes (Wood and Armitage 1997). While sDPS green sturgeon are lotic fish, as bottom feeders their foraging capacity may not be as impacted as other species due to turbidity and may be enhanced due to turbidity. Wishingrad *et al.* (2015) found that lake sturgeon (*Acipenser fulvescen*s) exhibited greater foraging activity in turbid water than in clear water.

Potential direct and indirect effects of increased sedimentation and turbidity will be addressed using BMPs. All in-water work will be conducted between June 1 and October 15 to minimize impacts to fish. During in-water construction activities, monitoring will occur to ensure that turbidity levels do not exceed a 20% increase above ambient, as this is the threshold determined in the Sacramento and San Joaquin Rivers Basins Plan (RWQCB 2011). If this threshold is exceeded, work will be adjusted to maintain compliance. To prevent the potential discharge of turbid water into the Sacramento River that may result from temporary dewatering activities, water removed from the dewatered areas will be filtered and/or treated in a manner to ensure conformance with the water quality requirements of the approved 401 permit, issued by the Central Valley RWQCB, prior to being discharged into the aforementioned receiving waters. Piling removal can cause elevated turbidity and disturbance of sediment in the water. BMPs addressing piling removal include removal by vibratory extraction. This should be done by a crane operator who is trained to do so slowly to minimize turbidity and disturbance. The piling should be vibrated to break the friction bond between the pile and soil and prevent additional soil from being pulled up. Extraction equipment should minimize the time the exposed timber pile is in the water to prevent unnecessary exposure of creosote. Upon removal from substrate the pile should be moved expeditiously from the water into a containment basin. This should be done directly without any action being taken to clean or remove adhering material from the pile. The work surface and containment basin should be cleaned by disposing of any sediment in a manner compliant with Federal and state regulations.

There is still some potential for impact to adult and juvenile fish due to temporary, localized plumes of turbidity during pile driving, removal of piles, and demolition processes. However, the BMPs will minimize the extent of adverse effects associated with the proposed action and impacts to fish are expected to be minimal.

2.5.5 Spills and Hazardous Materials

During construction, the potential exists for spills or leakage of toxic substances to enter the Sacramento River. Refueling, operation, and storage of construction equipment and materials could result in accidental spills of pollutants (*e.g.*, fuels, lubricants, concrete, sealants, and oil). Removal of existing creosote piles may result in contamination to the Sacramento River.

High concentrations of contaminants can cause direct and indirect effects to fish. Direct effects include mortality from exposure or increased susceptibility to disease that reduces the overall health and survival of the exposed fish. The severity of these effects depends on the contaminant, the concentration, duration of exposure, and sensitivity of the affected life stage. A potential indirect effect of contamination is reduced prey availability; invertebrate prey survival could be reduced following exposure, therefore making food less available for fish. Fish consuming contaminated prey may also absorb toxins directly. For salmonids and sturgeon, potential direct and indirect effects of reduced water quality during Project construction will be addressed with BMPs including measures to control non-storm water management and waste management practices. Equipment will be in good working order and free of dripping or leaking fluids. Any necessary equipment washing will be conducted where water is prevented from flowing into the drainage conveyance systems and receiving waters. An emergency response plan will also be put into place including strict onsite handling procedures to prevent construction and maintenance materials from entering the river, procedures related to refueling, operating, storing, and staging construction equipment, as well as preventing and responding to spills. BMPs will be in place for spill containment measures. This includes the use of plastic sheeting, absorbent pads, and containment devices during all barge-mounted construction activities. BMPs will be deployed around and beneath all over-water or barge-mounted construction equipment and supplemental equipment will be present on-site to collect and remove any spills which may occur. Returning turbid water to the river will be prevented by filtering discharge with a filter bag, diverting to a settling tank, and treatment of the water consistent with the requirements of the waste discharge permit issued by the Central Valley RWQCB. With these BMPs in place, impacts to listed species from contaminants are expected to be very minor and short-term.

2.5.6 Increase in Overwater Structure

A temporary trestle will be installed to assist in bridge construction. This trestle will be used during the in-water work window and left in place year round during construction. Shading from this trestle will cover 38,897 square feet (0.893 acres) of critical habitat on or along the Sacramento River. Additionally, the new bridge will cause permanently shading on the river. The current bridge is 30 feet wide and 455 feet long which is 13,650 square feet (0.313 acres) of shading. The new bridge will be 45 feet wide and 480 feet long which is 20,700 square feet (0.475 acres) of shading. Overwater structures can alter underwater light conditions and provide potential holding conditions for juvenile and adult fish, including species that prey on juvenile fishes. Temporary shading attributable to the presence of the temporary trestles, work platforms, and barges during bridge construction and permanent shading from the new bridge potentially

could reduce primary productivity of affected habitats resulting in decreased prey base for fish. Shading also could increase the number of predatory fishes (*e.g.*, striped bass, largemouth bass) holding in the action area and/or their ability to prey on juvenile fishes. Because the temporary trestles, work platforms, and barges would be present only during construction, effects of trestle and work platform would be temporary and localized. Temporary shading effects from these platforms will extend outside of the in-water work window because they will be left in place year round for three years. Permanent shading effects will occur throughout the life of the bridge.

To mitigate for these effects, contractors will remove the deck of the temporary trestle during the rainy season so the structure does not interfere with high flows. While the piles of the temporary trestle are in place in the water, they will be monitored so that any accumulated debris will be removed at least daily, or more often as necessary, to protect the temporary structure. Although not anticipated, the temporary piles may remain in the river for up to two winters and three summers. The piles used to support the second temporary trestle (used to remove the existing bridge) are anticipated to remain in the water for one season. Trestles will be removed after the new bridge is completed and the existing bridge is removed. To minimize disturbance to the river, the trestles would likely be constructed using top down methods where steel piles are first placed along the shoreline, then topped with the bridge deck units before moving sequentially out into the river. These construction methods will minimize the amount of shading from trestles and the effects of that shading.

Effects of trestle and work platform would be temporary and localized. With the BMPs described above in place, it is not anticipated that listed species will be negatively impacted by increased temporary shading effects. The construction of the new bridge will result in 0.475 acres of permanent shading.

2.5.7 Effects to Critical Habitat

Critical habitat has been designated in the action area for winter-run Chinook salmon, CV spring-run Chinook salmon, CCV steelhead, and sDPS of green sturgeon. The PBFs that occur within the action area for winter-run Chinook salmon are: (1) access to and from spawning grounds, (2) habitat areas and adequate prey items that are free of contaminants, (3) riparian habitat for juvenile rearing, (4) adequate river flows, and (5) water temperatures between 42.5 and 57.5°F. The PBFs within the action area for CV spring-run Chinook salmon and CCV steelhead are (1) freshwater rearing sites and (2) freshwater migration corridors. The PBFs within the action area for sDPS green sturgeon are: (1) food resources, (2) adequate flow regime for all life stages, (3) water quality, (4) migratory corridors, (5) adequate water depth for all life stages, and (6) adequate sediment quality.

Migratory corridor PBFs for winter-run Chinook salmon, CV spring-run Chinook salmon, CCV steelhead, and sDPS green sturgeon are likely to be affected by the proposed action. The construction of bridge piles associated with the proposed action will create a permanent loss of 0.002 acres of critical habitat below the OHWM. The Project also includes removal of 0.477 acres of existing fenders and piers, which is expected to result in less predator habitat.

Cofferdams, sheet piles, and temporary trestle piles are expected to temporarily affect a maximum of 0.452 acres of critical habitat. Impacts are expected to include minor decreases in

the flow regime and slight increases in temperatures. During the three seasons of in-water work, the entirety of the migratory corridor will be decreased, but the long-term project footprint is expected to result in an increase to usable area for fish migration.

The new bridge will shade the Sacramento River by 0.475 acres. This will degrade the migratory corridor PBF by increasing the predation risk. Overwater structures can alter underwater light conditions and provide potential holding conditions for juvenile and adult fish, including species that prey on juvenile listed fishes.

In addition, this Project will permanently remove 0.37 acres, and temporarily remove 0.56 acres of Sacramento River riparian woodland habitat that supports rearing PBFs of critical habitat. BMPs will be implemented to minimize temporary effects; any disturbed riparian vegetation will be replanted at a 1:1 ratio with native trees and shrubs. Rapidly sprouting plants will be cut off at ground level to allow root systems to remain intact. For onsite replacement plants, Caltrans will prepare a revegetation plan. This plan will include a list of species, planting locations, and maintenance requirements. The composition of planted species will include all native riparian species similar to those removed from the Project footprint. Caltrans would additionally restore 4 acres of a California State Parks parcel adjacent to the project to mitigate for the permanent loss of 0.072 acres of riparian habitat. This parcel borders the Sacramento River and has flooded approximately every 10 years (1997, 2006, and 2017). This restored floodplain would provide additional riparian habitat for juvenile rearing. Caltrans would plant 4 acres in rows mimicking the restored parcel on its northern boundary, planting species such as Valley oak, box elder, Arroyo and Gooding's willow, Fremont cottonwood, California sycamore, Oregon ash, and California rose. Because of this revegetation plan and mitigation efforts, permanent impacts to critical habitat will be minimal. Short-term impacts to critical habitat are minimal and planting the parcel will provide a long-term benefit for the PBF of rearing habitat.

Habitat and prey items may be temporarily affected due to turbidity and removal of woody debris. This will affect the PBFs of food sources and adequate prey items free from contaniments. Additionally, water quality will be affected by increased turbidity when large woody material is removed, during pile driving, and cofferdam dewatering which could cause an increase in water temperature and a temporary drop in oxygen levels. This will affect the PBF of adequate flow. These effects as well as construction debris, runoff, dust, and potential release of creosote from the old wooden fenders, affecting water quality PBFs, will be prevented through the implementation of aforementioned pile removal BMPs, turbidity monitoring, spill prevention measures, and an emergency response plan. These BMPs will minimize the extent of adverse effects associated with the proposed action and impacts to critical habitat are expected to be minimal and temporary.

Pile driving creating noise vibrations may temporarily degrade PBFs of rearing and migratory habitat in the action area.

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 in the rangewide status of the species (Section 2.2.).

2.6.1 Water Diversions

Water diversions for municipal and industrial use are found in the action area. Depending on the size, location, and season of operation, any of the diversions that are unscreened may entrain and kill many life stages of aquatic species, including juvenile listed anadromous fish species.

2.6.2 Increased Urbanization

Increases in urbanization and housing developments can affect habitat by altering watershed characteristics, and changing both water use and storm water runoff patterns. Increased growth will place additional burdens on resource allocations, including natural gas, electricity, and water, as well as on infrastructure such as wastewater sanitation plants, roads and highways, and public utilities. Some of these actions, particularly those that are situated away from waterbodies, will not require Federal permits, and thus will not undergo review through the ESA section 7 consultation process with NMFS.

Increased urbanization also is expected to result in increased recreational activities in the region. Among the activities expected to increase in volume and frequency is recreational boating. Boating activities typically result in increased wave action and propeller wash in waterways. This potentially will degrade riparian and wetland habitat by eroding channel banks and midchannel islands, thereby causing an increase in siltation and turbidity. Wakes and propeller wash also churn up benthic sediments thereby potentially re-suspending contaminated sediments and degrading areas of submerged vegetation. This, in turn, will reduce habitat quality for the invertebrate forage base required for the survival of juvenile salmonids and green sturgeon moving through the system. Increased recreational boat operation is anticipated to result in more contamination from the operation of gasoline and diesel powered engines on watercraft entering the associated water bodies.

2.6.3 Rock Revetment and Levee Repair Projects

Cumulative effects include non-Federal riprap projects. Depending on the scope of the action, some non-Federal riprap projects carried out by state or local agencies do not require Federal permits. These types of actions and illegal placement of riprap occur within the Sacramento River watershed. The effects of such actions result in continued degradation, simplification, and fragmentation of riparian and freshwater habitat.

2.7 Integration and Synthesis

The Integration and Synthesis section is the final step in our assessment of the risk posed to species and critical habitat as a result of implementing the proposed action. In this section, we add the effects of the action (Section 2.5) to the environmental baseline (Section 2.4) and the cumulative effects (Section 2.6), taking into account the status of the species and critical habitat (Section 2.2), to formulate the agency's BO 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 for the conservation of the species.

In our *Rangewide Status of the Species* section, NMFS summarized the current likelihood of extinction of each of the listed species. We described the factors that have led to the current listing of each species under the ESA and across their ranges. These factors include past and present human activities and climatological trends and ocean conditions that have been identified as influential to the survival and recovery of the listed species. Beyond the continuation of the human activities affecting the species, we also expect that ocean condition cycles and climatic shifts will continue to have both positive and negative effects on the species' ability to survive and recover. The *Environmental Baseline* section reviewed the status of the species and the factors that are affecting their survival and recovery in the action area. The *Effects of the Action* section reviewed the exposure of the species and critical habitat to the proposed action and cumulative effects. NMFS then evaluated the likely responses of individuals, populations, and critical habitat. This *Integration and Synthesis* section will consider all of these factors to determine the proposed action's influence on the likelihood of both the survival and recovery of the listed species and on the conservation value of designated critical habitats.

In order to estimate the risk to CCV steelhead, CV spring-run Chinook salmon, winter-run Chinook salmon, and sDPS green sturgeon as a result of the proposed action, NMFS uses a hierarchical approach. The condition of the ESU or DPS is summarized from the *Status of the Species* section of this BO. We then consider how the status of populations in the action area, as described in the *Environmental Baseline*, is affected by the proposed action. Effects on individuals are summarized, and the consequence of those effects is applied to establish risk to the diversity group, ESU, or DPS.

Status of the Species and Environmental Baseline

There are several criteria that would qualify the winter-run Chinook salmon population at moderate risk of extinction (continued low abundance, a negative growth rate over two complete generations, significant rate of decline since 2006, increased hatchery influence on the population, and increased risk of catastrophe), and because there is still only one population that spawns below Keswick Dam, winter-run Chinook are at a high risk of extinction in the long term. Although many of the PBFs of winter-run Chinook salmon critical habitat are currently degraded and provide limited high quality habitat, the spawning habitat, migratory corridors, and rearing habitat that remain are considered to have high intrinsic value for the conservation of the species.

CV spring-run Chinook salmon remain at moderate risk of extinction based on the evaluation for years 2012 – 2014 (Williams *et al.* 2016). However, based on the severity of the drought and the low escapements, as well as increased pre-spawn mortality in Butte, Mill, and Deer Creeks in 2015, there is concern that these CV spring-run Chinook salmon strongholds will deteriorate into high extinction risk in the coming years based on the population size or rate of decline criteria (NMFS 2016b). Although many of the PBFs of CV spring-run Chinook salmon critical habitat are currently degraded and provide limited high quality habitat, the spawning habitat, migratory corridors, and rearing habitat that remain are considered to have high intrinsic value for the conservation of the species.

The status of the CCV steelhead DPS appears to have remained unchanged since the 2016 status review and the DPS is likely to become endangered within the near future throughout all or a significant portion of its range (NMFS 2016a). Many of the PBFs of CCV steelhead critical habitat are degraded and provide limited high quality habitat. Although the current conditions of CCV steelhead critical habitat are significantly degraded, the spawning habitat, migratory corridors, and rearing habitat that remain in the Sacramento River watershed are considered to have high intrinsic value for the conservation of the species, as they are critical to ongoing recovery efforts.

The viability of sDPS green sturgeon is constrained by factors such as a small population size, lack of multiple populations, and concentration of spawning sites into just a few locations. The risk of extinction is believed to be moderate (NMFS 2015). Currently, many of the PBFs of sDPS green sturgeon are degraded and provide limited high quality habitat. Factors that lessen the quality of migratory corridors for juveniles include unscreened or inadequately screened diversions, altered flows in the Delta, and presence of contaminants in sediment. Although currently many of the PBFs of sDPS green sturgeon critical habitat are degraded and provide limited high quality habitat, the spawning habitat, migratory corridors, and rearing habitat that remain are considered to have high intrinsic value for the conservation of the species. The evidence presented in the *Environmental Baseline* section indicates that past and present activities within the Sacramento River basin have caused significant habitat loss, degradation, and fragmentation. This has significantly reduced the quality and quantity of the remaining PBFs within the Sacramento River for the populations of CCV steelhead, CV winter-run Chinook salmon, CV spring-run Chinook salmon, and sDPS green sturgeon that utilize the action area. Alterations in the flow regimes of the Sacramento River system, removal of riparian vegetation and shallow water habitat, reduced habitat complexity, construction of armored levees for flood protection, and the influx of contaminants from agricultural and urban discharges have also substantially reduced the functionality of the waterways.

Cumulative Effects

Water diversions, increased urbanization, and continuing rock revetment and levee projects can be reasonably assumed to occur in the future in the action area. The effects of these actions result in the continued degradation, simplification, and fragmentation of the riparian and freshwater habitat. Some of these actions, particularly those that are situated away from waterbodies, will not require Federal permits, and thus will not undergo review through the ESA section 7 consultation process with NMFS.

Summary of the Effects of the Proposed Action

Fish will be harassed, injured, or killed during completion of the proposed action through various pathways. Direct effects from Project activities could result in negative effects through behavioral responses, or prey items killed from sediment or pollutant buildup. Any spills or leaks of toxic substances from construction equipment could cause direct or indirect effects to fish that risk mortality or reduces the overall health and survival of exposed fish. A fish rescue and relocation plan involves capturing fish and physically handling and relocating them, which risks injury and death. Construction-related increases in sedimentation and siltation above background level could potentially affect fish species and their habitat reducing survival of juveniles or interfering with feeding, migrating, and rearing activities. A large and varied amount of pile driving can create enough sound to damage a fish's internal organs or affect their migration and behavioral responses. Avoidance and mitigation measures, as well as BMPs, have been put in place to minimize any negative effects to listed species.

Critical habitat has been designated in the action area for winter-run Chinook salmon, CV spring-run Chinook salmon, CCV steelhead, and sDPS green sturgeon. PBFs affected for each species are listed in section 2.5.7. The proposed action will permanently affect an area that already contains degraded PBFs. The migratory corridors and rearing habitat that remain are considered to have high intrinsic value for the conservation of the species. Therefore, the loss of any amount of these PBFs in the action area would negatively affect all of the listed species that utilize the action area.This loss of PBFs will be offset by the restoration of the 4-acre state parks parcel which will create floodplain and riparian habitat providing a long-term benefit for the PBF of rearing habitat.

NMFS Recovery Plans

The NMFS Recovery Plan for salmonids recommends recovery actions to be taken on the Sacramento River to enhance fish passage and habitat. Four actions relevant to the proposed action are:

(1) Restore and maintain riparian and floodplain ecosystems along both banks of the Sacramento River to provide a diversity of habitat types including riparian forest, gravel bars, bare cut banks, shady vegetated banks, side channels, and sheltered wetlands, such as sloughs and oxbow lakes following the guidance of the Sacramento River Conservation Area Handbook.
(2) Ensure that riverbank stabilization projects along the Sacramento River utilize biotechnical techniques that restore riparian habitat, rather than solely using the conventional technique of adding riprap.
(3) Curtail further development in active Sacramento River floodplains through zoning restrictions, county master plans, and other Federal, state, and county planning and regulatory processes.
(4) Implement projects that promote native riparian (*e.g.*, willows) species including eradication projects for nonnative species (*e.g.*, Arundo, tamarisk).

The NMFS Recovery Plan for sDPS green sturgeon recommends recovery actions to be taken to address threats to sDPS green sturgeon. The following is relevant to the proposed action; improve compliance and implementation of BMPs to reduce input of point and non-point source contaminants within the Sacramento River Basin.

The proposed Project reduces the riparian ecosystem by converting 0.072 acres of critical habitat to hardscape and creating 0.475 acres in shading over the Sacramento River. Although the in-water structure associated with the new bridge decreases by 0.477 acres, this structure represents new development in active Sacramento River floodplains, and continues to impact the ability of the habitat to support fish life stages.

Risk to Diversity Groups for each Species

Project effects to SR winter-run Chinook, CV spring-run Chinook, and CCV steelhead will affect the Basalt and Porous Lava, Northern Sierra Nevada, and Northwestern California Diversity Groups, as identified in the Salmonid Recovery Plan (NMFS 2014). Key threats to salmonids within these diversity groups (which include tributaries of the Sacramento River) include inaccessibility of historic habitat, altered flows and water temperatures, small and large passage impedements, loss of riparian and floodplain habitat, predation, and lack of spawning gravel.

Recovery criteria for SR winter-run Chinook includes maintenance/establishment of three viable populations for the ESU, all located within the Basalt and Porous Lava Diversity Group. Currently the populations of SR winter-run Chinook below Keswick Dam is the only population considered viable within the ESU. The Sacramento River within the Action Area provides important rearing PBFs for SR winter-run Chinook. Although the proposed Project is expected to adversely affect a small portion of this population, the work window will avoid peak migration timing.

For CV spring-run Chinook salmon, recovery criteria includes maintenance/establishment of seven viable populations within the Basalt and Porous Lava, Northern Sierra Nevada, and Northwestern California Diversity Groups and nine viable populations for the ESU, only one of which is currently considered viable. The Sacramento River within the Action Area provides important rearing PBFs for CV spring-run Chinook. Although the proposed Project is expected to adversely affect a small proportion of the ESU for these species, most of the range-wide habitat supporting the species is outside of the Action Area.

Recovery criteria for CCV steelhead include maintenance and establishment of nine viable populations for the ESU. Of those, two viable populations are to be within the Basalt and Porous Lava Diversity Group, four within the Northern Sierra Nevada Diversity Groups, and one within the Northwestern California Diversity Group. The proposed Project impacts represent a small loss, which is not expected to reach the designation scale for the CCV steelhead DPS as a whole. Permanent project impacts represent a small loss in the scope of available critical habitat at the designation scale for CVV steelhead though the intrinsic value of the action area for conservation of the species remains high.

The sDPS of green sturgeon includes only one spawning population in the Upper Sacramento River. The Recovery Plan for sDPS green sturgeon identifies a no-net loss of sDPS green sturgeon diversity from current levels as a recovery criteria. Diversity refers to individual and population variability in genetic, life history, behavioral, and physiological traits. Maintaining diversity is critical to retaining the species' ability to adapt to a diverse and variable environment. There are currently no methods to directly measure diversity or compare present and historical levels. However, the loss of spawning habitat can be used as a proxy and it is likely that some loss has occurred (NMFS 2018). Because diversity is closely tied with abundance, distribution, and productivity, the recovery criteria of no-net loss of diversity may be met by improving and/or increasing spawning and rearing habitat to a level which increases spawning and/or rearing distribution or success. Although the proposed Project is expected to adversely affect a small proportion of the DPS for these species, no spawning habitat occurs within the Action Area and most of the range-wide rearing habitat supporting the species is outside of the Action Area. Permanent project impacts represent a small loss in the scope of available critical habitat at the designation scale for sDPS green sturgeon though the intrinsic value of the action area for conservation of the species remains high.

Summary of Risk to the ESU/DPS for each Species and Critical Habitat at the Designation Level

The Sacramento River contains spawning populations of SR winter-run and CV spring-run Chinook salmon, CCV steelhead, and sDPS green sturgeon, making it an important river in terms of range-wide recovery for these species. Further, the Sacramento River is the only spawning location for SR winter-run Chinook salmon and the only known spawning location for sDPS green sturgeon. Although construction is expected to cause adverse effects to small numbers of listed fish, the impacts will be relatively short in duration and will avoid higher river and peak migration time periods, so that abundance would be low within the project footprint. Additionally, most of the effects are not lethal. Construction-related harassment will be temporary and will not impede adult fish from reaching upstream spawning and holding habitat, or juvenile fish from migrating downstream. Long-term impacts of the bridge structure are expected to result in some brief minor behavioral modifications of migrating or rearing juvenile fish, as they move past the structure.

Permanent impacts only represent a small loss in the scope of the available habitat for the ESU/DPS. Onsite mitigation will offset the loss of ecosystem function due to the modification of the riverbank and streambed (see Section 1.3). Measures are included in the proposed action to protect fish and designated critical habitat. The proposed Project, with the implementation of these measures and the restoration of adjacent riparian floodplains, is not expected to reduce appreciably the likelihood of either the survival or recovery of a listed species in the wild by reducing their numbers, reproduction, or distribution; or appreciably diminish the value of designated critical habitat for the conservation of the species.

2.8 Conclusion

After reviewing and analyzing the current status of the listed species and critical habitat, the environmental baseline within the action area, the effects of the proposed action, any effects of interrelated and interdependent activities, and cumulative effects, it is NMFS' biological opinion

that the proposed action is not likely to jeopardize the continued existence of Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, CCV steelhead, and sDPS green sturgeon, or destroy or adversely modify their designated critical habitats.

2.9 Incidental Take Statement

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is further defined by regulation to include significant habitat modification or degradation that actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering (50 CFR 222.102). "Incidental take" is defined by regulation as takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant (50 CFR 402.02). Section 7(b)(4) and section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA if that action is performed in compliance with the terms and conditions of this ITS. The take exemption conferred by this incidental take statement is based upon the proposed action occurring as described in the BO and in more detail in the Caltrans Biological Assessment (Caltrans 2021).

2.9.1 Amount or Extent of Take

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

NMFS anticipates incidental take of adult winter-run Chinook, adult and juvenile CV spring run Chinook salmon, adult and juvenile CCV steelhead, and adult and juvenile sDPS green sturgeon from impacts directly related to sedimentation and turbidity, pile driving, dewatering and potential fish entrainment, shading created by the bridge, and the possibility deleterious materials entering the waterway at the Project construction site. The incidental take is expected to be in the form of harm, harassment, or mortality of winter-run Chinook salmon, CV spring-run Chinook salmon, CCV steelhead, and sDPS green sturgeon resulting from the installation and removal of temporary and permanent piles during bridge construction. Incidental take is expected to occur for any in-water work window seasons when winter-run Chinook, CV spring-run Chinook, CCV steelhead, and sDPS green sturgeon individuals could potentially be in the action area.

It is impossible to precisely quantify and track the amount or number of individuals that are expected to be incidentally taken (injured, harmed, killed, etc.) per species as a result of the proposed action due to the variability and uncertainty associated with the response of listed species to the effects of the proposed action, the varying population size of each species, annual variations in the timing of spawning and migration, individual habitat use within the action area, and difficulty in observing injured or dead fish. However, it is possible to estimate the extent of incidental take by designating as ecological surrogates. Ecological surrogates are Project elements that are practical to quantify and monitor to determine the extent of incidental take that is occcuring.

Ecological surrogates for construction effects are described below. Overall, the number of listed fish that may be incidentally taken during activities is expected to be small, due to BMPs such as implementing the proposed work window.

1) Construction Related Effects

Incidental take is expected to occur from construction-related effects in the form of harm, injury or death of listed species. Additionally, take in the form of harassment is likely to occur as a result of displacement due to construction operations. Disruption of habitat utilization is likely to result in increased predation risk, decreased feeding, and increased competition. The behavioral modifications are expected to result from disruption of habitat use. Fish may be crushed by falling debris or interactions with construction equipment. Additionally they may experience a reduced prey base as a result of construction related mortality to macroinvertebrates. The 44.22-acre construction footprint contains the permanent effects and serves as the ecological surrogate for construction related effects. If Caltrans construction-related effects exceed the 44.2 acre footprint, the proposed Project will be considered to have exceeded anticipated take levels, thus requiring Caltrans to cease operations and coordinate with NMFS within 24 hours on ways to reduce the amount of take down to anticipated levels.

2) Fish Entrapment in Cofferdams

Incidental take in the form of harassment, harm, or death is expected to occur due to fish entrapment in cofferdams. Fish present and unable to avoid the cofferdam would be harasses, harmed, or killed during fish capture and relocation. The temporary cofferdams and trestle piles will occupy 0.436 acres of river during construction. This habitat disruption will affect the behavior of listed fish, resulting in displacement and increased predation, and decreased feeding. In turn, these will result in decreased survival, reduced growth and reduced fitness, respectively.This area contains the dewatering and relocation effects and serves as the ecological surrogate for these effects. If Caltrans exceeds the 0.436 acre cofferdam footprint, the proposed Project will be considered to have exceeded anticipated take levels, thus requiring Caltrans to cease operations and coordinate with NMFS within 24 hours on ways to reduce the amount of take down to anticipated levels.

3) Increased Sedimentation and Turbidity

Incidental take in the form of harassment, harm or death is expected due to increases in sedimentation and turbidity resulting from project activities. The analysis of the effects of the proposed Project anticipates that the turbidity levels produced by installation and removal of piles will not exceed 20% over background, the threshold derived from the Sacramento and San Joaquin Rivers Basins Plan (Central Valley Regional Water Quality Control Board, 2018). The 20% turbidity level is used here as an ecological surrogate. Increases in turbidty above 20% will affect the behavior of listed fish, including migration delay and displacement, which is reasonably certain to result in increased predation risk resulting in decreased survival; decreased feeding resulting in reduced growth; and increased competition, resulting in reduced fitness. If turbidity exceeds 20% over background levels, and construction activities fail to halt and adjust work to return to acceptable levels, the proposed Project will be considered to have exceeded

anticipated take levels, thus requiring Caltrans to cease operations and coordinate with NMFS within 24 hours on ways to reduce the amount of take down to anticipated levels.

4) Pile Driving and Acoustic Impacts

Incidental take in the form of harassment, harm, or death is expected to occur due to pile driving and acoustic impacts through exposure to temporary high noise levels or sustained exposure to lower sound levels (> 206 dB peak or 183 or 187 dB SEL) within the water column during the installation of the piles. NMFS will use the distance of acoustic impacts extending into the water column from each pile and the time period for pile driving as an ecological surrogate. As proposed, Caltrans/contractor will drive piles listed in Table 3, during the in-water work window, between June 1 and October 15, and during daylight hours only.

Based on the acoustic effects analysis (Table 3), peak sound pressures are estimated to be above the 206 dB threshold for injury and/or mortality of listed fish within 10 to 34 meters of the pile driving, depending on the size of piles used. Cumulative sound exposure levels are expected to exceed the 187 dB SEL threshold for physical injury for fish greater than 2 grams from 34 to 1,359 meters of the pile, depending on the size of piles used (Table 3). Non-injurious behavioral effects are expected to occur from 160 to 3,981 meters of the pile, depending on the size of pile used (Table 3). Fish exposed to these levels are expected to be injured or killed. Non-injurious behavioral effects will result in displacement, increased predation, and decreased feeding. This will result in decreased survival and reduced fitness. If Caltrans' monitoring indicates that sound levels greater than 206 dB peak, 187 dB cumulative SEL, or 150 dB RMS extend beyond the distances expected for the pile size and attenuation type, the amount of incidental take would be exceeded. If these ecological surrogate thresholds are exceeded, the proposed Project will be considered to have exceeded anticipated take levels, thus requiring Caltrans to cease operations and coordinate with NMFS within 24 hours on ways to reduce the amount of take down to anticipated levels.

5) Overwater Structure Impacts

NMFS anticipates harm of listed anadromous fish as a result of shading by the new structure over the Sacramento River. This harm is expected due to a reduced ability for listed fish to locate prey and the presence of predatory fishes holding in the action area. The ecological surrogate for incidental take associated with the action is the permanent shading of 0.475 acres of the Sacramento River in the action area. Overwater structure will decrease prey availability and increase predation which will result in decreased survival, reduced growth, and decreased feeding If this ecological surrogate is exceeded, the proposed action will be considered to have exceeded anticipated take levels, thus requiring Caltrans to cease and coordinate with NMFS within 24 hours on ways to reduce the amount of take down to anticipated levels.

6) Loss of Critical Habitat

NMFS anticipates incidental take in the form of harm and death from habitat modifications at the Project site. This harm is expected due to reduced quantity and quality of rearing habitat and by creating habitat conditions that increase the likelihood of predation. The ecological surrogates for

incidental take associated with the action is the temporary loss of 0.56 acres of riparian vegetation and the permanent loss of 0.37 acres of riparian vegetation. This loss of habitat is expected to result in reduced growth and fitness for listed species.

Anticipated incidental take will be exceeded if the ecological surrogates described in the sections above are not met, the Action is not implemented as described in the BA prepared for this Action, or the Action is not implemented in compliance with the terms and conditions of this incidental take statement. If these ecological surrogates are not met and maintained, the proposed action will be considered to have exceeded anticipated take levels, thus requiring Caltrans to cease and coordinate with NMFS within 24 hours on ways to reduce the amount of take down to anticipated levels.

2.9.2 Effect of the Take

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

2.9.3 Reasonable and Prudent Measures

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

The measures described below are non-discretionary, and must be undertaken by Caltrans so that they become binding conditions of any contracts or permits, as appropriate, for the exemption in section 7(o)(2) to apply. Caltrans has a continuing duty to regulate the activity covered by this incidental take statement. If Caltrans (1) fails to assume and implement the terms and conditions or (2) fails to require its contractor(s) to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, Caltrans must report the progress of the action and its impact on the species to NMFS as specified in the incidental take statement [50 CFR§402.14(i)(3)].

1. Measures shall be taken to minimize sedimentation events and turbidity plumes.
2. Measures shall be taken to reduce sound impacts.
3. Measures shall be taken to revegetate impacted areas below and above the OHWM with native plants and shrubs.
4. Measures shall be taken to reduce mortality of listed species requiring capture/relocation in association with dewatering activities.
5. Caltrans shall monitor and report on the amount or extent of incidental take.

2.9.4 Terms and Conditions

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

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

a) BMPs shall be implemented to prevent sediment incursion into the active channel. A description of all BMPs to be implemented shall be provided to the contractor.
b) Turbidity and settable solids shall be monitored according to water quality permits. If acceptable limits are exceeded, work shall be suspended until acceptable measured levels are achieved and NMFS shall be notified.

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

a) Attenuation measures shall be used during impact pile driving to control and dampen underwater pressure wave propagation. Effective attenuation measures include:
    a. Use of a bubble curtain around the pile.
    b. Use of a dual-casing isolation system.
    c. Use of a cushion block between the hammer and the pile.
b) Pile driving shall not be conducted at night when migration is most prevalent.

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

a) The removal of existing riparian and native vegetation shall be minimized, where feasible the root system of removed trees shall remain intact.
b) Restoration of the state parks parcel shall occur pursuant to the Restoration Plan including submission of the following:
    a. Confirmation of the title transfer of the parcel to USFWS possession for inclusion into the Sacramento National Wildlife Refuge Complex for long term management for the conservation of threatened and endangered species.
c) Restoration activities shall occur prior to and concurrent with construction activities.
d) Caltrans shall submit annual mitigation monitoring reports for 5 years post-construction to monitor the performance of the restoration effort as described in Section 1.4 of this BO.

The following terms and conditions implement reasonable and prudent measure 4:

a) During dewatering activities, a qualified fish biologist shall be present onsite to make observations, and capture/relocate fish. Only fish biologists trained in salmonid capture and relocation shall remove and relocate fish during dewatering activities.

The following terms and conditions implement reasonable and prudent measure 5:

a) Caltrans shall provide a report of Project activities to NMFS by December 31 of each construction year.
b) The report shall include at a minimum,
    a. A summary of all monthly compliance reports and annual status reports,

b. A description of each of the implemented mitigation measures and when each was implemented,
c. All available information about project-related incidental take of listed species,
d. Information about other project impacts on listed species,
e. Beginning and end dates of project activities,
f. An assessment of the effectiveness of this BO conservation measures in minimizing and fully mitigating project impacts on listed species and habitat,
g. Recommendations on how mitigation measures might be changed to more effectively minimize take and mitigate the impacts of future projects and,
h. Any other pertinent information.

c) Caltrans shall submit a fish passage plan at least 60 days in advance of construction to NMFS for review.

d) Caltrans shall visually monitor the waterway in the action area during operations for any affected fish, including, but not limited to, CV spring-run Chinook, CCV steelhead, winter-run Chinook, and the sDPS green sturgeon. Observation of affected fish shall be reported to NMFS by telephone at (916) 930-3600 or at the address given below within 24 hours of the incident. Operations shall be halted immediately until Caltrans coordinates with NMFS to determine the cause of the incident and whether any additional protective measures are necessary to protect listed salmonids and green sturgeon. Any protective measures that are determined necessary to protect listed salmonids and sturgeon shall be implemented as soon as practicable within 72 hours of the incident. Affected fish are defined as:
    a. Dead or injured fish at the water surface;
    b. Showing signs of erratic swimming behavior or other obvious signs of distress;
    c. Gasping at the water surface; or
    d. Showing signs of other unusual behavior.

    A follow-up written notification shall also be submitted to NMFS which includes the date, time, and location that the carcass or injured specimen was found, a color photograph, the cause of injury or death, if known, and the name and affiliation of the person who found the specimen. Written notification shall be submitted to NMFS at the above address. Any dead specimen(s) shall be placed in a cooler with ice and held for pick up by NMFS personnel or an individual designated by NMFS to do so.

Updates and reports required by these terms and conditions shall be submitted (preferably by email) to:

Assistant Regional Administrator
National Marine Fisheries Service
California Central Valley Office
650 Capitol Mall, Suite 5-100
Sacramento California 95814-4607
Email: ccvo.consultationrequests@noaa.gov

2.10 Conservation Recommendations

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

1) Caltrans should continue to work cooperatively with other State and Federal agencies, private landowners, governments, and local watershed groups to identify opportunities for cooperative analysis and funding to support recovery actions in the NMFS Salmonid Recovery Plan (NMFS 2014b)
2) Equipment used for the Project should be thoroughly inspected off-site for drips or leaks.
3) To the extent practicable, equipment should be serviced with petroleum or other containment sources, off-site.
4) Equipment used for the Project should be thoroughly cleaned off-site to prevent introduction of contaminants.
5) Caltrans should shield any lights used in or around the water at night to ensure that only the necessary light is being directed into the water.

2.11 Reinitiation of Consultation

This concludes formal consultation for Butte City State Route 162 Bridge Replacement over the Sacramento River.

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

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

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

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

3.1 Essential Fish Habitat Affected by the Project

EFH designated under the Pacific Coast salmon FMP may be affected by the proposed action. Species that utilize EFH designated under this FMP within the action area include fall-run/late fall-run Chinook salmon, threatened CV spring-run Chinook salmon, and endangered winter-run Chinook salmon. The habitat areas of particular concern (HAPCs) that may be either directly or indirectly adversely affected include (1) complex channels and floodplain habitats and (2) thermal refugia.

3.2 Adverse Effects on Essential Fish Habitat

Consistent with the ESA portion of this document which determined that aspects of the proposed action will result in impacts to pacific coast salmonids and critical habitat, we conclude that aspects of the proposed action would also adversely affect EFH for these species. We conclude that the following adverse effects on EFH designated for Pacific Coast Salmon are reasonably certain to occur (affected HAPCs are indicated by number, corresponding to the HAPCs listed above in Section 3.1):

Pile Driving:

- Permanent loss of habitat (1)

Sedimentation and Turbidity

- Reduced habitat complexity (1)

- Degraded water quality (1)
- Reduction in aquatic macroinvertebrate production (1)

Vegetation removal:

- Permanent loss of natural shade cover (2)
- Permanent loss of habitat (1)

Dewatering of cofferdams

- Degraded water quality (1, 2)
- Temporary loss of habitat (1, 2)

3.3 Essential Fish Habitat Conservation Recommendations

In order to minimize effects to EFH, Caltrans should implement the terms and conditions that apply to effects to critical habitat, specifically terms and conditions numbers 1 and 3 from Section 2.9.4 above. Additionally, the following are EFH conservation recommendations for impacts to complex channels and floodplain habitat:

(1) Caltrans should provide a NMFS-approved worker environmental awareness training program for construction personnel to be conducted by a NMFS-approved biologist for all construction workers prior to the commencement of construction activities. The program should provide workers with information on their responsibilities with regard to salmonids and federally-listed fish, their habitat, an overview of the life-history of all the species, information on take prohibitions, protections under the ESA, and an explanation of terms and conditions identified in this BO. Written documentation of the training should be submitted to NMFS within 30 days of the completion of training.

Fully implementing these EFH conservation recommendations would protect, by avoiding or minimizing the adverse effects described in Section 3.2, above, 0.387 acres of designated EFH for Pacific Coast salmon.

3.4 Statutory Response Requirement

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

In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, NMFS established a quarterly reporting requirement to determine how many conservation recommendations are provided as part of each EFH consultation and how

many are adopted by the action agency. Therefore, we ask that in your statutory reply to the EFH portion of this consultation, you clearly identify the number of conservation recommendations accepted.

3.5 Supplemental Consultation

Caltrans must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a way that may adversely affect EFH, or if new information becomes available that 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 user of this BO is Caltrans. Other interested users could include Butte City, Glenn County, U.S. Coast Guard, U.S. Fish and Wildlife Service, and California Department of Fish and Wildlife. Individual copies of this opinion were provided to Caltrans. The document will be available within two weeks at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. The format and naming adheres to conventional standards for style.

4.2 Integrity

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

4.3 Objectivity

Information Product Category: Natural Resource Plan

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

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

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

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

5 REFERENCES

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 Changing Climate. River Research and Applications.

California Department of Fish and Game. 1998. Report to the Fish and Game Commission. A status review of the spring-run Chinook salmon (Oncorhynchus tshawytscha) in the Sacramento River Drainage. Candidate species status report 98-01. Sacramento, 394 pages.

California Department of Transportation. 2021a. Sacramento River Bridge at Butte City Fisheries Biological Assessment. State of California, Department of Transportation.

California Department of Transportation. 2021b. Butte City Bridge Replacement Project Habitat Restoration Plan. State of California, Department of Transportation.

Central Valley Regional Water Quality Control Board. 2011. Sacramento and San Joaquin River Basins Plan. California Water Board.

Cohen, S. J., K. A. Miller, A. F. Hamlet, and W. Avis. 2000. Climate Change and Resource Management in the Columbia River Basin. Water International 25(2): 253-272.

Dettinger, M. D. 2005. From Climate Change Spaghetti to Climate-Change Distributions for 21st Century California. San Francisco Estuary and Watershed Science 3(1):1-14.

Dettinger, M. D. and D. R. Cayan 1995. Large-Scale Atmospheric Forcing of Recent Trends toward Early Snowmelt Runoff in California. Journal of Climate 8(3): 606-623.

Dettinger, M. D., D. R. Cayan, M. K. Meyer, and A. E. Jeton. 2004. Simulated Hydrologic Responses to Climate Variations and Changes in the Merced, Carson, and American River Basins, Sierra Nevada, California, 1900-2099. Climatic Change 62(62):283-317.

Dimacali, R. L. 2013. A Modeling Study of Changes in the Sacramento River Winter-Run Chinook Salmon Population Due to Climate Change. California State University, Sacramento.

Fisheries Hydroacoustic Working Group. 2008. Agreement in Principle for Interim Criteria for Injury to Fish from Pile Driving Activities.

Gaspin, J. B. 1975. Experimental Investigations of the Effects of Underwater Explosions on Swim bladder Fish. I. 1973 Chesapeake Bay Tests. DTIC Document.

Gisiner, R. C. 1998. Proceedings: Workshop on the Effects of Anthropogenic Noise in the Marine Environment, 10-12 February 1998. United States, Office of Naval Research.

Good, T. P., R. S. Waples, and P. Adams (editors). 2005. Updated status of federally listed ESU of West Coast salmon and steelhead. U.S. Department of Commerce, NOAA Technical Memo. NMFS-NWFSC-66. 598 pages.

Hastings, M. C. 1995. Physical Effects of Noise on Fishes. INTER-NOISE and NOISE-CON Congress and Conference Proceedings 1995(2):979-984.

Lindley, S. 2008. California Salmon in a Changing Climate.

Lindley, S. T., Schick, R. S., Mora, E., Adams, P. B., Anderson, J. J., Greene, S., Hanson, C., May, B. P., McEwan, D. R., MacFarlane, R. B. and Swanson, C. 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.

Lloyd, D. S. 1987. Turbidity as a Water Quality Standard for Salmonid Habitats in Alaska. North American Journal of Fisheries Management Vol. 7(1):34–45.

McClure, M. 2011. Climate Change in Status Review Update for Pacific Salmon and Steelhead Listed under the ESA: Pacific Northwest., M. J. Ford, editor, NMFS-NWFCS-113, 281 p.

McClure, M. M., M. Alexander, D. Borggaard, D. Boughton, L. Crozier, R. Griffis, J. C. Jorgensen, S. T. Lindley, J. Nye, M. J. Rowland, E. E. Seney, A. Snover, C. Toole, and V. A. N. H. K. 2013. Incorporating Climate Science in Applications of the U.S. Endangered Species Act for Aquatic Species. Conservation Biology 27(6):1222-1233.

McCullough, D. A., S. Spalding, D. Sturdevant, and M. Hicks. 2001. Summary of technical literature examining the physiological effects of temperature on salmonids. U. S. Environmental Protection Agency, Washington, D. C. EPA-910-D-01-005.

Merz, J. E. and L. K. O. Chan. 2005. Effects of Gravel Augmentation on Macroinvertebrate Assemblages in a Regulated California River. River Research and Applications 21(1):61-74.

Mora, E. A., R. D. Battleson, S. T. Lindley, M. J. Thomas, R. Bellmer, L. J. Zarri, and A. P. Klimley. 2018. Estimating the Annual Spawning Run Size and Population Size of the Southern Distinct Population Segment of Green Sturgeon. Transactions of the American Fisheries Society 147(1):195-203.

Mosser, C. M., L. C. Thompson, and J. S. Strange. 2013. Survival of Captured and Relocated Adult Spring-Run Chinook Salmon Oncorhynchus Tshawytscha in a Sacramento River Tributary after Cessation of Migration. Environmental Biology of Fishes 96(2-3):405-417.

Moyle, P. B. 2002. Inland fishes of California. University of California Press, Berkeley.

National Marine Fisheries Service. 2005. Endangered and Threatened Species: Designation of Critical Habitat for Seven Evolutionarily Significant Units of Pacific Salmon and Steelhead in California. Federal Register 70(170):52488-56627.

National Marine Fisheries Service. 2009. Biological and Conference Opinion on the Long term Operations of the Central Valley Plan and State Water Plan. June 4, 2009.

National Marine Fisheries Service. 2011. 5-Year Review: Summary and Evaluation of Central Valley Steelhead. U.S. Department of Commerce, 34 pp.

National Marine Fisheries Service. 2014. Recovery Plan for the Evolutionarily Significant Units of Sacramento River Winter-Run Chinook Salmon and Central Valley Spring-Run Chinook Salmon and the Distinct Population Segment of California Central Valley Steelhead. California Central Valley Area Office.

National Marine Fisheries Service 2015. 5-Year Summary and Evaluation: Southern Distinct Population Segment of the North American Green Sturgeon U.S. Department of Commerce. Long Beach, CA U.S. Department of Commerce: 42.

National Marine Fisheries Service. 2016a. 5-Year Review: Summary and Evaluation of California Central Valley Steelhead Distinct Population Segment. U.S. Department of Commerce, 44 pp.

National Marine Fisheries Service. 2016b. Endangered and Threatened Species; 5-Year Reviews for 28 Listed Species of Pacific Salmon, Steelhead, and Eulachon. Federal Register 81(102):33468-33469.

National Marine Fisheries Service. 2016c. 5-year review: Summary and evaluation of Sacramento River winter-run Chinook salmon Evolutionarily Significant Unit. National Marine Fisheries Service. West Coast Region. Central Valley Office, Sacramento, CA.

Pacific Fishery Management Council and National Marine Fisheries Service. 2014. Environmental Assessment and Regulatory Impact Review Pacific Coast Salmon Plan Amendment 18: Incorporating Revisions to Pacific Salmon Essential Fish Habitat. pp. 351.

Popper, A. N. and M. C. Hastings. 2009. The Effects of Human-Generated Sound on Fish. Integrative Zoology 4(1):43-52.

Popper, A. N., T. J. Carlson, A. D. Hawkins, B. L. Southall, and R. L. Gentry. 2006. Interim Criteria for Injury of Fish Exposed to Pile Driving Operations: A White Paper. Report to the Fisheries Hydroacoustic Working Group, California Department of Transportation, USA, 15pp.

Poytress, W. R., J. J. Gruber, F. D. Carrillo and S. D. Voss. 2014. Compendium Report of Red Bluff Diversion Dam Rotary Trap Juvenile Anadromous Fish Production Indices for Years 2002-2012. Report of U.S. Fish and Wildlife Service to California Department of Fish and Wildlife and US Bureau of Reclamation.

Poytress, W. R., J. J. Gruber, J. P. Van Eenennaam, and M. Gard. 2015. Spatial and Temporal Distribution of Spawning Events and Habitat Characteristics of Sacramento River Green Sturgeon. Transactions of the American Fisheries Society 144(6):1129-1142.

Richter, A. and S. A. Kolmes. 2005. Maximum Temperature Limits for Chinook, Coho, and Chum Salmon, and Steelhead Trout in the Pacific Northwest. Reviews in Fisheries Science 13(1):23-49.

Roos, M. 1987. Possible Changes in California Snowmelt Patterns. Pacific Grove, CA.

Roos, M. 1991. A Trend of Decreasing Snowmelt Runoff in Northern California. Page 36 Western Snow Conference, April 1991, Washington to Alaska.

Sacramento River Advisory Council. 2003. Sacramento River Conservation Area Forum Handbook. Red Bluff, CA.

Servizi, J. A. and D. W. Martens. 1992. Sublethal Responses of Coho Salmon (*Oncorhynchus kisutch*) to Suspended Sediments Canadian Journal of Fisheries and Aquatic Sciences 49:1389–1395.

Sigler, J. W., T. 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.

Slotte, A., K. Hansen, J. Dalen, and E. Ona. 2004. Acoustic Mapping of Pelagic Fish Distribution and Abundance in Relation to a Seismic Shooting Area off the Norwegian West Coast. Fisheries Research 67(2):143-150.

State Water Resources Control Board SWRCB. 2015. Drought Conditions Force Difficult Management Decisions For Sacramento River Temperatures. Media Release. http://www.waterboards.ca.gov/press_room/press_releases/2015/pr061615_shasta.pdf.

Thompson, L. C., M. I. Escobar, C. M. Mosser, D. R. Purkey, D. Yates, and P. B. Moyle. 2011. Water Management Adaptations to Prevent Loss of Spring-Run Chinook Salmon in California under Climate Change. Journal of Water Resources Planning and Management 138(5):465-478.

Tucker, M. E., C. M. Williams, and R. R. Johnson. 1998. Abundance, food habits, and life history aspects of Sacramento squawfish and striped bass at the Red Bluff Diversion Complex, including the research pumping plant, Sacramento River, California: 1994 to 1996. Red Bluff Research Pumping Plant Report Services, Vol. 4. USFWS, Red Bluff, California. 54 pages.

United States Fish and Wildlife Service (USFWS). 2005. Sacramento River National Wildlife Refuge Final Comprehensive Conservation Plan. June 2005. Prepared by the California/Nevada Refuge Planning Office, Sacramento, CA and Sacramento National Wildlife Refuge Complex, Willows, CA.

VanRheenen N. T., A. W. Wood, R. N. Palmer, and D. P. Lettenmaier. 2004. Potential Implications fo PCM Climate Change Scenarios for Sacramento-San Joaquin River Basin Hydrology and Water Resources. Climatic Change 62: 257-281.

Wade, A. A., T. J. Beechie, E. Fleishman, N. J. Mantua, H. Wu, J. S. Kimball, D. M. Stoms, and J. A. Stanford. 2013. Steelhead Vulnerability to Climate Change in the Pacific Northwest. Journal of Applied Ecology 50:1093-1104.

Wardle, C., T. Carter, G. Urquhart, A. Johnstone, A. Ziolkowski, G. Hampson, and D. Mackie. 2001. Effects of Seismic Air Guns on Marine Fish. Continental Shelf Research 21(8):1005-1027.

Waters, T. F. 1995. Sediment in Streams: Sources, Biological Effects, and Control. American Fisheries Society.

Williams, J. G. 2006. Central Valley Salmon: A Perspective on Chinook and Steelhead in the Central Valley of California. San Francisco Estuary and Watershed Science 4(3): 416.

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. National Marine Fisheries Service: 182.

Wishingrad, V., A. B. Musgrove, D. P. Chivers, and M. C. J. B. Ferrari. 2015. Risk in a Changing World: Environmental Cues Drive Anti-Predator Behaviour in Lake Sturgeon (*Acipenser fulvescens*) in the Absence of Predators. 152(5):635-652.

Wood, P. J. and P. D. Armitage. 1997. Biological Effects of Fine Sediment in the Lotic Environment. Environmental Management 21(2):203-217.

Yates, D., H. Galbraith, D. Purkey, A. Huber-Lee, J. Sieber, J. West, S. Herrod-Julius, and B. Joyce. 2008. Climate Warming, Water Storage, and Chinook Salmon in California's Sacramento Valley. Climatic Change 91(3-4):335-350.