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 ECO #: WCRO-2021-02995

March 23, 2022

Chris Fazzari
Associate Environmental Planner
Caltrans District 2
1657 Riverside Drive
Redding, California 96001

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 Drive over Olney Creek Bridge Replacement Project.

Dear Mr. Fazzari:

Thank you for your letter of October 29, 2021, requesting initiation of consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act of 1973 (ESA) (16 U.S.C. 1531 *et seq*.) for the Sacramento Drive over Olney Creek Bridge Replacement Project. Thank you, also, for your request for consultation pursuant to the essential fish habitat (EFH) provisions in Section 305(b) of the Magnuson–Stevens Fishery Conservation and Management Act [16 U.S.C. 1855(b)] for this action.

Based on the best available scientific and commercial information, the biological opinion concludes that the Sacramento Drive over Olney Creek Bridge Replacement Project is not likely to jeopardize the continued existence of the federally listed threatened Central Valley (CV) spring-run Chinook salmon evolutionarily significant unit (ESU) (Oncorhynchus tshawytscha), threatened California Central Valley (CCV) steelhead distinct population segment (DPS) (O. mykiss), or the endangered Sacramento River (SR) winter-run Chinook salmon (O. tshawytscha) and is not likely to destroy or adversely modify the designated critical habitats of the above listed species. For the above species, NMFS has included an incidental take statement with reasonable and prudent measures and non-discretionary 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 (National Environmental Policy Act 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 in NMFS California Central Valley Office via email at lyla.pirkola@noaa.gov or via phone at (916) 930-5615 if you have any questions concerning this consultation, or if you require additional information.

Sincerely,

A. Catherine Marcinkevage

Cathy Marcinkevage
Assistant Regional Administrator for
California Central Valley Office

Enclosure

cc: Copy to the File ARN 151422-WCR2017-SA00341
Copy to the File ARN 151422-WCR2021-SA00132

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

Sacramento Drive over Olney Creek Bridge Replacement Project

NMFS Consultation ECO Number: WCR-2021-02995

Action Agency: California Department of Transportation

Affected Species and NMFS' Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species?	Is Action Likely to Jeopardize the Species?	Is Action Likely to Adversely Affect Critical Habitat?	Is Action Likely to Destroy or Adversely Modify Critical Habitat?
California Central Valley steelhead (*Oncorhynchus mykiss*) distinct population segment	Threatened	Yes	No	Yes	No
Central Valley spring-run Chinook salmon (*Oncorhynchus tshawytscha*) evolutionarily significant unit (ESU)	Threatened	Yes	No	Yes	No
Sacramento River winter-run Chinook salmon (*Oncorhynchus tshawytscha*) ESU	Endangered	Yes	No	N/A	N/A

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: **March 23, 2022**

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

We completed pre-dissemination review of this document using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (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 2 weeks at the NOAA Library Institutional Repository (https://repository.library.noaa.gov/welcome). A complete record of this consultation is on file at NMFS California Central Valley Office in Sacramento, California.

1.2. Consultation History

- In March 2018, the California Department of Transportation (Caltrans) requested informal consultation with NOAA's National Marine Fisheries Service (NMFS) for the Sacramento Drive Bridge Replacement Project (project) over Olney Creek.
- On April 19, 2018, NMFS responded with a non-concurrence letter.
- On October 29, 2021, Caltrans submitted an updated biological assessment (BA) and letter requesting formal consultation with NMFS under the ESA. At this time, NMFS deemed the formal consultation package from Caltrans complete, and initiated consultation.

1.3. Proposed Federal Action

Under the ESA, “action” means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies (see 50 CFR 402.02). Under 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.

1.3.1. Project Description

The City of Redding, in coordination with Caltrans, is proposing to replace the existing Sacramento Drive Bridge over Olney Creek with a new bridge. The purpose of the project is to better convey flood flows and to provide a safe crossing over Olney Creek. The existing threespan, 83-foot-long, 30-foot-wide bridge will be replaced with a two-span, 117.5-foot-long, 48-foot-wide precast, prestressed, concrete, bridge at the same location. The new bridge will include two 12-foot wide lanes, each with a 6-foot wide shoulder and a 5-foot wide sidewalk.

The proposed project includes multiple activities that will impact Olney Creek and its habitat, including bridge demolition/reconstruction, stream widening/bank recontouring, stream bottom excavation, rip-rap installation, and riparian plantings. The proposed project would be completed over two construction seasons starting in summer 2022. In the first season, the northern lane of the bridge would be replaced and the northern stream restoration activities will be completed. During the second season, the southern lane of the bridge would be replaced and the southern stream restoration activities will be completed. To facilitate project construction, three temporary access roads would be constructed to provide access into the stream channel: two would be west of the creek (north and south of the bridge), and one would be southeast of the bridge.

Work during each season will consist of installing temporary culverts under the bridge and a short distance upstream or downstream to allow for bridge demolition/reconstruction work. The stream cross-section with the culverts would be covered with clean spawning-sized gravel to form a work pad. To allow for stream bottom excavation and stream widening, stream flows will be diverted to one side of the channel through the use of k-rails or gravel berms. Stream recontouring and rip-rap installation would then be completed on the dry side of the diversion. After one side of the channel has been recontoured and rip-rap installed, stream flow would be rerouted to the newly recontoured segment, and recontouring would be undertaken on the opposite side of the stream. The culverts and overlying gravels will be removed at the end of each season. Revegetation activities and appropriate erosion controls will be installed throughout the length of the affected channel segment. Revegetation will consist of woody plantings and reseeding.

Following completion of the access roads and dewatering activities, the northern half of the abutments and two existing bridge piers would be removed and replaced with new abutments and a single bridge pier. Approach roadway widening activities would be completed concurrently. During the second season, the new bridge lane/roadway would open to traffic, and the southern half of the bridge would be demolished/constructed using the same workflow.

Installation of each new abutment would require an excavation approximately 65 feet long, 12 feet wide, and 18 feet deep. The pier footing would require an excavation approximately 65 feet long, 12 feet wide, and 13 feet deep. As described above, the new bridge pier and abutments would be constructed over two seasons, so approximately half of the excavations described above would occur during each of the two years. Pile driving using a vibratory hammer would be required for the placement of steel soldier piles or steel sheet piles around the piers and abutments for excavation and dewatering purposes and as temporary retaining walls. After installation of the new abutments and pier, the new precast bridge deck slabs would be installed. Approximately 2,600 cubic yards of rip-rap of various size classes would be placed around the new abutments and along the length of the recontoured streambanks. The rip-rap would extend for a distance of approximately 655 linear feet along each stream bank and have a total surface coverage of 0.51 acres.

To improve flow and minimize the potential for flooding at the new bridge, the streambed of Olney Creek would be lowered by up to 3 feet and widened by up to 40 feet at the bridge. The channel deepening and widening would taper to conform to the existing stream channel 200 lineal feet upstream from the bridge and 455 lineal feet downstream from the bridge. The clean spawning gravel from the temporary work pads would be used to line the recontoured channel. Both banks of the 655-foot-long Olney Creek stream reach would be recontoured. The outlet of the on-site intermittent stream that flows into Olney Creek would also be recontoured; this work would be confined to the approximate ordinary high-water mark (OHWM) of Olney Creek.

Riparian vegetation removal will occur in the temporary construction access road corridors, around the bridge abutments, and along the recontoured streambanks. Several trees along Sacramento Drive outside of the riparian zone will be removed to accommodate widening of the approaches to the new bridge. The recontoured stream banks would be hard-armored with rip-rap. A total of 127 pole and bare root cuttings will be planted within the rip-rap as part of re-establishing vegetation along the stream. Plantings are not proposed in the narrow City right-of-way beneath the bridge or where stream velocities exceed 10 feet per second. Cuttings planted during the first work season would be maintained during the second work season, and replanting would occur if needed. However, due to private property ownership and lack of access, no maintenance will occur after planting following the second season of work. Temporarily disturbed areas between the top of the rip-rap slope and the high-visibility markers would be treated with one of two seed mix types for erosion control. Additional details regarding seed mix and planting locations can be found in the Olney Creek Channel Revegetation Plan (Caltrans 2021).

1.3.2. Avoidance, Minimization, and Conservation Measures

1) Limit the Work Period for In-Stream Work and Pile Driving.
    - In-stream construction activities, including pile driving, will be limited to the period from July 1 through October 31. If work is proposed outside of the agency approved work windows, the City shall obtain approval from those agencies prior to conducting such work, and shall implement any additional measures that may be required.
    - Pile driving will only be conducted during daytime hours defined as beginning one-half hour after sunrise and ending one-half hour prior to sunset.
2) Monitor In-Stream Work Activities.
    - All in-stream work, including installation of gravel work pads and flow diversion barriers, will be monitored by a qualified biologist. The biologist will ensure that the in-stream work is conducted in a manner that encourages salmonids to exit the work area before gravel or materials are discharged into the stream.
    - A qualified biologist will be present on the site each time a stream reach is dewatered. Following installation of flow diversion structures, the biologist will inspect the dewatered stream reach. All salmonids and, to the extent feasible, other aquatic life shall be relocated to the flowing stream channel.
3) Implement Best Management Practices (BMPs) for Erosion Control and Spill Prevention.

- BMPs for soil stabilization, sediment control, and spill prevention will be implemented throughout the duration of the project to ensure that sediment/pollutant transport into streams is minimized, which will in turn minimize the potential for adverse impacts to fish and the aquatic ecosystem.
- These BMPs will be specified in the storm water pollution prevention plan (SWPPP) to be prepared for the project.
- Other erosion control and spill prevention measures required by the California Department of Fish and Wildlife, U.S. Army Corps of Engineers, and/or the Regional Water Quality Control Board will also be implemented.

4) Minimize the Loss of Riparian Habitat.
   - Loss of riparian habitat will be minimized to the extent feasible. Measures to be taken to minimize such loss include the following:
     i. High-visibility fencing, flagging, or other markers will be installed along the outer edges of the construction zone where needed to prevent accidental entry into riparian habitat.
     ii. Equipment and materials will be stockpiled outside of riparian habitat, in designated staging areas.
     iii. Riparian plants will be pruned at ground level in temporary use areas (as opposed to mechanically removing the entire plant and root system), which will promote regeneration from the root systems.
5) Install Large Woody Debris in the Reconstructed Stream Channel.
   - To improve in-stream habitat, particularly fish-rearing habitat, large woody debris such as root wads and tree boles shall be installed in the reconstructed channel where feasible, both upstream and downstream of the new bridge.
6) Offset Long-Term Impacts on Salmonids and Designated Critical Habitat.
   - Riparian habitat creation or restoration credits will be purchased at a 1.5:1 ratio (estimated at 1.25 credits) at the Fremont Landing Conservation Bank or other NMFS-approved mitigation bank within critical habitat for the listed fish species discussed in this opinion.
   - Shaded riverine aquatic habitat creation or restoration credits will be purchased at a 1.5:1 ratio (estimated at 0.45 credits) at the Fremont Landing Conservation Bank or other NMFS-approved bank within critical habitat for the listed fish species discussed in this opinion.
   - Proof of purchase of mitigation credits will be provided to NMFS prior to the start of construction.

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

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

2.1. Analytical Approach

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

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

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

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

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

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

indirectly result in an alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species.

- If necessary, suggest a reasonable and prudent alternative to the proposed action.

2.2. Rangewide Status of the Species and Critical Habitat

This opinion examines the status of each species that is likely to be adversely affected by the proposed action. The status is determined by the level of extinction risk that the listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This informs the description of the species' likelihood of both survival and recovery. The species status section also helps to inform the description of the species' "reproduction, numbers, or distribution" for the jeopardy analysis. The opinion also examines the condition of critical habitat throughout the designated area, evaluates the conservation value of the various watersheds and coastal and marine environments that make up the designated area, and discusses the function of the PBFs that are essential for the conservation of the species. 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 ESU	Endangered, 70 FR 37160; June 28, 2005	According to the NMFS 5-year species status review (NMFS 2016c), the status of the winter-run Chinook salmon ESU, the extinction risk has increased from moderate risk to high risk of extinction since the 2007 and 2010 assessments. Based on the Lindley *et al*. (2007) criteria, the population is at high extinction risk in 2019. High extinction risk for the population was triggered by the hatchery influence criterion, with a mean of 66 percent hatchery origin spawners from 2016 through 2018. Several listing factors have contributed to the recent decline, including drought, poor ocean conditions, and hatchery influence. Thus, large-scale fish passage and habitat restoration actions are necessary for improving the winter-run Chinook salmon ESU viability.

Species	Listing Classification and Federal Register Notice	Status Summary
Central Valley spring-run Chinook salmon ESU	Threatened, 70 FR 37160; June 28, 2005	According to the NMFS 5-year species status review (NMFS 2016b), 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 and 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 2016 drought, uncertain juvenile survival during the drought are likely increasing the ESU's extinction risk. Monitoring data showed sharp declines in adult returns from 2014 through 2018 (CDFW 2018).
California Central Valley steelhead DPS	Threatened, 71 FR 834; January 5, 2006	According to the NMFS 5-year species status review (NMFS 2016a), the status of CCV steelhead appears to have remained unchanged since the 2011 status review that concluded that the DPS was in danger of becoming endangered. Most natural-origin 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 natural-origin 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.

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

Critical Habitat	Designation Date and Federal Register Notice	Description
Central Valley 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 critical habitat in the Central Valley are significantly limited and degraded, the habitat remaining is considered highly valuable.
California Central Valley 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 critical habitat in the Central Valley are significantly limited and degraded, the habitat remaining is considered highly valuable.

2.2.1. Recovery Plans

In July 2014, NMFS released a final Recovery Plan for Sacramento River (SR) winter-run Chinook salmon, CV spring-run Chinook salmon, and CCV steelhead (NMFS 2014, Recovery

Plan). The Recovery Plan outlines actions to restore habitat and access, and improve water quality and quantity conditions in the Sacramento River to promote the recovery of listed salmonids. Key recovery actions in the Recovery Plan include conducting landscape-scale restoration throughout the Delta, incorporating ecosystem restoration into Central Valley flood control plans that includes breaching and setting back levees, and restoring flows throughout the Sacramento and San Joaquin River basins and the Delta.

2.2.2. 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 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. 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 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).

Stream flow is a highly important variable and driving mechanism in fluvial ecosystems and climate has been identified as a landscape-scale driver of flow rates (Minshall 1988). Multiple climatological and hydrologic model predictions indicate that flows in the CCV will decrease throughout the 21st century as warming trends continue. Salmonids in the Sacramento River are facing a decrease in flows, resulting in potentially lethal or sub-lethal water temperatures in summer months, impaired migration and decreased egg to fry recruitment. In addition to altered flow regimes, some other aspects of stream systems that are particularly sensitive to changes in climate are sediment transport/channel alterations, nutrient loading and rates of nutrient cycling, fragmentation and isolation of cold-water habitats, altered exchanges with the riparian zone and life history characteristics of many aquatic insects (Meyer *et al.* 1999). Current warming trends and model predictions indicate that it is likely that climate change will result in some direct and indirect adverse effects to salmonids in the Sacramento River in the 21st century.

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 site is located over Olney Creek in the northern Sacramento Valley, within the City of Redding. The action area includes Olney Creek and associated riparian areas that may be adversely affected by (but not limited to) the following: noise generated by pile driving; dewatering; sedimentation and increased turbidity; and construction-related effects.

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. Status of Listed Species and Critical Habitat in the Action Area

Riverine and riparian habitats in the action area consist of Olney Creek, an intermittent stream, and riparian habitat. The remainder of the local area consists primarily of paved roadways, disturbed roadside shoulders, a portion of a golf course, and residences. Olney Creek is a low-gradient stream that is a direct tributary to the Sacramento River (approximately 1.25 miles downstream). Olney Creek is eight miles in length and drains the foothills to the west of the Sacramento River. Olney Creek has cold, variable flows during winter and spring. In summer and fall, low flows and cool temperatures are maintained by the input of cold water from the Anderson-Cottonwood Irrigation District (ACID) canal, located approximately one mile upstream.

Maslin *et al.* (1999) noted that the stream reach downstream of the ACID canal (which includes the action area) is used for salmonid spawning and rearing due to the input of cold-water leaking from the canal. Olney Creek within the action area functions as spawning, rearing, and migratory habitat for CCV steelhead. The action area may also function as non-natal rearing for juvenile CV spring-run and SR winter-run Chinook salmon.

Adult SR winter-run Chinook salmon and CV spring-run Chinook salmon likely do not spawn in Olney Creek. SR winter-run spawning occurs almost exclusively in the Sacramento River. CV spring-run utilize deep cold water pools to over-summer prior to spawning. Olney Creek lacks deep cold water pools required for CV spring-run. Rearing surveys conducted from 1997 to 1999 found no juvenile winter-run in Olney Creek at sampling stations from 0.3 miles to 1.85 miles upstream of its confluence with the Sacramento River. These surveys found juvenile CV spring-run Chinook salmon in 1997 and 1998 (Eight and forty five individuals, respectively). However, both juvenile SR winter-run and CV spring-run Chinook salmon may utilize Olney Creek for non-natal rearing in years with normal or above average rainfall. Juvenile Chinook salmon have a potential to rear in the action area year-round due to cold flows in winter and spring and the input of cold water leaking from the ACID canal during summer and fall.

Although no studies have investigated the number of adult CCV steelhead that return annually to spawn in Olney Creek, a small number of adult CCV steelhead may spawn in Olney Creek in years with normal or above average rainfall. Most spawning likely occurs upstream of Sacramento Drive, between Highway 273 and Texas Springs Road (S. Baumgartner, pers. com.). Juvenile CCV steelhead are known to rear in Olney Creek downstream of Highway 273 (S. Baumgartner, pers. com.). Rearing studies conducted in Olney Creek in 1997 and 1998 by Maslin and others noted the presence of rainbow trout/steelhead in the stream, but did not provide quantitative data. Adult CCV steelhead have a high potential to be present in the action area between December and April; juvenile CCV steelhead have a high potential to rear in the action area year round due to cold flows in winter and spring and the input of cold water leaking from the ACID canal during summer and fall.

The action area is in designated critical habitat for CV spring-run Chinook salmon and CCV steelhead. The action area contains approximately 2.374 acres of critical habitat for these species. PBFs in the action are include freshwater spawning sites, freshwater rearing sites, and freshwater migration corridors. The intended conservation roles of habitat in the action area are to provide appropriate freshwater rearing and migration conditions for juveniles and unimpeded freshwater migration and spawning conditions for adults. However, the conservation condition and function of this habitat has been impaired through several factors. The result has been the reduction in quantity and quality of several essential features of habitat required by salmonids to grow and survive.

The Recovery Plan (NMFS 2014) provides watershed profiles for the Sacramento River. Olney Creek is located within the Basalt and Porous Lava diversity group. The Recovery Plan identifies winter-run Chinook salmon in the mainstem Sacramento River below Keswick Dam as a Core 1 population with a moderate risk of extinction (Williams *et al*. 2011). Core 1 watersheds possess the known ability or potential to support a viable population. Spring-run Chinook salmon in the mainstem Sacramento River (below Keswick Dam) are a Core 2 population with a high population extinction risk. The steelhead in this region of the Sacramento River are also a Core 2 population, but with an uncertain population extinction risk. Core 2 populations provide increased life history diversity to the DPS and are likely to provide a buffering effect against local catastrophic occurrences that could affect other nearby populations.

2.4.2. Factors Affecting Listed Species and Critical Habitat in the Action Area

The Sacramento River and its tributaries (including Olney Creek) have been degraded from historic conditions and many anthropomorphic and naturally occurring factors have led to the decline of anadromous fish in the system. The combination of degraded physical habitat characteristics, fish passage barriers, and changes in hydrology resulting from dams and diversions since the mid-1800s has been associated with salmonid declines within the Sacramento River watershed. Altered flow regimes can influence migratory cues, water quality (including contaminants, dissolved oxygen and nutrients for primary productivity) and temperature.

Predation

Predation on juveniles rearing and migrating through Olney Creek impacts species from all populations. Predation is an ongoing threat to larvae and juveniles of listed salmonids, due to native species (*e.g.*, Sacramento sucker, pikeminnow, prickly sculpin) and non-native species (*e.g.*, striped bass, carp, American shad, crayfish, centrarchids, catfish, non-native minnows) (NMFS 2014). Species such as the Sacramento pikeminnow are native to the Sacramento River basin and have co-evolved with the anadromous salmonids in this system. However, rearing conditions in the Sacramento River watershed today (*e.g.*, warm water, low-irregular flow, standing water, and water diversions), 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. Olney Creek is known to support a variety of fish species including Sacramento pike minnow among others (Maslin *et al*. 1998). 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. The presence of man-made structures in the freshwater habitat likely contributes to increased predation levels.

Urbanization

The areas surrounding Olney Creek have been urbanized with residences and a golf course. This has likely increased the amount of contaminant loading in the aquatic ecosystem. Heavy metals, Polycyclic Aromatic Hydrocarbons (PAHs), petroleum products, plastics, fertilizer and many other contaminants can enter the creek via urban runoff. Shoreline areas along the creek have been developed over time, including artificially created levees and rip-rapping for bank stabilization. Shore-side development substantially reduces density and diversity of riparian vegetation and lead to decreased recruitment of large woody material (LWM), resulting in a loss of habitat complexity, which is a critical component of the freshwater rearing site PBF. Riparian vegetation provides a host of ecosystem services and its removal has diminished habitat value within the action area. Riparian vegetation plays a key role in the value of rearing habitat for conservation of all salmonid life stages by providing shade to lower stream temperatures, increasing the recruitment of large woody material into the river, increasing habitat complexity, providing shelter from predators and enhancing the productivity of aquatic macroinvertebrates (Anderson and Sedell 1979, Pusey and Arthington 2003). It has also been shown to directly influence channel morphology and may be directly correlated with improved water quality in aquatic systems (Schlosser and Karr 1981, Dosskey *et al*. 2010).

2.4.3. 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 (VanEheenen *et al.* 2004). Factors modeled by VanEheenen *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 (VanEheenen *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). The long-term projection of operations of the Central Valley Project and State Water Project (CVP/SWP) expects to include the effects of climate change in one of three possible forms: less total precipitation; a shift to more precipitation in the form of rain rather than snow; or, earlier spring snowmelt (Reclamation 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.

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).

2.4.4. Species Survival and Recovery in the Action Area

Olney Creek contains spawning, rearing, and migratory habitat for CCV steelhead. It also contains rearing habitat for SR winter-run and CV spring-run Chinook salmon. The portion of Olney Creek within the action area is designated critical habitat for CCV steelhead and CV spring-run Chinook salmon. Rearing habitat within the action area contains important PBFs for listed species. Juveniles of listed salmonid species may be present in the action area year-round.

Habitat complexity and food availability are important components within the action area as they facilitate juvenile rearing and growth.

The Recovery Plan (NMFS 2014) included recovery down/delisting criteria and diversity group priorities. Historically, SR winter-run Chinook salmon only occurred in the Basalt and Porous Lava diversity group. The recovery criteria includes reestablishment of three viable populations, including the current population in the mainstem Sacramento River (downstream of Shasta Dam and Keswick Dam), as well as priority reintroductions into Battle Creek (underway), and one of the rivers upstream of Shasta Dam (likely McCloud River).

Recovery Criteria and diversity group priorities for CV spring-run Chinook salmon includes establishment of two viable populations in the Basalt and Porous Lava diversity group (Battle Creek, and reintroduction to a river upstream of Shasta Dam (likely McCloud River), one in the Northwestern California diversity group (Clear Creek, and maintaining Core 2/dependent population in Cottonwood/Beegum Creek), four in the Northern Sierra Nevada diversity group (Mill, Deer, Butte creeks and reintroduction into the Yuba River upstream of Englebright Dam), as well as maintaining Core 2/dependent populations (Feather River, the Yuba River downstream of Englebright Dam, and Antelope Creek).

Finally, for CCV steelhead, recovery criteria and diversity group priorities include two viable populations in the Basalt and Porous Lava diversity group (Battle Creek and reintroduction into the McCloud River, as well as maintaining Core 2/dependent populations in Cow Creek, and other tributaries), one population in the Northwestern California diversity group (Clear Creek, and maintaining Core 2 population in Cottonwood/Beegum Creek), four populations in the Northern Sierra Nevada diversity group (Antelope, Deer, and Mill creeks, and reintroduction in the Yuba River upstream of Englebright Dam, as well and maintaining Core 2 populations (lower Yuba River, Butte Creek, Feather River, Big Chico Creek, Auburn Ravine, and the American River). The action area includes a portion of the Basalt and Porous Lava diversity group watersheds identified for the recovery of all three Central Valley salmonid species.

2.4.5. Mitigation Banks and the Environmental Baseline

Mitigation banks present a unique factual situation, which warrant a particular approach to how they are addressed. Specifically, when NMFS is consulting on a proposed action that includes mitigation bank credit purchases, it is likely that physical restoration work at the bank site has already occurred and/or that a section 7 consultation occurred at the time of bank establishment. A traditional reading of "environmental baseline" might suggest that the overall ecological benefits of the mitigation bank actions therefore belong in the environmental baseline. However, under this reading, all proposed actions, whether or not they included proposed credit purchases, would benefit from the environmental 'lift' of the entire mitigation bank, because it would be factored into the environmental baseline. In addition, where proposed actions did include credit purchases, it would not be possible to attribute their benefits to the proposed action without double counting. These consequences undermine the purposes of mitigation banks and do not reflect their unique circumstances. Specifically, mitigation banks are established based on the expectation of future credit purchases. In addition, credit purchases as part of a proposed action will also be the subject of a future section 7 consultation.

It is, therefore, appropriate to treat the beneficial effects of the bank as accruing incrementally at the time of specific credit purchases, not at the time of bank establishment or at the time of bank restoration work. Thus, for all projects within the service area of a bank, only the benefits attributable to credits sold are relevant to the environmental baseline. Where a proposed action includes credit purchases, the benefits attributable to those credit purchases are considered effects of the action. That approach is taken in this opinion.

The project occurs within the service area of two banks approved by NMFS with available credits for purchase or which are anticipated to have available credits for purchase prior to construction under the proposed action. These banks are located in areas that will benefit the ESUs/DPSs affected:

Bullock Bend Mitigation Bank: Established in 2016, the Bullock Bend Mitigation Bank is a 119.65-acre floodplain site along the Sacramento River at the confluence of the Feather River (Sacramento River Mile 106) and is approved by NMFS to provide credits for impacts to Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon and CCV steelhead. There are salmonid floodplain restoration, salmonid floodplain enhancement and salmonid riparian forest credits available. All features of this bank are designated critical habitat for the species analyzed in this opinion. The ecological value (increased rearing habitat for juvenile salmonids) of the credits that have been sold to-date is part of the environmental baseline.

Fremont Landing Conservation Bank: Established in 2006, the Fremont Landing Conservation Bank is 100-acre floodplain site along the Sacramento River at the confluence of the Feather River (Sacramento River Mile 80) and is approved by NMFS to provide credits for impacts to Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon and CCV steelhead. There are off-channel shaded aquatic habitat credits, riverine shaded aquatic habitat credits and floodplain credits available. All features of this bank are designated critical habitat for the species analyzed in this opinion. The ecological value (increased rearing habitat for juvenile salmonids) of the credits that have been sold to-date is part of the environmental baseline.

2.5. Effects of the Action

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

The proposed action includes activities that may impact CCV steelhead, CV spring-run Chinook salmon, SR winter-run Chinook salmon, or the critical habitats of CCV steelhead and CV spring-run Chinook salmon.

2.5.1. Effects to Species

The following is an analysis of the potential effects to listed fish species in Olney Creek that may occur as a result of implementing the proposed action. For our analysis, we have used the presence of listed species in the action area to determine the risk each species and life stage may face if exposed to project impacts. The expected effects of the proposed action include impacts due to: (1) water quality, (2) hydroacoustic impacts and, (3) dewatering.

Water Quality

Sedimentation and Turbidity

Construction-related disturbance to soils, vegetation, and the streambed within the action area will temporarily increase sedimentation and turbidity in Olney Creek. A prolonged increase in sedimentation and turbidity affects the growth, survival, and reproductive success of aquatic species. High levels of suspended sediment reduces the ability of listed fish to feed and respire, resulting in increased stress levels and reduced growth rates, and a reduced tolerance to fish diseases and toxicants (Waters 1995).

Responses of salmonids to elevated levels of suspended sediments often fall into three major categories: physiological effects, behavioral effects, and habitat effects (Bash *et al.* 2001). The severity of the effect is a function of concentration and duration (Newcombe and MacDonald 1991; Newcombe and Jensen 1996) so that low concentrations and long exposure periods are frequently as deleterious as short exposures to high concentrations of suspended sediments.

A review by Lloyd (1987) indicated that several behavioral characteristics of salmonids can be altered by even relatively small changes in turbidity (10 to 50 Nephelometric Turbidity Units [NTUs]). Salmonids exposed to slight to moderate increases in turbidity exhibited avoidance, loss of station in the stream, reduced feeding rates and reduced use of overhead cover. Short-term increases in turbidity and suspended sediment may disrupt feeding activities of fish or result in temporary displacement from preferred habitats. Numerous studies show that suspended sediment and turbidity levels moderately elevated above natural background values can result in non-lethal detrimental effects to salmonids.

Suspended sediment affects salmonids by decreasing reproductive success, reducing feeding success and growth, causing avoidance of rearing habitats, and disrupting migration cues (Bash *et al*. 2001). Sigler *et al*. (1984 in Bjornn and Reiser 1991) found that prolonged turbidity between 25 and 50 NTUs reduced growth of juvenile coho salmon and steelhead. MacDonald *et al.* (1991) found that the ability of salmon to find and capture food is impaired at turbidities from 25 to 70 NTUs. Reaction distances of *O. mykiss* to prey were reduced with increases of turbidity of only 15 NTUs over an ambient level of 4 to 6 NTUs in experimental stream channels (Barrett *et al*. 1992). Bisson and Bilby (1982) reported that juvenile coho salmon avoid turbidities exceeding 70 NTUs. Increased turbidity, used as an indicator of increased suspended sediments, also is correlated with a decline in primary productivity, a decline in the abundance of periphyton, and reductions in the abundance and diversity of invertebrate fauna in the affected area (Lloyd 1987, Newcombe and MacDonald 1991). Increased sediment delivery can also fill interstitial substrate spaces and reduce cover for juvenile fish (Platts *et. al*. 1979) and abundance and availability of aquatic invertebrates for food (Bjornn and Reiser 1991).

NMFS anticipates that some local increases in turbidity and suspended sediment above baseline levels will result from in-water construction activities. NMFS expects these water quality impacts to be minor, short-term increases in turbidity and sedimentation and only lasting the duration of the project. Water quality impacts are unlikely to affect migrating adults to the extent of injuring them, but may injure some juvenile fish, which are smaller and less mobile, and are actively feeding and growing, by temporarily disrupting normal behaviors that are essential to growth and survival. Increased sedimentation and turbidity resulting from project construction will be temporary and limited to a small portion of the creek during construction activities. The BMPs incorporated into the project plans will further minimize turbidity effects to listed fish in the action area.

Hazardous Materials and Chemical Spills

Construction-related activities could potentially impair water quality should hazardous chemicals (*e.g*., fuels and petroleum-based lubricants) or other construction materials enter Olney Creek. Construction-related chemical spills could potentially affect fish and aquatic resources by causing physiological stress, reducing biodiversity, altering primary and secondary production, interfering with fish passage, and causing direct mortality. Construction equipment and heavy machinery will be present in the action area and metals may be deposited through their use and operation (Paul and Meyer 2008). These materials have been shown to alter juvenile salmonid behavior through disruptions to various physiological mechanisms including sensory disruption, endocrine disruption, neurological dysfunction and metabolic disruption (Scott and Sloman 2004). Oil-based products used in combustion engines are known to contain PAHs which have been known to bio-accumulate in other fish taxa such as flatfishes (order Pleuronectiformes) and have carcinogenic, mutagenic and cytotoxic effects (Johnson *et al*. 2002). The exact toxicological effects of PAHs in juvenile salmonids are not well understood, although studies have shown that increased exposure of salmonids to PAHs, reduced immunosuppression, increasing their susceptibility to pathogens (Arkoosh *et al*. 1998, Arkoosh and Collier 2002). Listed fish species are expected to be present in the action area during construction activities and would potentially be directly affected by a pollution event. Listed fish could be indirectly affected by a pollution event if contaminants were to settle within substrate in the active channel of Olney Creek that may become disturbed at a later time. Avoidance and minimization measures are described in Section 1.3.2 and will aid in minimizing the potential risk of exposure to contaminants, to the extent exposure is not expected to occur.

Hydroacoustic Impacts

Pile driving using a vibratory hammer would be required during each of the two construction seasons for the placement of steel soldier piles or steel sheet piles around the piers and abutments for excavation and dewatering purposes and as temporary retaining walls. Based on recommendations from the Fisheries Hydroacoustic Working Group, NMFS uses interim dual metric criteria to assess onset of injury for fish exposed to pile-driving sounds (Caltrans 2015). Vibratory pile driving generally stays below injurious thresholds, but often introduces pressure waves that will incite behavioral changes. Even at great distances from the pile-driving location, underwater pressure changes/noises from pile driving is likely to cause flight, hiding, feeding interruption, area avoidance, and movement blockage, as long as pile driving is ongoing. Pile driving will be restricted to daytime hours to allow fish time to migrate upstream or downstream through the action area without being subjected to elevated sound pressure levels. Small numbers of juvenile listed fish may be subject to behavioral modifications due to vibratory pile driving.

Dewatering

Temporary dewatering of the channel of Olney Creek, underneath and adjacent to the bridge, would occur during both construction seasons. This will be accomplished by placing culverts in the channel and overtopping them with clean spawning-sized gravels to create an access road and work pad. The culverts and overlying gravels would be removed at the end of each work season. Dewatering would also be needed to allow for widening and recontouring of the stream channel upstream and downstream of the bridge. This would be accomplished by using k-rails or gravel berms to divert flow to one side of the channel.

Fish capture and relocation may be necessary during dewatering activities, if listed fish are present and found in the enclosed area of the cofferdam. Each step during the capture/relocation process could induce physiological stress leading to injury or death, even when a skilled fish biologist performs the relocation. The potential capture and relocation of CCV steelhead, CV spring-run Chinook salmon, and SR winter-run Chinook salmon associated with the dewatering of the cofferdam are expected to adversely affect a small number of fish if present in the action area. Although upstream-migrating adult CCV steelhead may occur in the action area during in-water work, the large size and probable avoidance of the enclosed area makes it unlikely that they would be trapped in the cofferdams.

Because of the variability and uncertainty associated with the population sizes of the species present, annual variation in the timing of migration and variability regarding individual habitat use of the action area, the actual number of individuals present in the action area during the in-water work window is not known. However, there would be few individuals present, since there is low probability of presence in the action area during the in-water work season. Juvenile listed salmonids that evade capture and remain in the construction area may be injured or killed from construction activities. This includes desiccation, if fish remain in the dewatered area, or death, if fish are crushed by personnel or equipment. However, because experienced biologists will be collecting fish, most are expected to be removed from the area. Juvenile CCV steelhead, CV spring-run Chinook salmon, or SR winter-run Chinook salmon may be present, and thus subject to the above effects. Effects to adult listed fish are improbable, due to their large size and probable avoidance.

2.5.2. Effects to Critical Habitat

The project is expected to adversely impact PBFs of critical habitat for CCV steelhead and CV spring-run Chinook salmon (freshwater rearing habitat and freshwater migratory corridors). The proposed project is expected to cause short- and long-term, and permanent effects on critical habitat for CCV steelhead and CV spring-run Chinook salmon. Potential project effects include temporary water quality degradation from localized increases in turbidity and suspended sediment and permanent habitat loss/modification of critical habitat.

Sedimentation and Turbidity

There is potential for degradation of PBFs resulting from turbidity and sedimentation associated with the proposed action. Kemp *et al*. (2011) describe a suite of physiochemical effects to lotic aquatic systems resulting from increased sedimentation and turbidity-related events. Sedimentation events in a system that shares both lotic and estuarine characteristics have the potential to increase turbidity on a broad temporal scale and reduce oxygen supply. These impacts could degrade the PBFs of critical habitat for CCV steelhead and CV spring-run Chinook salmon, such as riparian habitat, which is necessary for successful juvenile development and survival. BMPs, such as groundcover and stabilization, will be implemented during construction to help prevent project-disturbed soil on land from entering the water. With the minimization and avoidance measures included in the proposed action, turbidity and sedimentation are expected to result in minor and short-term effects to PBFs of designated critical habitat for CCV steelhead and CV spring-run Chinook salmon in the action area.

Riparian Vegetation Removal

Removal of riparian vegetation will occur during the clearing of staging areas and access roads, and grading activities. These activities have the potential to result in direct or indirect adverse effects to critical habitat PBFs. Riparian vegetation plays a key role in the conservation value of rearing habitat for many salmonid life stages. It provides shading to reduce stream temperatures, increases the recruitment of large woody material into the river that increases habitat complexity, provides shelter from predators, and enhances the productivity of aquatic macroinvertebrates (Anderson and Sedell 1979, Pusey and Arthington 2003). It has also been shown to directly influence channel morphology and may be directly correlated with improved water quality in riverine systems through biogeochemical cycling, soil and channel chemistry, water movement, and erosion (Schlosser and Karr 1981, Dosskey *et al*. 2010). The proposed action will result in the loss of 0.83 acres of riparian habitat due to disturbance from project activities. This loss of riparian habitat will result in the degradation of migratory corridors and rearing habitat PBFs for CCV steelhead and CV spring-run Chinook salmon. A Revegetation Plan (Caltrans 2021) will be implemented to return riparian areas to pre-project conditions. However, return to pre-project conditions may take 1-5 years. With implementation of a revegetation plan, long-term impacts to critical habitat due to riparian habitat removal are expected to be minimal.

Structure Presence

The new bridge will shade Olney Creek by approximately 5,700 square feet. 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. The increase in riverine shading may result in associated riparian vegetation receiving less sunlight for photosynthesis, as well as in-water vegetation receiving less light for photosynthesis. This can result in decreased fish habitat quality and decreased insect productivity (Pincetich 2019). Salmonids may benefit from the overwater shade as a cooling measure for water temperatures. Blocking light can also prevent stream eutrophication (an overabundance of nutrients in a water body), such as algal blooms. Eutrophication may reduce oxygen levels for fish and other species (Pincetich 2019). However, because there is suitable habitat for salmonids both upstream and downstream of the Action Area, the effects of the overwater structure are expected to be minor.

Stream Channel Excavation and Fill

Stream excavation and fill will result in temporary and permanent impacts to spawning and rearing habitat in Olney Creek. Project activities occurring underneath and north of the bridge (first construction season) would temporarily impact 200 linear feet of stream; work underneath and south of the bridge (second construction season) would temporarily impact at least 455 linear feet of stream. Temporary effects include loss of rearing habitat during the construction seasons and possible disruption of upstream and/or downstream migration of salmonids. Permanent effects on the streambed would result from minor widening and realignment of the channel, installation of the new pier and new abutments, and placement of rip-rap around the new abutments and along the recontoured streambanks. Habitat disturbance due to gravel pads will result in the temporary loss of 0.58 acres. A total of 0.3 acres of habitat below the OHWM will be permanently lost. However, 0.06 acres of new stream bottom will be created which may offset this loss to a degree. Additionally, spawning sized gravel from the gravel pads and large woody debris will be placed in the reconstructed channel to improve rearing habitat. For these reasons, the effects of stream channel excavation and fill are expected to be minor.

Mitigation/Conservation Bank Credit Purchase

To address permanent loss of riparian and aquatic habitats, the proposed action includes purchase of mitigation bank credits at a 1.5:1 ratio. Caltrans will purchase 1.25-acre credits of salmonid or riparian habitat credits for the loss of 0.83 acres of riparian habitat. Caltrans will purchase 0.45 acres of salmonid or shaded riparian aquatic (SRA) credits for the permanent loss of aquatic habitat.

The purchase of compensatory mitigation credits will restore and preserve, in perpetuity, SRA habitat or similar types of riverine habitat that will be beneficial to salmonids. The mitigation banks that serve the action area offer floodplain or other habitat that can support migrating juvenile and adult salmonids in the same way that river margin habitat otherwise would have, had the project not occurred. SRA habitat types of conservation credits can benefit both adult and juvenile listed salmonids, even if such banks are located far from the action area and individuals affected by the project would be unlikely to benefit from the compensation purchase.

Both the riparian and aquatic habitat impacts affect designated critical habitat, as well as listed fish species, described above in this opinion. The purchase of mitigation credits will address the loss of ecosystem functions due to the modification of the riverbank. These credit purchases are ecologically relevant to the PBFs of critical habitat and the species affected by the proposed action, because both banks include SRA, riparian forest and floodplain credits with habitat values that are already established and meeting performance standards. The purchase of mitigation credits at one of these banks is expected to benefit the PBFs of freshwater rearing habitat and migration corridors for juvenile listed salmonids by providing suitable floodplain and riparian habitat. The floodplains and riparian forest in the bank benefit the growth and survival of rearing salmonids by providing habitat with abundant food in the form of aquatic invertebrates, structural diversity, such as instream woody material and cooler stream temperatures.

The purchase of credits provides a high level of certainty that the benefits of a credit purchase will be realized, because all of the NMFS-approved banks considered in this opinion have mechanisms in place to ensure credit values are met over time. Such mechanisms include legally binding conservation easements, long-term management plans, detailed performance standards, credit release schedules that are based on meeting performance standards, monitoring plans and annual monitoring reporting to NMFS, non-wasting endowment funds that are used to manage and maintain the bank and habitat values in perpetuity, performance security requirements, a remedial action plan, and site inspections by NMFS. In addition, each bank has a detailed credit schedule, and each tracks their credit transactions and availability on the Regulatory In-lieu fee and Bank Information Tracking System (RIBITS). RIBITS was developed by the U.S. Army Corps of Engineers with support from the Environmental Protection Agency, the U.S. Fish and Wildlife Service, the FHWA, and NMFS to provide better information on mitigation and conservation banking and in-lieu fee programs across the country. RIBITS allows users to access information on the types and numbers of mitigation and conservation bank and in-lieu fee program sites, associated documents, mitigation credit availability, service areas, as well information on national and local policies and procedures that affect mitigation and conservation bank and in-lieu fee program development and operation.

2.6. Cumulative Effects

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

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

The private and State activities described below are likely to adversely affect SR winter-run Chinook salmon, CV spring-run Chinook salmon, CCV steelhead, and their designated critical habitats. These potential factors are ongoing and expected to continue into the future. However, the extent of the adverse effects from these activities is uncertain, and it is not possible to accurately predict the extent of the effects from these future non-Federal activities

2.6.1. Water Diversions

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

2.6.2. Increased Urbanization

Increases in urbanization and housing developments can impact habitat by altering watershed characteristics and changing both water use and stormwater 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 which are situated away from water bodies, will not require Federal permits, and thus will not undergo review through the ESA section 7 consultation process with NMFS.

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.

2.6.4. Aquaculture and Fish Hatcheries

More than 32 million fall-run Chinook salmon, 2 million CV spring-run Chinook salmon, 1 million late fall-run Chinook salmon, 0.25 million SR winter-run Chinook salmon, and 2 million steelhead are released annually from six hatcheries producing anadromous salmonids in the Central Valley. All of these facilities are currently operated to mitigate for natural habitats that have already been permanently lost as a result of dam construction. The loss of historical habitat and spawning grounds upstream of dams results in dramatic reductions in natural population abundance, which is mitigated for through the operation of hatcheries. Salmonid hatcheries can, however, have additional negative effects on ESA-listed salmonid populations.

The high level of hatchery production in the Central Valley can result in high harvest-to-escapements ratios for natural stocks. California salmon fishing regulations are set according to the combined abundance of hatchery and natural stocks, which can lead to over-exploitation and reduction in the abundance of wild populations that are indistinguishable and exist in the same system as hatchery populations. Releasing large numbers of hatchery fish can also pose a threat to wild Chinook salmon and steelhead stocks through the spread of disease, genetic impacts, competition for food and other resources, predation of hatchery fish on wild fish, and increased fishing pressure on wild stocks as a result of hatchery production.

Impacts of hatchery fish can occur in both freshwater and the marine ecosystems. Limited marine carrying capacity has implications for naturally produced fish experiencing competition with hatchery production. Increased salmonid abundance in the marine environment may also decrease growth and size at maturity, and reduce fecundity, egg size, age at maturity, and survival (Bigler *et al*. 1996).

2.6.5. Agricultural Practices

Non-Federal actions that may affect the action area include ongoing agricultural activities in the Sacramento River watershed. Farming and ranching activities adjacent to or upstream of the action area may have negative effects on water quality due to runoff laden with agricultural chemicals. Stormwater and irrigation discharges related to agricultural activities contain numerous pesticides and herbicides that may adversely affect salmonid reproductive success and survival rates (King *et al*. 2014). Grazing activities from cattle operations can degrade or reduce suitable critical habitat for listed salmonids by increasing erosion and sedimentation as well as introducing nitrogen, ammonia, and other nutrients into the watershed, which then flow into the receiving waters of the associated watersheds. Agricultural practices in the Sacramento River watershed may adversely affect riparian and wetland habitats through upland modifications of the watershed that lead to increased siltation or reductions in water flow.

2.6.6. Recreational Fishing

While hatchery CCV steelhead and Chinook salmon are targeted, incidental catch of protected species, such as naturally produced CV spring-run Chinook salmon and CCV steelhead, does occur. Since 1998, all hatchery CCV steelhead have been marked with an adipose fin clip, allowing anglers to tell the difference between hatchery and wild CCV steelhead. Current regulations restrict anglers from keeping unmarked CCV steelhead in Central Valley streams, except in the upper Sacramento River.

Current sport fishing regulations do not prevent wild CCV steelhead from being caught and released many times over while on the spawning grounds, where they are more vulnerable to fishing pressure. Recent studies on hooking mortality based on spring-run Chinook salmon have found a 12 percent mortality rate for the Oregon in-river sport fishery (Lindsay *et al*. 2004). Applying a 30 percent contact rate for Central Valley rivers (*i.e*., the average of estimated Central Valley harvest rates), approximately 3.6 percent of adult steelhead die before spawning from being caught and released in the recreational fishery. Studies have consistently demonstrated that hooking mortality increases with water temperatures. Mortality rates for steelhead may be lower than those for Chinook salmon, due to lower water temperatures.

In addition, survival of CCV steelhead eggs is reduced by anglers walking on redds in spawning areas while targeting hatchery CCV steelhead or salmon. Roberts and White (1992) identified up to 43 percent mortality from a single wading over developing trout eggs, and up to 96 percent mortality from twice daily wading over developing trout eggs. Salmon and trout eggs are sensitive to mechanical shock at all times during development (Leitritz and Lewis 1980). Typically, CCV steelhead and salmon eggs are larger than trout eggs, and are likely more sensitive to disturbance than trout eggs. While state angling regulations have moved towards restrictions on selected sport fishing to protect listed fish species, hook and release mortality of steelhead and trampling of redds by wading anglers may continue to cause a threat.

2.6.7. Habitat Restoration

Voluntary state or private sponsored habitat restoration projects may have short-term negative effects associated with in-water construction work, but these effects typically are temporary, localized, and the overall outcome is expected to benefit listed species and habitats.

2.7. Integration and Synthesis

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

SR winter-run Chinook salmon ESU, CV spring-run Chinook salmon ESU, and CCV steelhead DPS have experienced significant declines in abundance and available habitat in the California Central Valley relative to historical conditions. The status of the species (Section 2.2) details the current range-wide status of these ESUs and DPSs and their critical habitat. The environmental baseline (Section 2.4) describes the current baseline conditions found in Olney Creek, where the proposed action is to occur. Section 2.4.7 discusses the vulnerability of listed species and critical habitat to climate change projections in the California Central Valley. Reduced summer flows and increased water temperatures will likely be exacerbated by increasing surface temperatures in the Sacramento River watershed. Cumulative effects (Section 2.6) are likely to include decreased water flow and increased stormwater runoff from increased urbanization and from concurrent state and local projects in the action area.

2.7.1. Summary of the Project Effects to Listed Species

The proposed action has the potential to affect juvenile SR winter-run Chinook salmon, CV spring-run Chinook salmon, and juvenile and/or adult CCV steelhead. The project is expected to result in a temporary increase in suspended sediment and turbidity, a reduction of SRA habitat, harassment, injury or death, and predation-related mortality of individuals from pile driving, and dewatering.

The expected effects to listed salmonids resulting from the proposed action are harassment of juvenile SR winter-run and CV spring-run Chinook salmon and CCV steelhead resulting from the noise of pile driving, and entrainment, capture, and relocation of juveniles from construction activities. Vibratory pile driving is also expected to result in temporary disruptions in the feeding, sheltering, and migratory behavior of adult and juvenile salmon and steelhead. This disruption would result in reduced growth and increased susceptibility to predation. Listed salmonids are not expected to be injured or killed. They may experience temporary migration delays which are not expected to prevent successful spawning. Pile driving is also not expected to prevent salmonids from passing upstream or downstream, because pile driving will not be continuous through the entire day, and will not occur at night, when the majority of fish migrate.

Death as a result of dewatering is expected to be minimized by salvaging and relocating fish away from the project site, if necessary. Fish would be handled by a biologist, and a low mortality rate of juveniles (<10 percent) is expected to result from fish salvage.

Turbidity changes would result in sudden localized turbidity increases that would injure juvenile salmonids by temporarily impairing their migration, rearing, feeding, or sheltering behavior. Project-related turbidity increases would also contribute to the susceptibility of juvenile salmonids to increased predation. Turbidity-related injury and predation will be minimized by implementing the avoidance and contingency measures of the SWPPP, and by scheduling in-water work to avoid peak migration periods of listed salmonids.

2.7.2. Summary of Project Effects to Critical Habitat

Critical habitat has been designated for CV spring-run Chinook salmon and CCV steelhead within the Action Area. Relevant PBFs of the designated critical habitats are listed above in section 2.5.2. Based on the effects of the proposed project described previously in this opinion, the impacts are expected to permanently degrade a small portion of designated critical habitat for CV spring-run Chinook salmon and CCV steelhead.

The quality of the current conditions of PBFs in the action area are poor compared to historical conditions (pre-levees). In particular, levees, riprapping, and removal of riparian vegetation have greatly diminished the value of the aquatic habitat in the action area by decreasing rearing area, food resources via food-web degradation, and complexity and diversity of habitat forms necessary for holding and rearing (channel diversity). Perpetuating the overwater structure and in-water structure with the bridge construction would contribute to the degradation of designated critical habitat. The temporary construction impacts to designated critical habitat would negatively affect the ability of listed species to use the action area as spawning habitat, rearing habitat and as migratory corridors during the overlap of migration periods and construction, as discussed in the Effects to Species section.

The project will cause a permanent loss of 0.83 acres of riparian vegetation, adversely affecting migration and rearing habitat PBFs of critical habitat through a small reduction of near shore cover and food production. There will be a permanent loss of approximately 0.3 acres of riverine habitat from placement of the bridge piers and RSP. The spawning sized gravel used to construct the water diversion will be left in the channel following construction and large woody debris will be placed, the addition of these features is expected to improve habitat quality.

2.7.3. Effects of the Proposed Action at the Population Level

Based on the geographical location of the Action Area, core populations of salmonids that may be affected by the Proposed Action include the following Core 1 populations as designated by the Salmonid Recovery Plan: SR winter-run Chinook below Keswick Dam. Core 1 watersheds are those that possess the ability or potential to support a viable population. Core 2 populations which may be affected by the Proposed Action include: Sacramento River below Keswick Dam spring-run Chinook and steelhead; and Redding-area tributary steelhead. Core 2 watersheds have lower potential to support viable populations, due to lower abundance, or amount and quality of habitat. These populations provide increased life history diversity within the ESU/DPS.

With the exception of loss of SRA habitat, the July 1 to October 31 work window will avoid in-water work during peak juvenile SR winter-run Chinook and CV spring-run Chinook outmigration periods for the above listed populations. There is some likelihood for SR winter-run Chinook salmon juveniles to begin outmigrating, and potentially utilizing non-natal rearing habitat, in August (less than 10 percent). For this reason, we expect very few SR winter-run Chinook salmon to be utilizing the action area for non-natal rearing during this time. CV spring-run Chinook salmon populations display a second peak of outmigration past RBDD occurring between mid-March and May (Poytress *et al*. 2014) with an average of approximately 40% of upper Sacramento outmigration occurring during these months. However, the proportion of the ESUs utilizing the project area are expected to be relatively low since the majority of CV spring-run Chinook salmon production occurs within the Core 1 spring-run populations in Mill, Deer and Butte Creek, downstream of the project. CCV steelhead outmigration may occur during the in-water work window, but numbers are likely low as Olney Creek provides limited spawning habitat for the species.

Construction effects would last for the entirety of each work season, but would not permanently modify critical habitat function, as noise and turbidity would end after construction ends. The presence of the structure and loss of both in-water and riparian habitats will continue into the foreseeable future, thus creating a minor perpetual source of predation and water quality impacts (both beneficial and adverse, see Section 2.5.2) to the action area, and a permanent adverse effect to rearing PBFs.

2.7.4. Summary of Risk to Diversity Group for each Species

Project effects to SR winter-run Chinook, CV spring-run Chinook, and CCV steelhead will affect the Basalt and Porous Lava Diversity Group as identified in the Salmonid Recovery Plan (NMFS 2014). Key threats to salmonids within this diversity group (which includes Olney Creek) include inaccessibility of historic habitat, altered flows and water temperatures below Shasta and Keswick Dams, and lack of spawning gravel. Current Core 1 and 2 populations within this diversity group are described above (Section 2.7.3). The McCloud River and Battle Creek are identified as re-introduction priorities necessary to achieve recovery criteria. Other priority recovery actions within this diversity group include restoration and maintenance of riparian and floodplain ecosystems which provide diverse habitat along the Sacramento River, development and implementation of a long-term gravel augmentation plan to increase and maintain spawning habitat, and operational changes to river flow management to improve water temperature and flow conditions for listed salmonids.

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. Although the proposed project may 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 two viable populations within the Basalt and Porous Lava Diversity Group, and nine viable populations for the ESU, only one of which is currently considered viable. Olney Creek within the action area provides 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. 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.

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

Olney Creek serves as rearing habitat for small populations of SR winter-run and CV spring-run Chinook salmon, and CCV steelhead. Construction is expected to cause adverse effects to small numbers of listed salmonids, the impacts will be relatively short in duration and will avoid higher flow 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. 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.

Combining the minimal, adverse, and beneficial effects associated with the proposed action described above, including the environmental baseline, cumulative effects, status of the species, and critical habitat, the project is not expected to reduce appreciably the likelihood of both the survival and recovery of the 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, the effects of other activities caused by the proposed action, and the cumulative effects, it is NMFS' biological opinion that the proposed action is *not* likely to jeopardize the continued existence of SR winter-run Chinooks salmon, CV spring-run Chinook salmon and CCV steelhead or destroy or adversely modify their designated critical habitat.

2.9. Incidental Take Statement

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

2.9.1. Amount or Extent of Take

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

NMFS anticipates incidental take of SR winter-run Chinook salmon, CV spring-run Chinook salmon, and CCV steelhead from impacts directly on designated critical habitat PBFs, injury or harm related to the placement the cofferdam and dewatering, potential fish entrainment, relocation and fish passage delays. The incidental take is expected to be in the form of harm, harassment, injury or mortality. Incidental take is expected to occur for during the in-water work window (July 1 to October 31) when juvenile SR winter-run Chinook salmon, CV spring-run Chinook salmon, and CCV steelhead, are rearing in the site area.

It is not practical to quantify or track the amount or number of individuals that are expected to be incidentally taken as a result of the proposed action, due to the variability associated with the response of listed fish to the effects of the proposed action, 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 ecological surrogates, and it is practical to quantify and monitor the surrogates to determine the extent of incidental take that is occurring. The most appropriate threshold for incidental take are ecological surrogates of temporary habitat disturbance expected to occur during dewatering and permanent habitat disturbance expected to occur due to riparian removal and bridge structure presence in critical habitat.

Vibratory pile driving, turbidity, gravel pad placement, capture, and handling result in fish behavioral modifications, entrainment, harm, injury or death. Riparian removal and bridge structure presence reduces primary productivity, decreases prey availability and increases the presence of predatory fish, leading to harm or death. NMFS anticipates incidental take will be limited to the following forms:

1) Take in the form of harm, injury and death to listed fish due to handling during relocation, or stranding during dewatering activities and placement of the gravel work pads, covering up to 0.58 acres adjacent to the banks. 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. Individuals in the dewatered area may be injured or killed. Due to the timing of the activity, actual numbers for each species is expected to be low.

2) Take in the form of harm to listed fish from loss and degradation of riparian habitat leading to injury and death by creating habitat conditions that decrease productivity and prey availability and increase predation associated with the riparian removal and new bridge components. The total area of permanent riparian vegetation removal is 0.83 acres.

If the total acreage of gravel pad placement for the project exceeds 0.58 acres, then anticipated take levels described are also exceeded, triggering the need to reinitiate consultation. If the above described area for riparian removal are exceeded, the anticipated incidental take level described would be exceeded, triggering the need to reinitiate consultation.

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

1. Measures shall be taken to minimize incidental take of listed salmonids during dewatering and gravel pad installation;
2. Measures shall be taken to minimize the effect of temporary and permanent habitat loss of riverine and riparian habitat;
3. Caltrans shall monitor and report on the amount or extent of incidental take.

2.9.4. Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the Federal action agency must comply (or must ensure that any applicant complies) with the following terms and conditions. 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.

1. The following terms and conditions implement reasonable and prudent measure 1:
    a. A written plan for a fish rescue operation specific to this project shall be established prior to implementation of the project. The plan shall be thoroughly understood by all individuals that are to be involved and operations shall be conducted in strict accordance with the written plan.

    b. A biologist experienced in identifying salmonid redds shall visually survey the project area prior to placement and removal of gravel pads. If redds are present within 200ft of the gravel pad placement area, all in-water work shall stop and NMFS shall be notified within 24 hours.
    c. Flow diversions and gravel pads shall be placed in a way which maintains downstream passage for fish.
2. The following terms and conditions implement reasonable and prudent measure 2:
    a. Existing vegetation shall be protected in place where feasible to provide an effective form of erosion and sediment control as well as watershed protection, landscape beautification, dust control, pollution control, noise reduction, and shade;
    b. To control invasive species, all landscaping and re-vegetation shall consist of plants or seed mixes from native, locally adapted species.
    c. Caltrans shall provide NMFS a post-construction field review to assure conservation measures were adequately implemented. This review should occur the year following construction completion. The field review shall include a survival ratio to ensure planting of new vegetation is implemented and representative site photos.
3. The following terms and conditions implement reasonable and prudent measure 3:
    a. Caltrans shall provide a report of project activities to NMFS by December 31 of each construction year.
    b. The report shall include project schedules, project completions, and details regarding project implementation for each given year.
    c. This report shall include a summary description of in-water constraint activities, avoidance and minimization measures taken, and any observed take incidents.

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 limit the amount of riprap used for bank and in-stream protection in the Central Valley to the minimum amount needed for erosion and scour protection and bench design. Engineering plans shall be provided to the contractors that clearly show the amount of riprap to be placed at the project site. Limitation of riprap in design considerations is consistent with agency requirements set forth in section 7(a)(1).
2) Caltrans should consider using alternative methods to traditional rock slope protection for bridge projects and incorporating geotextiles for bank erosion control and prevention. Bioengineered products are available on the market and can be used to protect areas against erosive forces along shorelines and is an alternative to using riprap.

Implementation of riprap alternatives in design considerations is consistent with agency requirements set forth in section 7(a)(1).

2.11. Reinitiation of Consultation

This concludes formal consultation for the Sacramento Drive over Olney Creek Bridge Replacement Project.

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

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 (PFMC 2014) contained in the fishery management plans developed by the PFMC and approved by the Secretary of Commerce.

3.1. Essential Fish Habitat Affected by the Project

The geographic extent of salmon freshwater EFH is described as all water bodies currently or historically occupied by PFMC managed salmon within the USGS 4th field hydrologic units identified by the fishery management plan (PFMC 2014). This designation includes Olney Creek for all runs of Chinook salmon that historically and currently use these watersheds (winter-run, spring-run, fall-run, and late fall-run). The Pacific Coast salmon fishery management plan also identifies Habitat Areas of Particular Concern (HAPCs): complex channel and floodplain habitat, spawning habitat, thermal refugia, estuaries, and submerged aquatic vegetation. Complex channel and floodplain habitat and spawning habitat HAPCs are expected to be either directly or indirectly adversely affected by the proposed action.

3.2. Adverse Effects on Essential Fish Habitat

Effects to Pacific Coast salmon HAPCs for complex channel and floodplain habitat and spawning habitat are discussed in the context of effects to critical habitat PBFs as designated under the ESA and described in section 2.5.2. A list of adverse effects to EFH HAPCs is included in this EFH consultation. The effects are expected to be similar to the impacts affecting critical habitat and include permanent habitat loss/modification.

Permanent habitat loss/modification

- Reduced shelter from predators
- Reduction/change in aquatic macroinvertebrate production
- Reduced habitat complexity

3.3. Essential Fish Habitat Conservation Recommendations

NMFS determined that the following conservation recommendations are necessary to avoid, minimize, mitigate, or otherwise offset the impact of the proposed action on EFH.

1) Caltrans should limit the amount of riprap used for bank protection to the minimum amount needed for erosion and scour protection design. Engineering plans should be provided to the contractors that clearly show the amount of riprap to be placed at the project site. Limitation of riprap in design considerations will minimize loss of habitat productivity.

Fully implementing these EFH conservation recommendations would protect, by avoiding or minimizing the adverse effects described in section 3.2, above, 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 the 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 users of this opinion is Caltrans and the City of Redding. Other interested users could include the USFWS and/or CDFW. Individual copies of this opinion were provided to Caltrans. The document will be available within 2 weeks at the NOAA Library Institutional Repository (https://repository.library.noaa.gov/welcome). The format and naming adhere to conventional standards for style.

4.2. Integrity

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

4.3. Objectivity

Information Product Category: Natural Resource Plan

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

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

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

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

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