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

JUN 8 2017

Refer to NMFS No: ***WCR-2017-6920***

Matthew Dekar
Deputy Project Leader
Lodi Fish and Wildlife Office
850 South Guild Avenue, Suite 105
Lodi, CA 95240-3170

Re: Endangered Species Act Section 7(a)(2) Biological Opinion, Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response, and Fish and Wildlife Coordination Act Recommendations for the Yuba River Canyon Salmon Habitat Restoration Project

Dear Mr. Dakar:

Thank you for your letter of October 27, 2016, 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 Yuba River Canyon Salmon Habitat Restoration 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 (MSA)(16 U.S.C. 1855(b)) for this action.

This biological opinion (BiOp) is based on the final biological assessment (ESA 2016), received by NMFS on November 1, 2016. Based on the best available scientific and commercial information, the BiOp concludes that the project is not likely to jeopardize the continued existence of the federally listed threatened Central Valley (CV) spring-run Chinook salmon ESU, (*Oncorhynchus tshawytscha*), or the threatened California Central Valley (CCV) steelhead DPS (*O. mykiss*), and is not likely to destroy or adversely modify their designated critical habitats. NMFS has also 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. The United States Fish and Wildlife Service (USFWS) serves as the lead Federal Action Agency for the proposed project.

This letter also transmits NMFS's review of potential effects of the proposed project on essential fish habitat (EFH) for Pacific Coast Salmon, designated under the Magnuson-Stevens Fishery Conservation and Management Act (MSA), including conservation recommendations. This review was pursuant to section 305(b) of the MSA, implementing regulations at 50 CFR 600.920, and agency guidance for use of the ESA consultation process to complete EFH consultation. The document concludes that the project will adversely affect the EFH of Pacific Coast Salmon in the Action Area and has included recommendations.

The United States Fish and Wildlife Service has a statutory requirement under section 305(b)(4)(B) of the MSA to submit a detailed written response to NMFS within 30 days of receipt of these conservation recommendations, and 10 days in advance of any action, that includes a description of measures for avoiding, minimizing, or mitigating the impact of the project on EFH (50 CFR 600.920(j)). If unable to complete a final response within 30 days, USFWS should provide an interim written response within 30 days before submitting its final response. In the case of a response that is inconsistent with our recommendations, USFWS must explain its reasons for not following the recommendations, including the scientific justification for any disagreements with NMFS over the anticipated effects of the proposed project and the measures needed to avoid, minimize, or mitigate such effects.

Because the proposed project will modify a stream or other body of water, NMFS also provides recommendations and comments for the purpose of conserving fish and wildlife resources under the Fish and Wildlife Coordination Act (16 U.S.C. 662(a)).

Please contact Gary Sprague in NMFS' California Central Valley office at (916) 930-3615 or via email at Gary.Sprague@NOAA.gov if you have any questions concerning this section 7 consultation, or if you require additional information.

Sincerely,

Maria Rea

for Barry A. Thom
Regional Administrator

Enclosure

cc: California Central Valley Office
Division Chron File: 151422-WCR2016-00335

Ms. Elizabeth Campbell, Ph.D., United States Fish and Wildlife Service,
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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 Consultation and Fish and Wildlife Coordination Act Recommendations.

Yuba River Canyon Salmon Habitat Restoration Project

NMFS Consultation Number: ***WCR-2017-6920***

Action Agency: United States Fish and Wildlife Service

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*)	Threatened	Likely	No	Yes	No
California Central Valley spring-run Chinook salmon (*O. tshawytscha*)	Threatened	Likely	No	Yes	No

Fishery Management Plan That Describes 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: Maria Rea

for Barry A. Thom
Regional Administrator

Date: JUN 8 2017

TABLE OF CONTENTS

LIST OF ACRONYMS

cbec – cbec eco engineering, inc.
CV – Central Valley
CCV – California Central Valley
CDFG – California Department of Fish and Game (now CDFW)
CDFW – California Department of Fish and Wildlife
CFR – Code of Federal Regulations
cfs – cubic feet per second
Coleman NFH – Coleman National Fish Hatchery
DPS – distinct population segment
DQA – Data Quality Act
EFH – essential fish habitat
ESA – Endangered Species Act
ESA – Environmental Science Associates
ESU – evolutionarily significant unit
FMP – Fisheries Management Plan
FR – Federal Register
FRFH – Feather River Fish Hatchery
ft – feet
FWCA – Fish and Wildlife Coordination Act
HAPCs – habitat areas of particular concern
ITS – incidental take statement
IPCC – Intergovernmental Panel on Climate Change
MSA – Magnuson-Stevens Fishery Conservation and Management Act
NFH – National Fish Hatchery
NMFS – National Marine Fisheries Service
NOAA – National Oceanic and Atmospheric Administration
NTU – nephelometric turbidity unit
PBF – physical or biological feature
PCE – primary constituent element
PFMC - Pacific Fishery Management Council
RPM – Reasonable and Prudent Measure
sDPS – southern distinct population segment
SWPPP – Stormwater Pollution Prevention Plan
USFWS – U.S. Fish and Wildlife Service
USGS – U.S. Geological Survey
VSP – viable salmonid population
YCWA – Yuba County Water Agency
Yuba RMT – Yuba Accord River Management Team

Table of Figures

Table of Tables

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 (BiOp) and incidental take statement (ITS) portions of this document in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973 (16 USC 1531 et seq.), and implementing regulations at 50 CFR 402.

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

Because the proposed action would modify a stream or other body of water, NMFS also provides recommendations and comments for the purpose of conserving fish and wildlife resources, and enabling the Federal agency to give equal consideration with other project purposes, as required under the Fish and Wildlife Coordination Act (16 U.S.C. 661 et seq.).

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 through NMFS' Public Consultation Tracking System. A complete record of this consultation is on file at NMFS' California Central Valley Office.

1.2 Consultation History

June 2, 2016 NMFS attended a pre-application meeting with the U.S. Army Corps of Engineers (Corps). At that time the USFWS provided a preliminary project description.

December 29, 2016, NMFS received notice of a public meeting regarding the proposed project.

November 1, 2016, NMFS received the request for formal consultation, including a biological assessment.

March 20, 2017, NMFS requested some minor clarifications via email.

March 30, 2017, Priya Finnemore (Environmental Science Associates) for the USFWS, provided information regarding the sizes of gravel for instream placement, and the upland location of gravel and cobble placement.

Consultation was initiated on March 30, 2017. This consultation is based on the biological assessment for the proposed project, the Lower Yuba River Accord Monitoring and Evaluation Program report (Yuba RMT, 2013), and fish passage data from the Daguerre Point Dam fish ladders.

1.3 Proposed Federal Action

"Action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies (50 CFR 402.02). The Yuba River Canyon Salmon Habitat Restoration Project is designed to restore and enhance ecosystem processes with a primary focus on improving adult salmonid holding habitat, salmonid spawning habitat, and juvenile salmonid rearing habitat. The purpose is to increase natural production of CV spring-run Chinook salmon (*Oncorhynchus tshawytscha*) and CCV steelhead (*O. mykiss*) in the lower Yuba River.

Under the MSA Federal action means any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken by a Federal Agency (50 CFR 600.910).

Under the FWCA, an action occurs whenever the waters of any stream or other body of water are proposed or authorized to be impounded, diverted, the channel deepened, or the stream or other body of water otherwise controlled or modified for any purpose whatever, including navigation and drainage, by any department or agency of the United States, or by any public or private agency under Federal permit or license" (16 USC 662(a)).

"Interrelated actions" are those that are part of a larger action and depend on the larger action for their justification. "Interdependent actions" are those that have no independent utility apart from the action under consideration (50 CFR 402.02). No interrelated or interdependent actions associated with the proposed project were identified.

The Yuba River Canyon Salmon Habitat Restoration Project is designed to restore and enhance habitat salmonid spawning and rearing habitat. The proposed project is in an area that has been impacted by gold mining, and by the U.S. Army Corps of Engineers' (Corps) Englebright Dam. Englebright Dam was built to contain the high sediments quantities moving downstream, from placer mining prior to 1860. Englebright Dam has interrupted the natural downstream movement of cobbles and gravel that would be used by fish for spawning. The quantities of cobbles and smaller substrate in the area downstream of Englebright dam became sparse as the smaller material was washed downstream. In addition, angular shot-rock from dam construction has ended up being washed downstream. The shot-rock is not suitable for spawning fish, and makes suitable cobbles and gravel inaccessible to spawning fish. The Yuba River Canyon Salmon Habitat Restoration Project will rehabilitate 8.29 acres of river channel plus an alluvial bar in the vicinity of the confluence of Deer Creek with the Yuba River. The approach is to excavate, grade, and sort the alluvial bar and enhance in-river topography. This will result in building up degraded riffles and reducing the amount of armoring. The bar excavation and sorting will remove the shot-rock and provide a source of spawning gravel. The project includes post construction monitoring. The project includes creation of riffles, side channels, and pools. The project is based on a management plan for this section of the lower Yuba River (ESA, 2015), several years of monitoring before and after the upstream gravel augmentation (Brown and Pasternack, 2012, 2014a, 2014b). Pasternack (2010) found that the armored state of the alluvial bar limits the amount of spawning habitat in this reach. Monitoring of the upstream gravel augmentation has shown use by Chinook salmon for spawning.

The alluvial bar will be excavated to improve rearing habitat and to generate material for the gravel augmentation for this project. Based on observations, the shot rock is on top of the alluvial bar. The shot rock will be removed, and then the material below will be sorted. After material is excavated, it will be processed by a screening machine. The material will be sorted into four size classes. The size classes will be fines (<1/4 inch), rounded gravels and cobbles (1/4 inch to 10 inches), angular shot rock (> 6 inches), and boulders (> 10 inches). If the rounded gravels and cobbles do not meet the needs of the proposed project for spawning gravels, clean appropriate sized spawning gravel will be brought in to supplement the gravel from the sorting operation. It is estimated that approximately 23,500 cubic yards of material will need to be excavated, and approximately 20,000 cubic yards of gravel will be needed for the new salmonid spawning habitat. Heavy equipment will be used for the excavation and placement of materials.

Excavated materials will be tested for mercury. If the amount of mercury is higher than acceptable levels, it will be buried and capped with coarser materials, or hauled off-site, based on resource agency direction. If the mercury levels are acceptable, the material will be used on site. Thresholds for the acceptable level of mercury will be determined by the Regional Water Quality Control Board as part of the water quality certification under Section 401 of the Clean Water Act. Sampling and testing will be conducted every other day, and analyzed by a qualified local laboratory. The laboratory turn around time is expected to be 48 hours.

All access and staging areas will be treated with erosion control measures after project completion. This will include erosion control fabric, coir logs for roadside trapping of fine sediments from the roadway, and hay and straw over other disturbed ground surfaces. After the grading has been completed, portions of the disturbed areas will revegetated with native riparian vegetation. The revegetation planting will occur in late November.

The construction is planned to start in June 2017 and is expected to be completed in one season. However, factors (stream flow, contracting, etc.) may extend the project to include work in 2018, 2019, or 2020. The total expected construction time is eight to twelve weeks, with the in-stream work taking 60 days. The instream work will only occur from July 1 to September 1, of any year. Construction is planned to take place during normal working hours, 6:30 am to 5:00 pm, Monday through Friday. However, itt may be necessary to work on Saturdays and Sundays.

Post project monitoring will be used to evaluate ecological and geomorphic outcomes. The monitoring is expected to be limited to topographic/bathymetric surveys, hydraulic and water quality/chemistry measurements, and biological observations. The biological monitoring may include; macroinvertebrate sampling; comparison of pre-and post-project juvenile salmonid growth and abundance; and enumeration of spawning adult salmonids. Monitoring is planned prior to project construction, and would be performed annually for up to five years, depending on funding. Funding for monitoring is available through 2020, but is not secured after 2020.

Spawning habitat

The proposed project will create about 3.24 acres of spawning habitat that does not currently exist in this area, due to the effects of Englebright Dam. The spawning habitat is expected to be utilized by CV spring-run Chinook salmon and CCV steelhead. Gravel augmentation upstream of this location has been successful in creating spawning habitat for these species.

Pools

Because adult CV spring-run Chinook salmon hold in the river for up to several months, the creation and preservation of holding habitat is expected to be very beneficial for adult CV spring-run Chinook salmon. The holding pools should also be beneficial for adult CCV steelhead. The pools will also be beneficial for rearing juvenile salmonids.

Side channels

The proposed project will also create three side channels, totaling about 0.25 acres. The side channels are expected to provide rearing habitat for juvenile salmonids, and refugia habitat during high flow events. High flow refugia habitat is currently limited in this reach of the lower Yuba River, due to the stream gradient and steep banks.

Figure 1 provides an overview of the proposed project configuration.

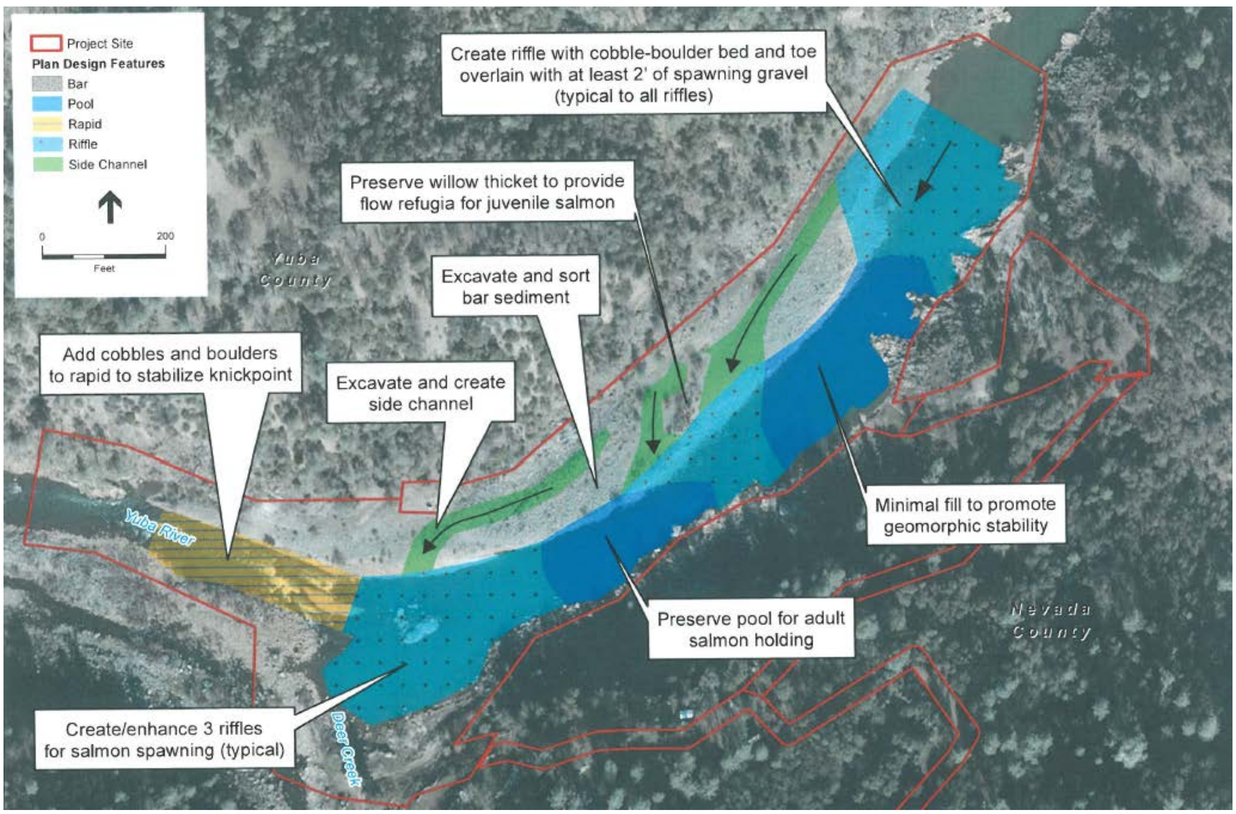

Figure 1. Project Plan (Figure 2-4 from the 2016 ESA Biological Assessment)

The proposed project includes conservation measures to avoid and/or minimize potential adverse effects of the proposed project. These measures include:

1. A stormwater pollution prevention plan (SWPPP):
    a. Identification of runoff and drainage characteristics and erosion hazards.
    b. Construction procedures and on-site housekeeping measures.
    c. Constrain, to the extent possible, excavation and spoils haulage to the dry season.
    d. Minimize sediment input to surface waters.
    e. Implement erosion control measures (silt fencing, fiber rolls), to prevent sediment input to surface waters.
    f. A spill prevention and response plan. This will include storage of hazardous substances away from drainage courses, training of workers, spill prevention kits on-site, and procedures and measures to avoid, minimize, and respond to spills.
    g. Monitoring by a qualified SWPPP practitioner (QSP).

2. Water Quality in-channel work:
    a. Comply with Section 401 of the Clean Water Act.
    b. Control sediment from entering the river.
    c. Clean all trucks and equipment away from flowing water.
    d. Steam clean vehicles and equipment prior to working within the stream channel.
    e. All equipment fueling and lubrication will occur in a designated area away from the stream channel and stream bank.
    f. Monitor water quality.
    g. Evaluation of mercury concentrations.
    h. Use vegetable based oil and grease in equipment.
    i. Gravel will be appropriately screened to avoid introduction of fines.

3. Fill Placement:
    a. Gravel will be appropriately screened, and washed to avoid fines.
    b. Gravel will placed in a manner to create an in-channel stage for work.
    c. Gravel suitable for spawning will be used for any stream crossings.

4. Species Concerns:
    a. In stream work will occur from July 1 to September 1, to avoid adverse effects on emigrating juvenile salmonids, incubating salmonids, immigrating adult CV spring-run Chinook salmon.
    b. Operations will be limited to 6:30 am to 5 pm, allowing fish passage at other times.
    c. All equipment will be steam cleaned, to remove contaminants, prior to being used in the stream.
    d. All equipment will be steamed cleaned before being used elsewhere, to reduce the chance of introducing invasive species to other waters.
    e. Surveys by a qualified fish biologist will be conducted prior to in-channel work to determine the presence of adult salmonids. If adult salmonids are present, work will cease until the fish have left the work area.

f. Training will be given to all project personnel about the protection of biological resources, especially special status species.
g. Stream shade producing trees and bank stabilizing vegetation will be retained, as much as possible.
h. Areas where vegetation is disturbed, will be replanted with native riparian vegetation.
i. Woody material may be added to the restoration reach and side channel.

Funding for design, permitting, construction, and monitoring is provided by the USFWS Anadromous Fish Restoration Program as authorized by several Federal and state legislative acts including the Central Valley Project Improvement Act and the Fish and Wildlife Coordination Act. The USFWS serves as the Federal action agency for this consultation.

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

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

2.1 Analytical Approach

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

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

The designation(s) of critical habitat for (species) use(s) the term primary constituent element (PCE) or essential features. The new critical habitat regulations (81 FR 7414) replace this term with physical or biological features (PBFs). 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 BiOp, we use the term PBF to mean PCE or essential feature, as appropriate for the specific critical habitat.

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

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

2.2 Rangewide Status of the Species and Critical Habitat

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

The following federally listed species evolutionarily significant units (ESU), distinct population segment (DPS) and designated critical habitat occur in the Action Area and have the potential to be affected by the action (Table 1):

Table 1. ESA Listing History.

Species	ESU or DPS	Original Final FR Listing	Current Final Listing Status	Critical Habitat Designated
Chinook salmon (*Oncorhynchus tshawytscha*)	Central Valley spring-run ESU	9/16/1999 64 FR 50394 Threatened	6/28/2005 70 FR 37160 Threatened	9/2/2005 70 FR 52488
Steelhead (*O. mykiss*)	California Central Valley DPS	3/19/1998 63 FR 13347 Threatened	1/5/2006 71 FR 834 Threatened	9/2/2005 70 FR 52488

2.2.1 Central Valley Spring-run Chinook salmon

The federally listed ESU of Central Valley (CV) spring-run Chinook salmon and designated critical habitat for this ESU occurs in the Action Area and may be affected by the proposed project. Detailed information regarding ESU listing and critical habitat designation history, designated critical habitat, ESU life history, and viable salmonid population (VSP) parameters can be found in the NMFS 2014 Recovery Plan for the Evolutionarily Significant Units of Sacramento River Winter-Run Chinook Salmon, Central Valley Spring-Run Chinook Salmon, and the Distinct Population Segment of California Central Valley Steelhead.

Historically, spring-run Chinook salmon were the second most abundant salmon run in the Central Valley and one of the largest on the west coast (CDFG 1990). These fish occupied the upper and middle elevation reaches (1,000 to 6,000 feet) of the San Joaquin, American, Yuba, Feather, Sacramento, McCloud and Pit rivers, with smaller populations in most tributaries with sufficient habitat for over-summering adults (Stone 1872, Rutter 1904, Clark 1929). The Central Valley drainage as a whole is estimated to have supported spring-run Chinook salmon runs as large as 600,000 fish between the late 1880s and 1940s (CDFG 1998). The San Joaquin River historically supported a large run of spring-run Chinook salmon, suggested to be one of the largest runs of any Chinook salmon on the West Coast with estimates averaging 200,000-500,000 adults returning annually (CDFG 1990).

Monitoring of the Sacramento River mainstem during spring-run Chinook salmon spawning timing indicates some spawning occurs in the river (CDFW, unpublished data, 2014). Genetic introgression has likely occurred here due to lack of physical separation between spring-run and fall-run Chinook salmon populations (CDFG 1998). Sacramento River tributary populations in Mill, Deer, and Butte creeks are likely the best trend indicators for the CCV spring-run Chinook salmon ESU. Generally, these streams have shown a positive escapement trend since 1991, displaying broad fluctuations in adult abundance (CDFW 2016). The Feather River Fish Hatchery (FRFH) spring-run Chinook salmon population represents an evolutionary legacy of populations that once spawned above Oroville Dam. The FRFH population is included in the ESU based on its genetic linkage to the natural spawning population, and the potential for development of a conservation strategy (June 28, 2005, 70 FR 37160).

The Central Valley Technical Review Team estimated that historically there were 18 or 19 independent populations of CV spring-run Chinook salmon, along with a number of dependent populations, all within four distinct geographic regions, or diversity groups (Lindley *et al.* 2004). Of these populations, only three independent populations currently exist (Mill, Deer, and Butte creeks tributary to the upper Sacramento River) and they represent only the northern Sierra Nevada diversity group. Additionally, smaller populations are currently persisting in Antelope and Big Chico creeks, and the Feather and Yuba rivers in the northern Sierra Nevada diversity group (CDFG 1998). In the San Joaquin River basin, observations in the last decade suggest that spring-running populations may currently occur in the Stanislaus and Tuolumne rivers (Franks 2015).

The CV spring-run Chinook salmon ESU is comprised of two known genetic complexes. Analysis of natural and hatchery CV spring-run Chinook salmon stocks in the Central Valley indicates that the northern Sierra Nevada diversity group CV spring-run Chinook salmon populations in Mill, Deer, and Butte creeks retain genetic integrity as opposed to the genetic integrity of the Feather River population, which has been somewhat compromised by introgression with the fall-run ESU (Good *et al.* 2005, Garza *et al.* 2008, Cavallo *et al.* 2011).

Because the populations in Butte, Deer and Mill creeks are the best trend indicators for ESU viability, we can evaluate risk of extinction based VSP in these watersheds. Over the long term, these three remaining populations are considered to be vulnerable to anthropomorphic and naturally occurring catastrophic events. The viability assessment of CV spring-run Chinook salmon conducted during NMFS' 2010 status review (NMFS 2011), found that the biological status of the ESU had worsened since the last status review (2005) and recommended that the species status be reassessed in two to three years as opposed to waiting another five years, if the decreasing trend continued. In 2012 and 2013, most tributary populations increased in returning adults, averaging over 13,000. However, 2014 returns were lower again, just over 5,000 fish, indicating the ESU remains highly fluctuating. The most recent status review was conducted in 2015 (NMFS 2016b), which looked at promising increasing populations in 2012-2014; however, the 2015 returning fish were extremely low (1,488), with additional pre-spawn mortality reaching record lows. Since the effects of the 2012-2015 drought have not been fully realized, we anticipate at least several more years of very low returns, which may result in severe rates of decline (NMFS 2016b).

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. Even in tributaries with cool water springs, in years of extended drought and warming water temperatures, unsuitable conditions may occur. 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*. 2012).

Summary of the Central Valley spring-run Chinook salmon ESU viability

In summary, the extinction risk for the CV spring-run Chinook salmon ESU remains at moderate risk of extinction (NMFS 2016b). Based on the severity of the drought and the low escapements as well as increased pre-spawn mortality in Butte, Mill, and Deer creeks in 2015, there is concern that these CV spring-run Chinook salmon strongholds will deteriorate into a status of high extinction risk in the coming years, based on the population size or rate of decline criteria (NMFS 2016b).

Critical Habitat and Physical or Biological Features for Central Valley Spring-run Chinook salmon

The critical habitat designation for CV spring-run Chinook salmon lists the PBFs (June 28, 2005, 70 FR 37160), which are described in NMFS 2014 Recovery Plan for the Evolutionarily Significant Units of Sacramento River Winter-Run Chinook Salmon, Central Valley Spring-Run Chinook Salmon, and the Distinct Population Segment of California Central Valley Steelhead. In summary, the PBFs include freshwater spawning sites, freshwater rearing sites, freshwater migration corridors, and estuarine habitat. The geographical range of designated critical habitat includes stream reaches of the Feather, Yuba, and American rivers, Big Chico, Butte, Deer, Mill, Battle, Antelope, and Clear creeks, and the Sacramento River, as well as portions of the northern Delta (June 28, 2005, 70 FR 37160).

Summary of the Value of CCV Spring-run Chinook salmon Critical Habitat for the Conservation of the Species

Currently, many of the PBFs of CV spring-run Chinook salmon critical habitat are degraded, and provide limited high quality habitat. Features that lessen the quality of migratory corridors for juveniles include unscreened or inadequately screened diversions, altered flows in the Delta, scarcity of complex in-river cover, and the lack of floodplain habitat. Although the current conditions of CV spring-run Chinook salmon critical habitat are significantly degraded, the spawning habitat, migratory corridors, and rearing habitat that remain are considered to have high intrinsic value for the conservation of the species.

<u>2.2.2 California Central Valley Steelhead</u>

The federally listed distinct population segment (DPS) of California Central Valley (CCV) steelhead and designated critical habitat for this DPS occurs in the Action Area and may be affected by the proposed project. Detailed information regarding DPS listing and critical habitat designation history, designated critical habitat, DPS life history, and VSP parameters can be found in the NMFS 2014 Recovery Plan for the Evolutionarily Significant Units of Sacramento River Winter-Run Chinook Salmon, Central Valley Spring-Run Chinook Salmon, and the Distinct Population Segment of California Central Valley Steelhead.

Historic CCV steelhead run sizes are difficult to estimate given the paucity of data, but may have approached one to two million adults annually (McEwan 2001). By the early 1960s the CCV steelhead run size had declined to about 40,000 adults (McEwan 2001). Current abundance data for CCV steelhead is limited to returns to hatcheries and redd surveys conducted on a few rivers. The hatchery data is the most reliable because redd surveys for steelhead are often made difficult by high flows and turbid water usually present during the winter-spring spawning period. CCV steelhead returns to Coleman National Fish Hatchery (NFH) have increased from 2011 to 2014. After hitting a low of only 790 fish in 2010, the last two years, 2013 and 2014, have averaged 2,895 fish. Wild adults counted at the hatchery each year represent a small fraction of overall returns, but their numbers have remained relatively steady, typically 200–300 fish each year. Numbers of wild adults returning each year have ranged from 252 to 610 from 2010 to 2014.

Redd counts are conducted in the American River and in Clear Creek (Shasta County). An average of 143 redds have been counted on the American River from 2002–2015 [data from Hannon *et al.* (2003), Hannon and Deason (2008), Chase (2010)]. An average of 178 redds have been counted in Clear Creek from 2001 to 2015 following the removal of Saeltzer Dam, which allowed steelhead access to additional spawning habitat. The Clear Creek redd count data ranges from 100-1023 and indicates an upward trend in abundance since 2006 (USFWS 2015).

The returns of CCV steelhead to the Feather River Hatchery experienced a sharp decrease from 2003 to 2010, with only 679, 312, and 86 fish returning in 2008, 2009 and 2010, respectively. In recent years, however, returns have experienced an increase with 830, 1,797 and 1,505 fish returning in 2012, 2013 and 2014 respectively. Overall, steelhead returns to hatcheries have fluctuated so much from 2001 to 2015 that no clear trend is present.

An estimated 100,000 to 300,000 naturally produced juvenile steelhead are estimated to leave the Central Valley annually, based on rough calculations from sporadic catches in trawl gear (Good *et al.* 2005). Nobriga and Cadrett (2001) used the ratio of adipose fin-clipped (hatchery) to unclipped (wild) steelhead smolt catch ratios in the USFWS Chipps Island trawl from 1998 through 2000 to estimate that about 400,000 to 700,000 steelhead smolts are produced naturally each year in the Central Valley. Trawl data indicate that the level of natural production of steelhead has remained very low since the 2011 status review, suggesting a decline in natural production based on consistent hatchery releases. Catches of CCV steelhead at the fish collection facilities in the southern Delta are another source of information on the production of wild steelhead relative to hatchery steelhead (CDFW 2014 data: ftp.delta.dfg.ca.gov/salvage). The overall catch of steelhead has declined dramatically since the early 2000s, with an overall average of 2,705 in the last 10 years. The percentage of wild (unclipped) fish in salvage has fluctuated, but has leveled off to an average of 36 percent since a high of 93 percent in 1999.

About 80 percent of the historical spawning and rearing habitat once used by anadromous *O. mykiss* in the Central Valley is now upstream of impassible dams (Lindley *et al.* 2006). Many historical populations of CCV steelhead are entirely above impassable barriers and may persist as resident or adfluvial rainbow trout, although they are presently not considered part of the DPS.

Steelhead are well-distributed throughout the Central Valley below the major rim dams (Good *et al.* 2005, 2016a NMFS). Most of the steelhead populations in the Central Valley have a high hatchery component, including Battle Creek (adults intercepted at the Coleman NFH weir), the American River, Feather River, and Mokelumne River.

CCV steelhead abundance and growth rates continue to decline, largely the result of a significant reduction in the amount and diversity of habitats available to these populations (Lindley *et al.* 2006). Recent reductions in population size are supported by genetic analysis (Nielsen *et al.* 2003). Garza and Pearse (2008) analyzed the genetic relationships among CCV steelhead populations and found that unlike the situation in coastal California watersheds, fish below barriers in the Central Valley were often more closely related to below barrier fish from other watersheds than to *O. mykiss* above barriers in the same watershed. This pattern suggests the ancestral genetic structure is still relatively intact above barriers, but may have been altered below barriers by stock transfers. The genetic diversity of CCV steelhead is also compromised by hatchery origin fish, placing the natural population at a high risk of extinction (Lindley *et al.* 2007). Steelhead in the Central Valley historically consisted of both summer-run and winter-run migratory forms. Only winter-run (ocean maturing) steelhead currently are found in California Central Valley rivers and streams as summer-run have been extirpated (McEwan and Jackson 1996, Moyle 2002).

Although CCV steelhead will experience similar effects of climate change as those experienced by Chinook salmon in the Central Valley, 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 steelhead populations.

Summary of California Central Valley Steelhead DPS viability

All indications are that natural CCV steelhead have continued to decrease in abundance and in the proportion of natural fish over the past 25 years (Good *et al.* 2005, NMFS 2016a); the long-term trend remains negative. Hatchery production and returns are dominant. Most wild CCV populations are very small and may lack the resiliency to persist for protracted periods if subjected to additional stressors, particularly widespread stressors such as climate change. The genetic diversity of CCV steelhead has likely been impacted by low population sizes and high numbers of hatchery fish relative to wild fish.

In summary, the status of the CCV steelhead DPS appears to have remained unchanged since the 2011 status review, and the DPS is likely to become endangered within the foreseeable future throughout all or a significant portion of its range (NMFS 2016a).

Critical Habitat and Physical or Biological Features for California Central Valley Steelhead

The critical habitat designation for CCV spring-run steelhead lists the PBFs (June 28, 2005, 70 FR 37160), which are described in NMFS 2014 Recovery Plan for the Evolutionarily Significant Units of Sacramento River Winter-Run Chinook Salmon, Central Valley Spring-Run Chinook Salmon, and the Distinct Population Segment of California Central Valley Steelhead. In summary, the PBFs include freshwater spawning sites; freshwater rearing sites; freshwater migration corridors; and estuarine areas. The geographical extent of designated critical habitat includes: the Sacramento, Feather, and Yuba rivers, and Deer, Mill, Battle and Antelope creeks in the Sacramento River basin; the San Joaquin River, including its tributaries but excluding the mainstem San Joaquin River above the Merced River confluence; and the waterways of the Delta.

Summary of the Value of California Central Valley Steelhead Critical Habitat for the Conservation of the species

Many of the PBFs of CCV steelhead critical habitat are currently degraded and provide limited high quality habitat. Passage to historical spawning and juvenile rearing habitat has been largely reduced due to construction of dams throughout the Central Valley. Levee construction has also degraded the value for the conservation of the species of freshwater rearing and migration habitat and estuarine areas as riparian vegetation has been removed, reducing habitat complexity, food resources, and resulting in many other ecological effects. Contaminant loading and poor water quality in Central California waterways poses threats to lotic fish, their habitat and food resources. Additionally, due to reduced access to historical habitats, genetic introgression is occurring because naturally-produced fish are interacting with hatchery-produced fish which has the potential to reduce the long-term fitness and survival of this species.

Although the current conditions of CCV steelhead critical habitat are significantly degraded, the spawning habitat, migratory corridors, and rearing habitat that remain in the Sacramento/San Joaquin River watersheds and the Delta are considered to have high intrinsic value for the conservation of the species as they are critical to ongoing recovery effort.

2.2.3 Global Climate Change

One factor affecting the range-wide status of CCV steelhead, and CV spring-run Chinook, and aquatic habitat at large is climate change.

The world is about 1.3°F warmer today than a century ago and the latest computer models predict that, without drastic cutbacks in emissions of carbon dioxide and other gases released by the burning of fossil fuels, the average global surface temperature may rise by two or more degrees in the 21st century (IPCC 2007). Much of that increase likely will occur in the oceans, and evidence suggests that the most dramatic changes in ocean temperature are now occurring in the Pacific (Noakes *et al.* 1998). Using objectively analyzed data Liu and Huang (2000) estimated a warming of about 0.9°F per century in the Northern Pacific Ocean.

Sea levels are expected to rise by 0.5 to 1.0 meters in the northeastern Pacific coasts in the next century, mainly due to warmer ocean temperatures, which lead to thermal expansion much the same way that hot air expands. This will cause increased sedimentation, erosion, coastal flooding, and permanent inundation of low-lying natural ecosystems (*e.g.*, salt marsh, riverine, mud flats) affecting listed salmonid PBFs. Increased winter precipitation, decreased snow pack, permafrost degradation, and glacier retreat due to warmer temperatures will cause landslides in unstable mountainous regions and destroy fish and wildlife habitat, including salmon-spawning streams. Glacier reduction could affect the flow and temperature of rivers and streams that depend on glacier water, with negative impacts on fish populations and the habitat that supports them.

Summer droughts along the South Coast and in the interior of the northwest Pacific coastlines will mean decreased stream flow in those areas, decreasing salmonid survival and reducing water supplies in the dry summer season when irrigation and domestic water use are greatest. Global warming may also change the chemical composition of the water that fish inhabit: the amount of oxygen in the water may decline, while pollution, acidity, and salinity levels may increase. This will allow for more invasive species to overtake native fish species and impact predator-prey relationships (Petersen and Kitchell 2001, Stachowicz *et al.* 2002).

In light of the predicted impacts of global warming, the California Central Valley has been modeled to have an increase of between 2 and 7 degrees Celsius by 2100, with a drier hydrology predominated by rainfall rather than snowfall (Dettinger *et al*. 2004, Hayhoe *et al.* 2004, VanRheenen 2004, Stewart *et al.* 2005). This will alter river runoff patterns and transform the tributaries that feed the Central Valley from a spring and summer snowmelt dominated system to a winter rain dominated system. It can be hypothesized that summer temperatures and flow levels will become unsuitable for salmonid survival. The cold snowmelt that furnishes the late spring and early summer runoff will be replaced by warmer precipitation runoff. This will truncate the period of time that suitable cold-water conditions exist downstream of existing reservoirs and dams due to the warmer inflow temperatures to the reservoir from rain runoff. Without the necessary cold water pool developed from melting snow pack filling reservoirs in the spring and early summer, late summer and fall temperatures in rivers downstream of reservoirs, such as Lake Shasta, could potentially rise above thermal tolerances for juvenile and adult salmonids that must hold and/or rear in the river downstream of the dams over the summer and fall periods.

2.3 Action Area

"Action area" means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). The Action Area for the proposed project includes the project footprint and the area downstream where construction activities can temporarily decrease water quality, impacting listed fish species. The project will affect the area within the project footprint and the area downstream where construction activities can temporarily decrease water quality, impacting listed fish species. The project will occur in the Yuba River from just upstream of the confluence with Deer Creek (39.230851 N Latitude, -121.280926 W Longitude), upstream 2,041 feet (39.232818 N Latitude, -121.275132 W Longitude). The effects of increased turbidity will attenuate downstream as suspended sediment settles out of the water column. Therefore, the Action Area includes the width of the river over the length of the construction area, including the alluvial bar on the northwest bank of the river, and the river downstream from the project area for 1,000 feet.

2.4 Environmental Baseline

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

Other completed section 7 consultations that have occurred in the area include informal consultation for the ongoing operation and maintenance of Englebright Dam and Reservoir (2014) and formal consultation for the operation and maintenance of Daguerre Point Dam (2014). Both of these consultations determined that the proposed actions would not result in jeopardy to listed species or adverse modification of their critical habitats.

2.4.1 Historical Usage of the Lower Yuba River

The lower Yuba River has undergone significant morphological and ecological changes over the past 150 years due to a sequence of anthropomorphic disturbances, beginning with the discovery of gold in California in 1848. Most relevant of these changes:

- ***vast influx of hydraulic mining sediment* -** It is estimated that from 1849 – 1909, the Yuba River received roughly 685 million cubic yards of sediment, more than the Upper Feather, Bear, and American rivers combined (Gilbert 1917). This influx caused such severe aggradation of the Yuba River that by 1868 the channel bed had risen 20 feet and was higher than the streets of Marysville (Ayres Associates 1997). Flooding in Marysville in 1875 prompted the prohibition of in-stream disposal of hydraulic mining sediments.

- ***shifting and confinement of the river's course* -** In the early 1900s, the California Debris Commission sanctioned the re-alignment of the lower Yuba River to the north of the historic alignment and the construction of large linear "training walls" consisting of steeply mounded tailings piles in the center and along both banks of the straightened river corridor. The training walls were piled to substantial heights above the 100-yr flood elevation and with dramatically varying top widths of up to 500 feet (AECOM 2015). The makeshift training walls were intended to laterally confine the river to allow for additional widespread dredging operations (gold mining) of the naturally occurring and hydraulic mining derived sediments deposited in the valley.

- ***river regulation and coarse sediment control -*** In 1906, Daguerre Point Dam was constructed as a partial sediment barrier and base-level control point. Englebright Dam was constructed in 1941, and was designed to keep upstream hydraulic mining debris out of the lower river (YCWA 2017). In 1971, New Bullards Bar Dam was built to control mining debris and generate power (Pasternack 2009). As a result, the influx of sediment and the major flood events have both been significantly altered, affecting the hydrologic regime and the movement of sediment in the system. Large woody material passes over the Englebright Dam, but is often greatly weathered or simplified from residence time in the reservoirs upstream and through passage over the dam (i.e., canopy and rootwad removed). This most likely reduces the ability of key pieces to lock in place within the channel.

Despite the presence of several significant dams in the upper watershed (e.g. New Bullards Bar and Englebright Dam), the lower Yuba River still experiences moderate and major floods capable of inducing natural and significant geomorphic changes.

2.4.2 Mercury Contamination

During historical gold mining within the Yuba River watershed, more than 8 million pounds of mercury were lost to the environment (Hunerlach *et al.* 2004). Much of the mercury left over from the mining era is contained in sediment held behind Englebright Dam and Daguerre Point Dam.

Methylmercury is the form of mercury that is toxic to biota and which can bioaccumulate in aquatic organisms. In the environment, methylmercury can be produced from the soluble fraction of the inorganic mercury by naturally occurring anaerobic bacteria. However, it is likely that only a very small fraction of the total mercury associated with gold mining sediments in the Yuba River is actually 'reactive' and available to bacteria for methylation (Singer *et al.* 2016).

Although most of the mercury is not biologically available, enough has methylized in Englebright Lake that it is bioaccumulating in the larger predatory fish (USACE 2014).

Methylmercury can be removed from shallow surface waters through photo degradation, a process by which methylmercury is converted to less toxic inorganic mercury by the sun's ultraviolet light (USGS 2014). However, because mercury in aquatic environments preferentially partitions to soil, sediment, and suspended matter (i.e., the dissolved mercury concentration is typically far lower than the concentration in soil, sediment, and suspended matter), most of the mercury in the water column is removed not by reduction to the elemental species, but by sedimentation of the particles to which divalent mercury and methylmercury are bound. As a result of this sedimentation process, sediment in the Yuba River exhibits high levels of mercury (Cramer Fish Sciences 2016).

2.4.3 Existing Conditions

CCV anadromous salmonids in the Yuba River do not have access to their historic habitat in the upper watershed. Historically, this is an area where CV spring-run Chinook salmon adults held over the summer, spawned, and juveniles reared. Steelhead also used the upper watershed. The upper watershed provided cool water for CV spring-run Chinook salmon to hold over the summer, and ample spawning habitat. CCV anadromous salmonids currently are unable to move upstream of Englebright Dam. The Yuba River downstream of Daguerre Point Dam can get very warm in the summer. It is likely that the water in the Yuba River downstream of Daguerre Point Dam will get warmer over time, due to changes in the climate.

In the lower portion of the lower Yuba River, fish habitat is impaired due to mining, water withdrawals, and other modifications to the river. In the lowest reaches of the lower Yuba River water temperatures can be unsuitable for salmonids. In the upper reaches of the lower Yuba River water temperatures are cooler. For these reasons, restoration and creation of holding, spawning, incubation, and rearing habitat in the upper portion of the lower Yuba River is very important for salmonid persistence and recovery.

The Action Area for the proposed project has been severely altered. Englebright Dam interrupts the movement of sediment that would normally create spawning habitat in this area of the Yuba River. Construction of Englebright Dam and adjacent facilities has resulted in shot rock moving downstream and being deposited in the Action Area. In addition, mechanical mining has occurred in the area. All of these activities have significantly modified the salmonid habitat in the Action Area.

Due to the lack of spawning gravel, gravel augmentation in the Yuba River Englebright Dam Reach, downstream to the confluence with Deer Creek was identified in the NMFS Recovery Plan for Central Valley Chinook Salmon and Steelhead (2014) as a recovery action. That plan also identified the creation and restoration of side channel habitat in the Yuba River as a recovery action.

2.4.4 CV Spring-run Chinook Salmon and CCV Steelhead and their Critical Habitat in the Action Area

The Yuba River within the Action Area is used as a migration corridor for adult and juvenile CV spring-run Chinook salmon and CCV steelhead.

Juvenile salmonid rearing habitat is limited within the action area for the proposed project. Currently, rearing habitat is restricted to edge habitats along the river’s margins. Within these areas there is little large wood, and few features that would provide shelter from high velocities, feeding zones, and cover from predators. Partly due to lost sediment supply, the river channel has incised over the last 75 years, leading to steeper banks, a reduction in the availability of edge habitat, and the abandonment of a relic side channel on the north bank.

There are five areas within the action area that potentially suitable for adult salmonid holding and potential spawning. There are three riffles and two pools. The riffles lack sediment of the appropriate sizes preferred by spawning CCV steelhead and CV spring-run Chinook salmon (Kammel and Pasternack, 2014; Pasternack et al., 2014).

The PBFs of critical habitat features for CV spring-run Chinook salmon and CCV steelhead within the Action Area include freshwater rearing, migration, and spawning.

<u>2.4.5 Global Climate Change</u>

By contrast to the conditions for other Central Valley floor rivers, climate change may not have as much of an impact on salmonids in the lower Yuba River downstream of Englebright Reservoir (YCWA 2010b). Presently, the lower Yuba River is one of the few Central Valley tributaries that consistently has suitable water temperatures for salmonids throughout the year. Lower Yuba River water temperatures generally remain below 58°F year-round at the Smartsville Gage (downstream of Englebright Dam), and below 60°F year-round at Daguerre Point Dam (YCWA *et al.* 2007). At Marysville, water temperatures generally remain below 60°F from October through May, and below 65°F from June through September (YCWA *et al*. 2007). However, in dry years temperatures may become warmer than the optimum range for salmonids, particularly in the lower section of the Yuba River.

According to (YCWA 2010a), because of specific physical and hydrologic factors, the lower Yuba River is expected to continue to provide the most suitable water temperature conditions for anadromous salmonids of all Central Valley floor rivers, even if there are long-term climate changes. This is because New Bullards Bar Reservoir is a deep, steep-sloped reservoir with ample cold water pool reserves. Throughout the period of operations of New Bullards Bar Reservoir (1969 through present), which encompasses the most extreme critically dry year on record (1977), the cold water pool in New Bullards Bar Reservoir never was depleted. Since 1993, cold water pool availability in New Bullards Bar Reservoir has been sufficient to accommodate year-round utilization of the reservoir's lower level outlets to provide cold water to the lower Yuba River. Even if climate conditions change, New Bullards Bar Reservoir still will have a very substantial cold water pool each year that will continue to be available to provide sustained, relatively cold flows of water into the lower Yuba River during the late spring, summer and fall of each year (YCWA 2010a).

2.5 Effects of the Action

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

2.5.1 Potential Effects of Instream Construction Activities on Individuals

Juvenile CCV steelhead, and CV spring-run Chinook salmon, may be impacted by instream construction activities. Fish are expected to migrate downstream in response the noise and disturbance caused by these activities. Fish that migrate downstream in response to instream construction activities may endure short term stress from being forced to migrate away from their rearing area and needing to locate a new rearing area. Fish may endure some short term stress from crowding and competition with resident fish for food and habitat. Fish may be subject to increased predation risk while they are locating a new rearing area. However, displaced fish will likely locate to areas downstream that have suitable habitat and low competition. Due to the limited spawning areas upstream, high velocities, and the high flows that occurred in 2017 (displacing gravel, fish and eggs), only a small number of juvenile steelhead and Chinook salmon are likely to be displaced by the proposed project in 2017. It is not expected that the temporary displacement of fish or the competition they endure will affect the survival chances of individual fish, based on the size of the area that will be affected and the small number of CCV steelhead, and CV spring-run Chinook salmon likely to be displaced.

Instream construction activities are expected to cause mortality or abundance reduction of benthic aquatic macroinvertebrates within the immediate sediment placement areas when they are covered with coarse sediment. However, not all invertebrates will be smothered and many will move up through the material to colonize the new surface layer (Merz and Chan 2005). Furthermore, effects to aquatic macroinvertebrates from coarse sediment smothering will be temporary because construction activities will be relatively short in duration and rapid recolonization (about two weeks to two months) of the new sediment is expected (Merz and Chan 2005). Furthermore, downstream drift is expected to temporarily benefit any downstream, drift-feeding organisms, including juvenile salmonids. The benthic macroinvertebrate production within the site is expected to increase when the project is complete as there will be an increase in area of perennial riffle habitat. The amount of food available for juvenile salmonids and other native fishes is therefore expected to increase relative to pre-project conditions.

Juvenile CCV steelhead, and juvenile CV spring-run Chinook salmon may be present during instream construction activities, and thus subject to the above effects. Because juveniles will be able to retreat to suitable habitat and food resources will only be temporarily impacted, effects of instream construction activities will be minor and are unlikely to result in injury or death. Adult CCV steelhead are not expected to be present during instream construction activities, and adult CV spring-run Chinook salmon movement at night will be undisturbed, thus impacts to this life stage of these species is considered improbable.

2.5.2 Potential Effects of Sediment and Turbidity

Construction activities related to restoration actions will temporarily disturb soil and riverbed sediments, resulting in the potential for temporary increases in turbidity and suspended sediments in the Action Area. Turbidity plumes are expected to affect a portion of the channel width and extend up to 1,000 feet downstream of the site. Construction-related increases in sedimentation and siltation above the background level could potentially affect fish species and their habitat by reducing egg and juvenile survival, interfering with feeding activities, causing breakdown of social organization, and reducing primary and secondary productivity. The magnitude of potential effects on fish depends on the timing and extent of sediment loading and flow in the river before, during, and immediately following construction.

High concentrations of suspended sediment can have both direct and indirect effects on salmonids. The severity of these effects depends on the sediment concentration, duration of exposure, and sensitivity of the affected life stage. Based on the types and duration of proposed in-water construction methods, short-term increases in turbidity and suspended sediment may disrupt feeding activities or result in avoidance or displacement of fish from preferred habitat. Juvenile salmonids have been observed to avoid streams that are chronically turbid (Lloyd 1987) or move laterally or downstream to avoid turbidity plumes (Sigler *et al.* 1984). Sigler *et al.* (1984) found that prolonged exposure to turbidities between 25 and 50 nephelometric turbidity units (NTUs) resulted in reduced growth and increased emigration rates of juvenile coho salmon and steelhead compared to controls. These findings are generally attributed to reductions in the ability of salmon to see and capture prey in turbid water (Waters 1995). Chronic exposure to high turbidity and suspended sediment may also affect growth and survival by impairing respiratory function, reducing tolerance to disease and contaminants, and causing physiological stress (Waters 1995). Berg and Northcote (1985) observed changes in social and foraging behavior and increased gill flaring (an indicator of stress) in juvenile coho salmon at moderate turbidity (30-60 NTUs). In this study, behavior returned to normal quickly after turbidity was reduced to lower levels (0-20 NTU).

Any increase in turbidity associated with instream work is likely to be brief and occur only in the vicinity of the site, attenuating downstream as suspended sediment settles out of the water column. Temporary spikes in suspended sediment may result in behavioral avoidance of the site by fish; several studies have documented active avoidance of turbid areas by juvenile and adult salmonids (Bisson and Bilby 1982, Lloyd 1987, Servizi and Martens 1992, Sigler et al. 1984).

Individual fish that encounter increased turbidity or sediment concentrations will likely move away from affected areas into suitable surrounding habitat. Measurements of turbidity will be performed on a regular basis during construction to track the response of water quality to construction activities. In-water work will only occur during a two month period, to limit the duration of the effects and avoid critical life stage periods for salmonids. Gravel will be screened to reduce the introduction of fine sediments to the stream.

Sediment plumes will occur intermittently during daylight hours, resulting in daily periods (at least 12 hours) in which water quality will return to background levels. The proposed project will also include preparation and implementation of SWPPP in compliance with the State Water Resources Control Board’s General Permit for Discharges of Storm Water Associated with Construction Activity. The amount of sediment generated by construction will be minimized by mitigation measures associated with the SWPPP that are designed to minimize erosion and sediment entering the channel. Juvenile CCV steelhead, and CV spring-run Chinook salmon may be present during instream construction activities, and thus subject to the above effects. However, with the above measures in place, the effects of increased turbidity will be minor and are unlikely to result in injury or death. Adult CV spring-run Chinook salmon may be present during activities that may increase turbidity. However, the increased turbidity is expected to be localized to a small area limited to day time hours thus allowing adult CV spring-run Chinook salmon to move upstream and downstream unimpaired at night. Thus, potential impacts to this life stage of these species is considered small.

Sedimentation is known to have lethal and sublethal effects to incubating salmonids eggs by decreasing dissolved oxygen transport between spawning gravel. Sediment also blocks micropores on the surface of incubating eggs, inhibiting oxygen transport and creates an additional oxygen demand through the chemical and biological oxidation of organic material (Kemp *et al*. 2011, Greig *et al*. 2007, Suttle *et al*. 2004). However, due to the location and timing of construction, CV spring-run Chinook salmon, and CCV steelhead eggs will not be present, and thus adverse impacts to incubating eggs are not expected to occur.

2.5.3 Potential Effects of Elevated Levels of Mercury

The construction of the proposed project has the potential to expose clay and silt sized particles which have elevated mercury levels. These finer sized sediments with elevated mercury could then be transported into the wetted channel of the Yuba River during high flow events. A fraction of the mercury may then methylate and become toxic to fishes and other biota in the

Yuba River. The inundation of floodplains plays an important role in the methylation, mobilization, and transport of mercury. Methylmercury has a range of toxic effects to fish including; behavioral, neurochemical, hormonal, and reproductive changes. In one study of Atlantic salmon (*Salmo salar*), methylmercury caused altered behavior and pathological damage in Atlantic Salmon (Berntssen *et al.* 2003).

The fine grained sediment will be regularly monitored and tested for mercury. If fines are determined to contain mercury above acceptable levels, the material will be either buried and capped, or removed from the area. With implementation of these measures, impacts from increased mercury levels are expected to be improbable for all life stages of CCV steelhead, and CV spring-run Chinook salmon.

2.5.4 Potential Effects of Contaminants

During construction, the potential exists for spills or leakage of toxic substances that could enter the Yuba River. Refueling, operation, and storage of construction equipment and materials could result in accidental spills of pollutants (e.g., fuels, lubricants, concrete, sealants, and oil).
High concentrations of contaminants can cause direct (sublethal to lethal) and indirect effects on fish. Direct effects include mortality from exposure or increased susceptibility to disease that reduces the overall health and survival of the exposed fish. The severity of these effects depends on the contaminant, the concentration, duration of exposure, and sensitivity of the affected life stage. A potential indirect effect of contamination is reduced prey availability; invertebrate prey survival could be reduced following exposure, therefore making food less available for fish. Fish consuming infected prey may also absorb toxins directly. For salmonids, potential direct and indirect effects of reduced water quality during project construction will be addressed by

utilization of vegetable-based lubricants and hydraulic fluids in equipment operated in the wet channel, and by implementing the construction site housekeeping measures incorporated in the project SWPPP. These measures include provisions to control erosion and sedimentation, as well as a Spill Prevention and Response Plan to avoid, and if necessary, clean up accidental releases of hazardous materials.

With these best management practices in place, impacts from contaminants are expected to be improbable for all life stages of CCV steelhead, and CV spring-run Chinook salmon.

2.5.5 Potential Effects of Noise

Noise generated by heavy equipment and personnel during construction activities could adversely affect fish and other aquatic organisms. The potential direct effects of underwater noise on fish and other organisms depend on a number of biological characteristics (e.g., fish size, hearing sensitivity, behavior) and the physical characteristics of the sound (e.g., frequency, intensity, duration) to which fish and invertebrates are exposed. Potential direct effects include behavioral effects, physiological stress, physical injury (including hearing loss), and mortality. Exposure of adult and juvenile salmonids to noise will be minimized by conducting all instream activities during a construction season to between July 1 and September 1, when minimal numbers of adult and juvenile CV spring-run Chinook salmon and CCV steelhead will be present in the Action Area. Once construction has begun, individual fish are likely to detect the sounds and avoid the immediate area. Therefore, fish are not expected to be exposed to sounds that may cause physical injury. Any fish disturbed by the limited aquatic noise generated by construction are expected to move away to suitable habitat. Therefore, the effects of increased noise will be minor and are unlikely to result in injury or death to juvenile CCV steelhead, or juvenile CV spring-run Chinook salmon, or adult CV spring-run Chinook salmon. Adult CCV steelhead are not expected to be present during activities that may increase turbidity, and thus impacts to this life stage of these species is considered improbable.

2.5.6 Potential Effects of Monitoring on Individuals

Evaluation of the changes of hydrology and geomorphology in the Action Area will be done predominately with digital elevation models and 2D hydraulic models. Collection of data for these models will require in-water wading by people to survey the area. Wading will most likely be done during low flow time of the year, in late summer. During this time there are expected to be few juvenile salmonids, and only adult CV spring-run Chinook salmon may be present. No salmonid eggs will be present in the gravel. Any juvenile salmonids and adult CV spring-run Chinook salmon that may be present would more to avoid the people wading in the river. Due to the time of year and the salmonid species and life stages that may be present, and the short time needed for surveying, no injuries or mortalities of CV spring-run Chinook salmon or CCV steelhead are expected due to the surveying. Any disturbance and change in behavior of CV spring-run Chinook salmon or CCV steelhead due to surveying is expected to be temporary and minor. Thus impacts from surveying are improbable.

Temperature monitoring is also part of the project. This will be done with temperature recorders place in the Yuba River. This will require wading to place temperature recorders and retrieve the data. The installation, presence, and retrieval of data in not expected to result in any injuries or mortalities of CV spring-run Chinook salmon or CCV steelhead are expected due to the temperature monitoring. Any disturbance and change in behavior of CV spring-run Chinook salmon or CCV steelhead due to temperature monitoring is expected to be temporary and minor. Thus impacts from temperature monitoring are improbable.

The post construction monitoring includes monitoring of changes in water quality near spawning habitat. This may include installation of devices to monitor in-gravel water temperatures and dissolved oxygen in the water in the spawning gravels. The placement of these sensors will likely result in take of CV spring-run Chinook salmon and CCV steelhead through changes in the behavior of adult fish preparing to spawn. The disturbance of spawning fish is expected to last only for a few minutes when the sensors are placed adjacent to redds. No injuries or mortalities are expected due to the placement of in-gravel sensors.

Monitoring of changes in the food supply for juvenile salmonids will require assessments of macroinvertebrates. This will be done pre-construction and post-construction by collecting samples of macroinvertebrates from the water column and from the substrate. Areas being used for spawning will be avoided. Juvenile salmonids may be displaced by the sampling activity. The sampling will be of short duration and no injuries or mortalities of salmonids are expected. Thus adverse impacts from food supply monitoring are improbable.

Monitoring for redds and snorkel surveys will be conducted to estimate habitat use and abundance of salmonids in the areas modified by the proposed project. Redd counts will be performed twice a month from September through December. Redd count will be done by walking along the bank and possibly in the river, if necessary. Care will be taken to avoid stepping on redds. Surveyors will wear polarized sunglasses to maximize redd observation. When a redd is identified, its location will be recorded and the average water column velocity upstream of the pot will be recorded. Redd surveys is likely to disturb some adult and juvenile CV spring-run Chinook salmon and adult and juvenile CCV steelhead. The disturbance is likely to be of a very short duration and the fish are expected to return to their previous locations quickly. The redd surveys are likely to result in take of CV spring-run Chinook salmon and CCV steelhead through short term modification of behavior. No injuries or mortalities of salmonids are expected.

Snorkel surveys will be used to observe and enumerate juvenile rearing salmonids within the project site. The location, depth, and water velocity in the location of rearing juvenile salmonids will be recorded. Snorkel surveys are expected to take a day each month, from February through May. Adult CV spring-run Chinook salmon and adult CCV steelhead may also be observed if they are within the project site. The snorkel surveys are likely to result in take of CV spring-run Chinook salmon and CCV steelhead through short term modification of behavior. No injuries or mortalities of salmonids are expected.

To monitor juvenile salmonid use of edge habitats may require sampling with a beach seine. Up to four locations within each habitat type (main channel, side channel, backwater) would be seined, with up to three seines per location. The seine will have 1/8 inch mesh and be 10 to 40 feet long, depending on location. Captured fish will be held in cool oxygenated water. They will be anesthetized prior to any handling. Captured juvenile Chinook salmon and CCV steelhead will be weighted and measured, then placed in an aerated recovery bucket. Upon recovery fish will be released within the area from which they were captured. Captured salmonids may

experience minor abrasions and short term effects from handling. If a fish mortality occurs during seining, the seining operation will cease and NMFS and CDFW will be contacted. Seining will only resume with approval of NMFS and CDFW. The capture of juvenile CV spring-run Chinook salmon and adult CCV steelhead is considered take. Additionally, take may occur through injury and mortalities.

2.5.7 Effects to Critical Habitat

The proposed project is expected to have direct short- and long-term effects on the designated critical habitat of CCV steelhead, and CV spring-run Chinook salmon. The PBFs of critical habitat features for CV spring-run Chinook salmon and CCV steelhead within the Action Area include freshwater rearing, migration, and spawning. The impacts that could occur and affect PBFs of salmon, and steelhead are water quality impacts, including temporary increases to turbidity and suspended sediment and release of contaminants. These impacts are expected to be localized, minor, short term. The applicant will also utilize best management practices, including the implementation of a SWPPP and associated Spill Prevention and Response Plan. The applicant will use vegetable oil as a lubricant for construction machinery, and locate the equipment staging area in an upland area well away from the Yuba River. A contaminant spill is not likely and if one does occur then it will be cleaned up and remediated rapidly such that its effects are expected to be localized, minor, and short term.

The creation and enhancement of high quality juvenile salmonid rearing habitat and adult salmonid spawning habitat are the primary goals of the project and it is expected to have measureable benefits to the PBFs of freshwater rearing for salmonids. The suitability of aquatic habitat for juvenile salmonids and other fishes depends on the presence of nearshore areas with shallow water, instream woody material, and aquatic and riparian vegetation. These attributes provide juvenile salmonids and other fishes with valuable feeding and resting habitat, concealment from predators, and refuge during high flows (Jeffres et al. 2008, McCormick and Harrison 2011). Creation of floodplains, side channels, and other off-channel areas that increase habitat complexity and inundate more frequently will function as high quality juvenile salmonid rearing habitat.

The instream construction is expected to have short term effects on the critical habitat salmonid PBFs of freshwater rearing habitat through construction disturbance and modification as well as the removal of some riparian trees and shrubs. However, the removal of riparian trees and shrubs will be localized and short term. To the maximum extent practicable, existing riparian habitat will be retained and disturbance will be minimized. Following construction, all disturbed or exposed soils will be stabilized and/or planted with native woody and herbaceous vegetation to control erosion and offset any unavoidable losses of vegetation. Non-native plant species will be replaced with native riparian plants. Some short term losses of mature riparian vegetation may occur during construction however, plantings and natural riparian vegetation recruitment will establish and mature following construction thereby resulting in an increase in the amount and extent of riparian habitat within the site. This increase in riparian habitat is expected to provide increased rearing habitat, complexity, and cover for CV spring-run Chinook salmon, CCV steelhead, and other native fishes in the Action Area.

Large woody material may be placed in strategic locations to provide a variety of geomorphic functions including scour protection and enhancement, sediment deposition and sorting, as well as habitat functions including structural coverage and velocity refuge for juvenile salmonids. Large woody material added as part of the proposed project will increase instream habitat diversity and complexity within the site.

The proposed project is expected to have little to no adverse effect on the salmonid critical habitat PBFs of spawning habitat. Construction of side channel habitat and floodplain enhancement may require the removal of small amounts of riparian vegetation in the Action Area which has the potential to have direct or indirect adverse effects on spawning habitat. It has been suggested by Dosskey et al. (2010) that the presence and abundance of riparian vegetation can be directly correlated with water quality in riverine systems through biogeochemical cycling, soil and channel chemistry, water movement and erosion. Riparian vegetation also plays a role in maintaining adequate temperature for incubating eggs by shading. Removal of riparian vegetation has the potential to directly and indirectly adversely affect spawning habitat in the Action Area. However, affects to riparian vegetation will be minor and short term, as riparian vegetation will be avoided to the maximum extent possible during construction, and replanted after completion of the project.

The proposed project is also expected to have a positive effect on the salmonid critical habitat PBFs of freshwater migration corridors, as the proposed project has been designed to avoid creating a fish stranding risk. Furthermore, there will be sufficient flow in the main channel of the Yuba River all year to allow for migration of salmonids and other native fishes.

With the above minimization and mitigation measures in place, adverse impacts to the critical habitat of CCV steelhead, and CV spring-run Chinook salmon, are expected to be localized, minor, and short term.

2.6 Cumulative Effects

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

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

Few future non-Federal actions that may affect the Action Area are expected to occur. Non-Federal actions that may affect the Action Area include changes in upstream hydropower operations, angling and State angling regulation changes, agricultural practices, private water contracts, habitat restoration or maintenance, water withdrawals and diversions, and increased population growth resulting in urbanization and development of floodplain habitats.

Existing upstream hydropower operations are currently undergoing licensing through the Federal Energy Regulatory Commission. Any affects to fish species listed under the ESA due to changes in the operation of these projects is expected to undergo ESA consultation. California angling regulations have moved toward restrictions on recreational sport fishing to protect listed fish species but incidental hooking of Chinook salmon, hook and release mortality of steelhead, and disturbance of redds by wading anglers may continue to cause a threat. Habitat restoration and maintenance projects may have short-term negative effects associated with in-stream construction activities, but these effects are temporary and localized with listed species and habitats expected to benefit long term. Prolonged periods of elevated water turbidity levels may result from agricultural practices, and increased urbanization and/or development of riparian habitat, and could adversely affect the ability of juvenile salmonids to feed effectively, resulting in reduced growth and survival. Turbidity may cause injury or mortality to juvenile CV spring run Chinook salmon, and CCV steelhead in the vicinity and downstream of the project area. High turbidity levels can cause fish mortality, reduce feeding efficiency, and decrease food availability (Berg and Northcote 1985). Upstream water withdrawals and diversions may result in may result in depleted river flows that are necessary for migration, spawning, rearing, sediment flushing from spawning gravels, gravel recruitment, and transport of large woody debris. Future urban and/or rural residential development may adversely affect water quality, riparian function, and aquatic productivity. Most of these actions would require Federal permits, and would undergo individual or programmatic Section 7 consultation. No known specific and reasonably certain future state or private activities are expected to occur within the Action Area, other than those ongoing activities already discussed in the existing conditions.

2.7 Integration and Synthesis

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

CCV steelhead, and CV spring-run Chinook salmon have experienced significant declines in abundance and available habitat in the California Central Valley relative to historical conditions. The status of the species and critical habitat and environmental baseline sections (2.2 and 2.4) detail the current range-wide status of these ESUs and also the current baseline conditions found in the Yuba River, where the proposed project is to occur. Sections 2.2.3 and 2.4.5 discusses the vulnerability of listed species and critical habitat to climate change projections in the California Central Valley and specifically in the Yuba. In light of the predicted impacts of global warming, it has been hypothesized that summer temperatures and flow levels will become unsuitable for salmonid survival in many parts of the Central Valley. However, because of specific physical and hydrologic factors (discussed in section 2.4.5) the lower Yuba River is expected to continue to provide the most suitable water temperature conditions for anadromous salmonids of all Central Valley floor rivers, even if there are long-term climate changes (YCWA 2010a).

Cumulative effects that may affect the Action Area include hydropower operations, angling and State angling regulation changes, agricultural practices, private water contracts, habitat restoration or maintenance, water withdrawals and diversions, adjacent mining activities, and increased population growth resulting in urbanization and development of floodplain habitats. The proposed project contains restoration actions that are consistent with the NMFS recovery plan for CV spring-run Chinook salmon and CCV steelhead, and are intended to aid in their long-term recovery and survival.

2.7.1 Effects of the Proposed Project to Listed Species

The proposed project has the potential to affect various life stages of CCV steelhead, and CV spring-run Chinook salmon. However, the only life stages that are expected to be present in the Action Area during construction are juvenile CCV steelhead, juvenile CV spring-run Chinook salmon, and adult CV spring-run Chinook salmon. Juveniles of these species may be captured, injured, or killed during construction and monitoring. Construction of side channel habitat and floodplain modification are likely to result in sediment and turbidity pulse events which may result in adverse effects to juvenile salmonids due to increased activity, gill fouling and reduced foraging capability. Best management practices, minimization and avoidance measures implemented during implementation of the proposed project will minimize direct impacts to ESA listed fish in the Yuba River.

2.7.2 Effects of the Proposed Project to Critical Habitat

Critical habitat has been designated for CCV steelhead, CV spring-run Chinook salmon. PBFs contained within the Action Area are for salmonids are: 1) freshwater spawning habitat 2) freshwater rearing habitat and 3) a migration corridor. Spawning and rearing habitat PBFs have the potential to be adversely affected by sedimentation and loss of riparian vegetation through a variety of physical and biological mechanisms. The migration corridor PBF also has the potential to be temporarily adversely effected in the course of the proposed construction operations. However, the beneficial effects to critical habitat PBFs far outweigh the adverse effects. The results of the proposed project will ultimately enhance all three PBFs contained in the Action Area for salmonids.

Construction-related effects may also occur as a result of equipment operation in riparian habitats, and habitat will be impacted by the temporary removal of riparian vegetation.

2.7.3 Survival and Recovery

The CV spring-run Chinook salmon ESU is currently limited to independent populations in Mill, Deer, and Butte creeks, with the Yuba River and others serving as dependent populations. This ESU continues to be threatened by habitat loss, degradation and modification, small hydropower dams and water diversions that reduce or eliminate instream flows during migration, unscreened or inadequately screened water diversions, excessively high water temperatures, and predation by non-native species. In the lower Yuba River, CV spring-run Chinook salmon spawning may occur a few weeks earlier than fall-run Chinook salmon spawning, but currently there is no physical separation between the two Chinook salmon runs because of the disruption of spatial segregation by Englebright Dam. Thus, spring-run and fall-run Chinook salmon spawning overlap temporally and spatially (NMFS 2014). Restoration goals outlined in the proposed project are consistent with specific recommended recovery actions for the Yuba River outlined in the NMFS Recovery Plan for CV spring-run Chinook salmon. These include increasing floodplain habitat, improving the quality of side channel habitat, and increasing instream cover (NMFS 2014). Implementation of the proposed project is expected to benefit these fish and their critical habitat by improving growth, survival, and production, ultimately aiding in the range-wide recovery of these ESUs.

Existing wild steelhead populations in the Sacramento River basin occur in the upper Sacramento River and its tributaries, which includes the Yuba River. The NMFS Recovery Plan for CCV steelhead lists the Yuba River steelhead as an independent population with and uncertain population extinction risk. Englebright Dam is currently impassable to steelhead, and thus represents the upstream extend of their range in the Yuba River. Restoration goals outlined in the proposed project are consistent with specific recommended recovery actions for the Yuba River outlined in the NMFS Recovery Plan for CCV steelhead. These include increasing floodplain habitat, improving the quality of side channel habitat, and increasing instream cover (NMFS 2014). Implementation of the proposed project is expected to aid in the range-wide recovery of this ESU.

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 project, any effects of interrelated and interdependent activities, and cumulative effects, it is NMFS’ BiOp that the proposed project is not likely to jeopardize the continued existence of CCV steelhead, or CV spring-run Chinook salmon, or destroy or adversely modify designated critical habitat of these species.

2.9 Incidental Take Statement

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

2.9.1 Amount or Extent of Take

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

NMFS anticipates incidental take of juvenile CCV steelhead, juvenile CV spring-run Chinook salmon and adult CV spring-run Chinook salmon to occur in the course of the Yuba River Canyon Salmon Habitat Restoration Project. Specifically, NMFS anticipates that juvenile CCV steelhead, juvenile CV spring-run Chinook salmon captured, injured, or killed as a result of project implementation associated with seining.

Take of CCV steelhead, and CV spring-run Chinook salmon may occur due to redd surveys, snorkel surveys, in-gravel water quality sampling, and seine sampling. Take is quantified in the table below.

Seine sampling may result in take through alteration of fish behavior, injury, or death.

Table 2. Take associated with seine sampling.

Species	Life Stage	Expected Capture	Injury	Mortality
CV spring-run Chinook salmon	Adult	10	0	0
CV spring-run Chinook salmon	Juvenile	500/year	50/year	2/year
CCV steelhead	Adult	0	0	0
CCV steelhead	Juvenile	500/year	50/year	2/year

2.9.2 Effect of the Take

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

2.9.3 Reasonable and Prudent Measures

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

1. The Measures shall be taken to minimize take associated with project monitoring.
2. USFWS shall prepare and provide NMFS with a yearly report detailing the exposure and take of listed fish species associated with the project.

2.9.4 Terms and Conditions

The terms and conditions described below are non-discretionary, and the [*Action Agency*] or any applicant must comply with them in order to implement the RPMs (50 CFR 402.14). The [*name Federal agency*] 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 project would likely lapse.

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

    a. All monitoring shall be supervised by a qualified fish biologist.

    b. All handling of fish shall be supervised by an on-site qualified fish biologist.

    c. All mortalities of CV spring-run Chinook salmon and CCV steelhead (*any O. mykiss*) shall be reported to NMFS within one weekday.

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

    a. The USFWS shall submit to NMFS an annual report describing the exposure of ESA listed anadromous fish species and incidental take resulting from the proposed project. This report shall be filed not later than January 31st, covering the instream construction window from the previous year. An annual report regarding the monitoring shall also be submitted to NMFS by March 1st, covering the fish monitoring activities for the previous calendar year. These reports should be submitted to the following address:

        Maria Rea
        California Central Valley Area Office
        National Marine Fisheries Service
        650 Capitol Mall, Suite 5-100
        Sacramento CA 95814
        Phone: (916) 930-3600
        FAX: (916) 930-3629

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) USFWS should provide a NMFS-approved Worker Environmental Awareness Training Program for construction personnel to be conducted by a NMFS-approved biologist for all construction workers prior to the commencement of construction activities. The program shall provide workers with information on their responsibilities with regard to federally-listed fish, their critical habitat, an overview of the life-history of all the species, information on take prohibitions, protections under the ESA, and an explanation of terms and conditions identified in this BiOp. Written documentation of the training must be submitted to NMFS.

(2) A report should be submitted to NMFS within 30 days of the completion of training. Completion of this training is consistent with agency requirements set forth in section 7(a)(1).

(3) USFWS should continue to work cooperatively with other State and Federal agencies, private landowners, governments, and local watershed groups to identify opportunities for cooperative analysis and funding to support salmonid and sturgeon habitat restoration projects in the Yuba River. Implementation of future restoration projects is consistent with agency requirements set forth in section 7(a)(1).

2.11 Reinitiation of Consultation

This concludes formal consultation for Yuba River Canyon Salmon Habitat Restoration Project.

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

2.12 "Not Likely to Adversely Affect" Determinations

NMFS has determined that the proposed project is not likely to adversely affect critical habitat designated for CCV steelhead, or for CV spring-run Chinook salmon. Details regarding the potential for direct or indirect adverse effects to these species and/or their critical habitats are included in Section 2.5.

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

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

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

3.1 Essential Fish Habitat Affected by the Project

EFH designated under the Pacific Coast Salmon Fisheries Management Plan (FMP) may be affected by the proposed project. EFH is designated under the FMP within the Action Area for all runs of Chinook salmon. Habitat Areas of Particular Concern (HAPCs) that may be either directly or indirectly adversely affected include **(1)** complex channels and floodplain habitats, **(2)** thermal refugia and **(3)** spawning habitat.

3.2 Adverse Effects on Essential Fish Habitat

Effects to the HAPCs listed in section 3.1 above are discussed in context of effects to critical habitat PCEs as designated under the ESA in section 2.5. Effects to ESA-listed critical habitat and EFH HAPCs are appreciably similar, therefore no additional discussion is included.

3.3 Essential Fish Habitat Conservation Recommendations

The following are EFH conservation recommendations for the proposed project:

(1) USFWS should provide a NMFS-approved Worker Environmental Awareness Training Program for construction personnel to be conducted by a NMFS-approved biologist for all construction workers prior to the commencement of construction activities. The program shall provide workers with information on their responsibilities with regard to federally-listed fish, their critical habitat, an overview of the life-history of all the species, information on take prohibitions, protections under the ESA, and an explanation of terms and conditions identified in this BiOp. Written documentation of the training

should be submitted to NMFS within 30 days of the completion of training. HAPCs that would benefit from implementation of this training include (1) complex channels and floodplain habitats, (2) thermal refugia and (3) spawning habitat.

Fully implementing this EFH conservation recommendation would protect, by avoiding or minimizing the adverse effects described in section 3.2, designated EFH for Pacific Coast salmon.

3.4 Statutory Response Requirement

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

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

3.5 Supplemental Consultation

The USFWS 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. FISH AND WILDLIFE COORDINATION ACT

The purpose of the FWCA is to ensure that wildlife conservation receives equal consideration, and is coordinated with other aspects of water resources development (16 USC 661). The FWCA establishes a consultation requirement for Federal agencies that undertake any action to modify any stream or other body of water for any purpose, including navigation and drainage (16 USC 662(a)), regarding the impacts of their actions on fish and wildlife, and measures to mitigate those impacts. Consistent with this consultation requirement, NMFS provides recommendations and comments to Federal action agencies for the purpose of conserving fish and wildlife resources, and providing equal consideration for these resources. NMFS' recommendations are provided to conserve wildlife resources by preventing loss of and damage to such resources. The FWCA allows the opportunity to provide recommendations for the conservation of all species and habitats within NMFS' authority, not just those currently managed under the ESA and MSA.

The following recommendation applies to the proposed project:

> The USFWS should consider providing information from the project, including from the monitoring on a USFWS Internet webpage. This will better inform the public about habitat improvement projects and the benefits of improving degraded fish habitat.

The action agency must give these recommendations equal consideration with the other aspects of the proposed project so as to meet the purpose of the FWCA.

This concludes the FWCA portion of this consultation.

5. DATA QUALITY ACT DOCUMENTATION ANDPRE-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 BiOp addresses these DQA components, documents compliance with the DQA, and certifies that this BiOp has undergone pre-dissemination review.

5.1 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 BiOp is the USFWS. Other interested users could include the California Department of Fish and Wildlife, and the Army Corps of Engineers. Individual copies of this BiOp were provided to the USFWS. This BiOp will be posted on the Public Consultation Tracking System website. The format and naming adheres to conventional standards for style.

5.2 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.

5.3 Objectivity

Information Product Category: Natural Resource Plan

Standards: This consultation and supporting documents are clear, concise, complete, and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including the NMFS ESA Consultation Handbook, ESA regulations, 50 CFR 402.01 et seq., and the MSA implementing regulations regarding EFH, 50 CFR 600.
Best Available Information: This consultation and supporting documents use the best available information, as referenced in the References section. The analyses in this biological BiOp 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.

6. REFERENCES

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