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

Refer to NMFS ECO#: WCRO-2019-01904

February 19, 2020

Laura Shivel
Senior Project Manager - California North Section
U.S. Army Corps of Engineers, Sacramento District
Department of the Army
1325 J Street
Sacramento, California 95814-2922

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 Red Bluff Riverfront Park Boat Facilities Project (SPK-2019-00387)

Dear Ms. Shively:

Thank you for your letter of June 27, 2019, 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 Red Bluff Riverfront Park Boat Facilities Project (SPK-2019-00387). This consultation was conducted in accordance with the 2019 revised regulations that implement section 7 of the ESA (50 CFR 402, 84 FR 45016).

Thank you, also, for your request for consultation pursuant to the essential fish habitat (EFH) provisions in Section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA)(16 U.S.C. 1855(b)) for this action. NMFS concluded that the action would adversely affect the EFH of Pacific Coast Salmon. Therefore, we have included the results of that review in Section 3 of this document.

Based on the best available scientific and commercial information, the biological opinion concludes that the Red Bluff Riverfront Park Boat Facilities Project (SPK-2019-00387) is not likely to jeopardize the continued existence of the federally listed endangered Sacramento River winter-run Chinook salmon evolutionarily significant unit (ESU) (*Oncorhynchus tshawytscha*), the threatened Central Valley spring-run Chinook salmon ESU (*O. tshawytscha*), the threatened California Central Valley steelhead distinct population segment (DPS) (*O. mykiss*), or the threatened southern DPS of North American green sturgeon (*Acipenser medirostris*), and is not likely to destroy or adversely modify their designated critical habitats. For the above species, NMFS has included an incidental take statement with reasonable and prudent measures and non-

discretionary terms and conditions that are necessary and appropriate to avoid, minimize, or monitor incidental take of listed species associated with the project.

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.).

As described in the terms and conditions section of the attached biological opinion, the U.S. Army Corps of Engineers (USACE) will provide NMFS with an annual report by June 1st following the construction season describing any incidental take that occurred as a result of this project. Additionally, USACE will provide notification that the applicant provided the construction crew with the attached biological opinion outlining their requirements and obligations under this opinion. NMFS further requests that USACE provide us with a notice of implementation of any of the conservation recommendations provided.

Please contact Neal McIntosh at the NMFS California Central Valley Office at (916) 930-5647 or via email at neal.mcintosh@noaa.gov, if you have any questions concerning this consultation, or if you require additional information.

Sincerely,

Maria Rea

Maria Rea
Assistant Regional Administrator
California Central Valley Office

Enclosure

cc: File: 151422-WCR2019-SA00531
Mr. Matthew Roberts, USACE Project Manager, matthew.j.roberts@usace.army.mil

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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

Red Bluff Riverfront Park Boat Facilities Project (SPK-2019-00387)

National Marine Fisheries Service Consultation Number: WCR-2019-01904

Action Agency: United States Army Corps of Engineers

Affected Species and NMFS' Determinations:

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

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

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

Issued By:

Maria Rea
Assistant Regional Administrator

Date: *February 19, 2020*

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LIST OF ACRONYMS AND ABBREVIATIONS

ACID – Anderson–Cottonwood Irrigation District
ADA – American Disabilities Act
BA – biological assessment
BMPs – best management practices
°C – degrees Celsius
CCV – California Central Valley
CCVO – California Central Valley Office
CDFG – California Department of Fish and Game
CDFW – California Department of Fish and Wildlife
CFR – Code of Federal Register
cfs – cubic feet per second
CV – Central Valley
CVP – Central Valley Project
CWA – Clean Water Act
DO – dissolved oxygen
DPS – distinct population segment
DQA – Data Quality Act
DWR – California Department of Water Resources
EFH – essential fish habitat
EPA – Environmental Protection Agency
ESA – Endangered Species Act
ESU – evolutionarily significant unit
°F – degrees Fahrenheit
FMP – Fishery Management Plan
FR – Federal Register
FWCA – Fish and Wildlife Coordination Act
GCID – Glenn–Colusa Irrigation District
HAPC – habitat area of particular concern
hr – hour
ITS – incidental take statement
IWM – instream woody material
kg – kilogram
l – liter
LSNFH – Livingston Stone National Fish Hatchery
LWM – large woody material
m – meter
mg – milligram
MSA – Magnuson-Stevens Fishery Conservation and Management Act
NMFS – National Marine Fisheries Service
NPCC – Northwest Power and Conservation Council
NOAA – National Oceanic and Atmospheric Administration
NTU – nephelometric turbidity units
O_2 – oxygen
OHWM – ordinary high water mark
opinion – biological opinion

PAH – polycyclic aromatic hydrocarbon
PBF – physical or biological feature
PCB – polychlorinated biphenyls
PCE – primary constituent element
ppt – parts per thousand
PVA – population viability analysis
RBDD – Red Bluff Diversion Dam
Reclamation – United States Bureau of Reclamation
RM – river mile
RPMs – reasonable and prudent measures
RSP – rock slope protection
SRCAF – Sacramento River Conservation Area Forum
SWRCB – State Water Resource Control Board
SWE – snow water equivalent
SWP – State Water Project
TCD – temperature control device
TCP – temperature compliance point
USACE – United States Army Corps of Engineers
USC – United States Code
USGS – United States Geological Survey
USFWS – United States Fish and Wildlife Service
VSP – viable salmonid population
WRO – Water Rights Order

1. INTRODUCTION

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

1.1. Background

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

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 USC 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 (FWCA) (16 USC 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 within two weeks at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. A complete record of this consultation is on file at the NMFS California Central Valley Office (CCVO).

1.2. Consultation History

- On July 1, 2019, NMFS' CCVO received a consultation initiation request and biological assessment (BA) from the U.S. Army Corps of Engineers (USACE) for the Red Bluff Riverfront Park Boat Facilities Project.
- On July 22, 2019, NMFS requested more information on this project.
- On August 26, 2019, NMFS received more information from USACE.
- On October 4, 2019, NMFS project biologist, Neal McIntosh, and USACE project manager, Matthew Roberts, discussed various aspects of this project including requirements of the California Department of Fish and Wildlife (CDFW) for their consistency determination and clarification on the previous phases of work at the project location which are not part of this project.
- On October 4, 2019, NMFS received additional project information including design drawings. On this date, NMFS initiated consultation.

1.3. Proposed Federal Action

Under ESA, "Action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies (50 CFR 402.02).

For EFH consultation, 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)).

The USACE proposes to issue a permit (SPK-2019-00387) for the City of Red Bluff to expand improvements to the Riverfront Park Boat Launch Facility by constructing a new boat ramp on the gravel bar northeast of the existing boat ramp. The proposed project is located along the Sacramento River, in Red Bluff, Tehama County, California. The proposed project will provide safer and more reliable river access as boaters are currently using the gravel bar exposed by the retreat of Lake Red Bluff for boat deployment and parking which poses a risk to public safety and adversely affects water quality. The proposed boat ramp will be a two-lane "V"-groove, reinforced concrete ramp, approximately 112.5 feet long with a 14 percent slope, and two 15-foot wide lanes with an 8-foot wide boarding float and/or walkway to accommodate vessel boarding. Rock slope protection (RSP) will be placed abutting the ramp for bank stabilization. An American Disabilities Act (ADA) compliant parking space and walkway to the boat ramp will be installed in waters of the United States. The work will be conducted in the winter months, and the entire project is expected to take 120 days or less to complete. Construction of the in-channel components of the proposed project is anticipated to take 75 days or less to complete. Construction of in-water components will take 30 days or less to complete. For the purposes of their BA, USACE defined "in-channel" as work occurring below the ordinary high water mark (OHWM) and "in-water" as occurring in the wetted part of the river.

We considered whether or not the proposed action would cause any other activities and determined that it would not. However, this project is phase two of improvements at Red Bluff Riverfront Park. The previous, smaller project involved putting a concrete pad and ramp onto the gravel bar. NMFS issued the USACE a letter of concurrence (NMFS 2014a) for the USACE's issuance to the City of Redding of a permit (SPK-2012-00283) for phase one of the project.

1.3.1. Project Location

The proposed project is located along the Sacramento River, in Red Bluff, Tehama County, California. The project site was formerly part of Lake Red Bluff which was permanently dewatered in 2010 as a result of the permanent opening of the downstream Red Bluff Diversion Dam (RBDD). The project site is an urban city park fronting the Sacramento River, surrounded by urban land uses, primarily commercial and retail on the project side of the river and residential on the opposite side. The project site comprises urban parkland, riparian, and riverine habitat. Fresh emergent wetland-riparian habitat lines a steep embankment along the former

shore of now-dewatered Lake Red Bluff. Most of the proposed project facilities will be constructed on a largely unvegetated gravel bar adjacent to the Sacramento River near river mile (RM) 244.9.

1.3.2. Project Description

The proposed boat ramp will be a two-lane "V"-groove, reinforced concrete ramp, approximately 112.5 feet long with a 14 percent slope, and two 15-foot wide lanes with an 8-foot wide boarding float and/or walkway to accommodate vessel boarding. An ADA compliant parking space and walkway to the boat ramp will be installed in waters of the United States. The existing 66,000 square foot parking lot will provide a combination of 75 accessible parking, single-car parking, and vehicle/trailer parking or 130 single-vehicle parking spaces.

A new two-lane paved access road approximately 240 feet long will be constructed through Red Bluff Riverfront Park, connecting to the proposed new boat maneuvering area located next to the Sacramento River. The existing restrooms will be replaced with new restrooms that meet current accessibility requirements. A picnic pavilion and two picnic sites will be constructed in the park portion of the project area. An existing former lakeside pedestrian path will be relocated closer to the river's edge, providing a required ADA-compliant path of travel between the parking lot, restrooms, and picnic pavilion. The relocated path will also provide a required ADA-compliant path of travel between the proposed motorized vessel ramp and the non-motorized vessel ramp.

The areal extent of the proposed facilities, once fully constructed, will be approximately 120,000 square feet (2.75 acres), including parking lot, restrooms, gazebo, picnic sites, trails, access road, maneuvering area, boat ramp, and RSP. Materials imported and placed in the floodplain will cover 28,735 square feet (0.66 acres) and total approximately 1,319 cubic yards of material.

The project will likely require the use of a bulldozer, a front-end loader/backhoe, and a roller-compactor. The bulldozer and roller-compactor will be used for the grading of the approach road and maneuver area. The front-end loader/backhoe will be used for the in-water construction of the boat ramp. No dewatering or cofferdam construction will be necessary to complete the project. Best management practices (BMPs) to control soil erosion and stormwater run-off will be employed (e.g. star waddles, silt fences, etc.). Silt curtains for in-water work will be used to minimize downstream migration of suspended sediment. In-water construction will occur during low flows and will be suspended during major storm events. In the event that importing gravel is necessary, only clean washed gravel will be used.

The work will be conducted in the winter months, and the entire project is expected to take 120 days or less to complete. Construction of the in-channel components of the proposed project is anticipated to take 75 days or less to complete. Construction of in-water components will take 30 days or less to complete. In the event of winter storms and runoff from unregulated tributaries, construction will be suspended until flows subside. If construction is interrupted by high water flows, it will continue in the spring as soon as site conditions allow for construction (i.e. the gravel bar is not inundated with river water). The proposed in-water work window is November 1 through February 15 but may alter depending on flows. RSP will be placed abutting the ramp for bank stabilization.

To compensate for impacts to listed fish species resulting from the proposed action, off-site mitigation credits for listed salmonids have been purchased from a NMFS-approved mitigation bank. Credits were purchased at a 1:1 ratio for impacts to floodplain and riparian habitat impacts (0.66 acres); permanent impacts include placement of RSP, the boat ramp, vehicle access to the ramp, and the ADA parking area. NMFS-approved mitigation banks with service areas that include the proposed action area are the Fremont Landing Conservation Bank and the Bullock Bend Mitigation Bank. The applicant chose to purchase credits at Bullock Bend Mitigation Bank.

1.3.3. Avoidance and Minimization Measures

BMPs will be used during project construction, including the installation of silt fencing between the work area and the water's edge to prevent sediment from entering the river. Site grading will be accomplished by using an excavator to pull material back from the riverbank to prevent fall back into the river.

1.3.3.1. Protection of Water Quality

- No equipment will enter the river; a backhoe or small excavator will be used from the riverbank during construction of the boat ramp facilities.
- Silt curtains for in-water work will be used to minimize the downstream migration of suspended sediments.
- In-water construction will occur during low winter flows and suspended during major storm events.
- In the event that the need to import gravel is necessary, only clean washed gravel will be used.
- Type D erosion control measures (i.e. hydroseeding) will be implemented during construction of the proposed project in non-riparian upland areas.
- Erosion control work will consist of one application of erosion control materials to embankment slopes, excavation slopes, and other areas within non-riparian uplands designated by the project engineer. These materials will consist of fiber rolls, seed, commercial fertilizer, and water.
- Activities that increase the erosion potential in the project area will be restricted to the relatively dry periods to the maximum extent practicable to minimize the potential for rainfall events to transport sediment to the Sacramento River and other surface water features. If these activities take place during the late fall, winter, or early spring, then temporary erosion and sediment control structures must be in place and operational at the end of each construction day and maintained until permanent erosion control structures are in place.

- Areas where wetland and upland vegetation needs to be removed shall be identified in advance of ground disturbance and limited to only those areas that have been approved by the City.

- Within 10 days of completion of construction, weed-free mulch will be applied to disturbed areas in order to reduce the potential for short-term erosion. Prior to a rain event or when there is a greater than 50 percent possibility of rain forecasted by the National Weather Service during the next 24 hours, weed-free mulch will be applied to all exposed areas upon completion of the day's activities. Soils will not be left exposed during the rainy season.

- Filter fences and catch basins will be placed below all construction activities at the edge of the Sacramento River and other surface water features to intercept sediment before it reaches the waterway. These BMPs will be implemented prior to any clearing or grading activities.

- Spoil sites will be located such that they do not drain directly into a surface water feature, if possible. If a spoil site drains into a surface water feature, catch basins will be constructed to intercept sediment before it reaches the feature. Spoil sites will be graded and vegetated to reduce the potential for erosion.

- Sediment control measures will be in place prior to the onset of the rainy season and will be monitored and maintained in good working condition until disturbed areas have been revegetated.

- The project will include a low-profile RSP border around the approach road, parking area, turn-around area, and boat ramp. The border will be high enough to define the permissible area for driving without affecting hydrology inundating flows.

- The City will adopt an ordinance banning parking in the vicinity of City-owned boat parks except in designated parking spots.

- The project will include placing appropriate signage informing visitors of the ban on parking outside of designated areas and designating the two in-channel parking spots as a disabled parking authorized parking zone.

1.3.3.2 Minimization of Impacts to Anadromous Fish Species

- Project construction will be scheduled when river flow regimes are most predictable, after spring snowmelt and spring storm discharges have declined and prior to the onset of winter storms, to minimize potential impacts to fish and riparian habitat.

- The access route to the boat ramp will be designed so that it does not pool water upstream of the road and risk potential stranding of juvenile salmonids.

- Mitigation for impacts to riparian habitat will be implemented so as to enhance anadromous fish habitat.

- Credits have been purchased from Bullock Bend mitigation bank to mitigate for impacts to anadromous fish species.

1.3.3.3 Minimization of Impacts to Riparian Habitat

- Any established trees removed for construction will be replaced at a 3:1 ratio.
- Construction fencing will be erected along the outer edges of the construction zone where needed to prevent accidental entry into riparian habitat.
- Mature native trees located near construction areas will be flagged and avoided during construction.
- Impacts to herbaceous cover will be offset by reseeding any unvegetated and impacted areas with a suitable seed mixture post-construction.
- Credits have been purchased from Bullock Bend mitigation bank at a 1:1 ratio to mitigate for impacts to riparian habitat.

1.3.3.4 Minimization of Impacts to Jurisdictional Wetlands and Waters

- Credits have been purchased from Bullock Bend mitigation bank to mitigate for impacts to jurisdictional wetlands and waters.
- Riverine habitat shall be enhanced by adding gravel to the downstream portion of the gravel bar.

A total of 0.66 acres of credits have been purchased from Bullock Bend mitigation bank for this project. NMFS-approved mitigation banks with service areas that include the proposed action area are the Fremont Landing Conservation Bank and the Bullock Bend Mitigation Bank.

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 provide an opinion stating how the agency's actions would affect listed species and their critical habitats. If incidental take is reasonably certain to occur, section 7(b)(4) requires NMFS to provide an ITS that specifies the impact of any incidental taking and includes non-discretionary reasonable and prudent measures (RPMs) and terms and conditions to minimize such impacts.

2.1. Analytical Approach

This biological opinion includes both a jeopardy analysis and an adverse modification analysis. The jeopardy analysis relies upon the regulatory definition of "jeopardize the continued existence of" a listed species, which is "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species.

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

The designations of critical habitat for some of the listed species analyzed in this opinion use the term primary constituent element (PCE) or essential features. The 2016 critical habitat regulations (50 CFR 424.12) 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 biological opinion, we use the term PBF to mean PCE or essential feature, as appropriate for the specific critical habitat.

The 2019 regulations define effects of the action using the term "consequences" (50 CFR 402.02). As explained in the preamble to the regulations (84 FR 44977), that definition does not change the scope of our analysis and in this opinion we use the terms "effects" and "consequences" interchangeably.

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

- Evaluate the rangewide status of the species and critical habitat expected to be adversely affected by the proposed action.

- Evaluate the environmental baseline of the species and critical habitat.

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

2.2. Rangewide Status of the Species and Critical Habitat

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

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

Species	Listing Classification and Federal Register Notice	Status Summary
Sacramento River winter-run Chinook salmon evolutionarily significant unit (ESU)	Endangered, 70 FR 37160; June 28, 2005	According to the NMFS 5-year species status review (NMFS 2016c), the status of the winter-run Chinook salmon ESU, the extinction risk has increased from moderate risk to high risk of extinction since the 2007 and 2010 assessments. Based on the Lindley et al. (2007) criteria, the population is at high extinction risk in 2019. High extinction risk for the population was triggered by the hatchery influence criterion, with a mean of 66 percent hatchery origin spawners from 2016 through 2018. Several listing factors have contributed to the recent decline, including drought, poor ocean conditions, and hatchery influence. Thus, large-scale fish passage and habitat restoration actions

Species	Listing Classification and Federal Register Notice	Status Summary
		are necessary for improving the winter-run Chinook salmon ESU viability.
Central Valley (CV) spring-run Chinook salmon ESU	Threatened, 70 FR 37160; June 28, 2005	According to the NMFS 5-year species status review (NMFS 2016b), the status of the CV spring-run Chinook salmon ESU, until 2015, has improved since the 2010 5-year species status review. The improved status is due to extensive restoration, and increases in spatial structure with historically extirpated populations (Battle and Clear Creeks) trending in the positive direction. Recent declines of many of the dependent populations, high pre-spawn and egg mortality during the 2012 to 2016 drought, uncertain juvenile survival during the drought are likely increasing the ESU's extinction risk. Monitoring data showed sharp declines in adult returns from 2014 through 2018 (CDFW 2018).
California Central Valley (CCV) steelhead distinct population segment (DPS)	Threatened, 71 FR 834; January 5, 2006	According to the NMFS 5-year species status review (NMFS 2016a), the status of CCV steelhead appears to have remained unchanged since the 2011 status review that concluded that the DPS was in danger of extinction. Most natural-origin CCV populations are very small, are not monitored, and may lack the resiliency to persist for protracted periods if subjected to additional stressors, particularly widespread stressors such as climate change. The genetic diversity of CCV steelhead has likely been impacted by low population sizes and high numbers of hatchery fish relative to natural-origin fish. The life-history diversity of the DPS is mostly unknown, as very few studies have been published on traits such as age structure, size at age, or growth rates in CCV steelhead.
Southern DPS (sDPS) of North American green sturgeon	Threatened, 71 FR 17757; April 7, 2006	According to the NMFS 5-year species status review (NMFS 2015) and the 2018 final recovery plan (NMFS 2018), some threats to the species have recently been eliminated, such as take from commercial fisheries and removal of some passage barriers. Also, several habitat restoration actions have occurred in the Sacramento River Basin, and spawning was documented on the Feather River. However, the species viability continues to face a moderate risk of extinction because many threats have not been addressed, and the majority of spawning occurs in a single reach of the main stem Sacramento

Species	Listing Classification and Federal Register Notice	Status Summary
		River. Current threats include poaching and habitat degradation. A recent method has been developed to estimate the annual spawning run and population size in the upper Sacramento River so species can be evaluated relative to recovery criteria (Mora et al. 2018).

Table 2. Description of critical habitat, listing, and status summary.

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

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

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

2.2.1 Global Climate Change

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

For winter-run Chinook salmon, the embryonic and larval life stages that are most vulnerable to warmer water temperatures occur during the summer, so this run is particularly at risk from climate warming. Spring-run Chinook salmon adults are vulnerable to climate change because they over-summer in freshwater streams before spawning in autumn (Thompson et al. 2011). Spring-run Chinook salmon spawn primarily in the tributaries to the Sacramento River, and those tributaries without cold water refugia (usually input from springs) will be more susceptible to impacts of climate change. Although steelhead will experience similar effects of climate change to Chinook salmon, as they are also blocked from the vast majority of their historic spawning and rearing habitat, the effects may be even greater in some cases, as juvenile steelhead need to rear in the stream for one to two summers prior to emigrating as smolts. In the Central Valley, summer and fall temperatures below the dams in many streams already exceed the recommended temperatures for optimal growth of juvenile steelhead, which range from 14°C to 19°C (57°F to 66°F). The Anderson Cottonwood Irrigation Dam (ACID) is considered the upriver extent of green sturgeon passage in the Sacramento River. The upriver extent of green sturgeon spawning, however, is approximately 30 kilometers downriver of ACID where water temperature is higher than ACID during late spring and summer. Thus, if water temperatures increase with climate change, temperatures adjacent to ACID may remain within tolerable levels for the embryonic and larval life stages of green sturgeon, but temperatures at spawning locations lower in the river may be more affected.

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

2.3. Action Area

"Action area" means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). The proposed project is located along the Sacramento River, in Red Bluff, Tehama County, California. The project is within the Red Bluff East United States Geological Survey (USGS) topographic quad and is located at approximately river mile 244.9.

Areas affected directly will be those in the immediate project footprint and immediately downstream. Indirect effects of the project are those effects that are caused by, or will result from, the proposed action and may occur later in time, but are still reasonably certain to occur (50 CFR 402.02). Indirect effects associated with the project are those related to noise, dust, and turbidity above ambient levels. The action area includes the adjacent riparian zone, 100 feet beyond the construction footprint in all directions on the river side of the project to account for indirect effects from noise and dust, and an additional approximately 200 feet downstream to capture turbidity impacts. The action area encompasses an area of approximately 4.88 acres.

Since the applicant has purchased mitigation credits from a mitigation bank for impacts of the proposed project, the action area also includes the area affected by the Bullock Bend Mitigation

Bank. Bullock Bend has a service area relevant to the project. The Bullock Bend Mitigation Bank is a 119.65-acre floodplain site along the Sacramento River near Kirkville, California.

2.4. Environmental Baseline

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

The Sacramento River originates near Mt. Shasta and flows south for 447 miles before reaching the Sacramento-San Joaquin River Delta and San Francisco Bay. Shasta Dam, which is located at RM 311 on the Sacramento River near Redding, California, was completed in 1945. It serves to control floodwaters and store surplus winter runoff for irrigation in the Sacramento and San Joaquin Valleys, maintain navigation flows, provide flows for the conservation of fish in the Sacramento River and water for municipal and industrial use, protect the Sacramento-San Joaquin Delta from intrusion of saline ocean water, and generate hydroelectric power. Keswick Dam (RM 302) was constructed nine miles downstream from Shasta Dam to create a 23,800 acre-foot afterbay for Shasta Lake and the Trinity River Division, which stabilizes uneven water releases from the powerplants. Below Keswick Dam, ACID Dam (RM 297) is seasonally in place to raise the water level for diversions into the ACID canal. The 59 mile reach of the Sacramento River between Keswick Dam and RBDD is commonly referred to as the upper Sacramento River.

Coarse sediment from the upper watershed is prevented from being transported downstream by Shasta and Keswick dams, resulting in an alluvial sediment deficit and reduction in fish habitat quality within the Upper Sacramento River reach (Wright and Schoellhamer 2004). In addition to the reduction of sediment supply, recruitment of large woody material to the river channel and floodplain has also declined due to a reduction in bank erosion and blockage of wood transport by Shasta Dam.

The combination of degraded physical habitat characteristics, fish passage barriers, and changes in hydrology resulting from dams and diversions since the mid-1800s has been associated with salmonid and green sturgeon declines within the Sacramento River watershed.

2.4.1. Hydrology

Flows in the Sacramento River in the 65 mile reach between Shasta Dam and RBDD are regulated by Shasta Dam and again, just downstream at Keswick Dam. Water stored in the reservoirs during the winter and spring is released in the summer and fall for municipal and industrial supply, irrigation, water quality, power generation, recreation, and fish and wildlife

purposes. Historically, the upper Sacramento River was highly responsive to periodic precipitation events and seasonal variation. Since completion of the dams, flows are now lower in the winter and spring and higher in the summer and fall. During July, August, and September, the mean monthly flows of the Sacramento River at Keswick since 1963 are nearly 400 percent higher than the mean monthly flows prior to 1943 (Department of Water Resources 1981, as cited in the Sacramento River Conservation Area Forum (SRCAF) handbook (2003). In this reach, flows are influenced by tributary inflow. Major west-side tributaries to the Sacramento River in this reach of the river include Clear and Cottonwood Creeks. Major east-side tributaries to the Sacramento River in this reach of the river include Battle, Bear, Churn, Cow, and Paynes Creeks.

2.4.2. Land Use

As reported by SRCAF (2003), the Keswick-RBDD reach has a variety of land uses, including urban, residential, industrial, and agricultural. Agriculture use makes up about 35 percent of the area and urban, residential, and industrial uses make up about 12 percent. Industrial land uses within this reach include lumber mills and gravel removal operations. Residential and commercial land uses in the cities of Redding, Anderson, and Red Bluff are common as well. In addition, this reach has the most recreational facilities on the Sacramento River (SRCAF 2003). Historically, the river between Redding and Anderson supported several gravel mining operations (SRCAF 2003).

2.4.3. Water Quality

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

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

2.4.4. Predation

Sacramento pikeminnow and striped bass congregate downstream of the dam and prey on juvenile salmon in the tailwaters. The Sacramento pikeminnow is a species native to the Sacramento River basin and has co-evolved with the anadromous salmonids in this system. However, rearing conditions in the Sacramento River today (*e.g.*, warm water, low-irregular flow, standing water, and water diversions) compared to its natural state and function decades

ago in the pre-dam era, are more conducive to warm water species such as Sacramento pikeminnow and striped bass than to native salmonids. Tucker et al. (1998) reported that predation during the summer months by Sacramento pikeminnow on juvenile salmonids increased to 66 percent of the total weight of stomach contents in the predatory pikeminnow.

2.4.5. Fisheries and Aquatic Habitat

The Upper Sacramento River between Keswick Dam (RM 302) and RBDD (RM 243) currently serves as the only spawning ground for winter-run Chinook salmon, and is an important migration corridor for adult and juvenile spring-run Chinook salmon and steelhead, particularly populations from Cottonwood Creek, Clear Creek, Cow Creek, and Battle Creek, as well as other smaller tributaries. Green sturgeon utilize the upper Sacramento River as a migratory corridor as well as for spawning and juvenile rearing.

Shasta and Keswick Dams have presented impassable barriers to anadromous fish since 1944(Billington et al. 2005). ACID Dam and RBDD presented partial barriers to salmonid migration until improvements were made in 2001 and 2012 (NMFS 2009, 2014a), respectively, although ACID Dam continues to present an impassable barrier to green sturgeon (NMFS 2009).

2.4.5.1. Sacramento River winter-run Chinook salmon

The distribution of Sacramento River winter-run Chinook salmon spawning and rearing is currently limited to the upper Sacramento River, with managed flows out of Shasta Dam. Keswick Dam re-regulates flows from Shasta Dam and mixes it with water diverted from the Trinity River through the Spring Creek tunnel to control water temperatures below ACID pursuant to actions in the NMFS opinion, to provide cold water throughout the summer, allowing for spawning, egg incubation, and rearing during the mid-summer period (NMFS 2009). Approximately, 299 miles of tributary spawning habitat in the upper Sacramento River above the dams is now inaccessible to winter-run Chinook salmon (NMFS 2014b). The proportion of the winter-run Chinook salmon spawning above ACID has increased since the ladder improvements in 2001 (CDFW 2014 unpublished aerial redd counts). Data on the temporal distribution of winter-run Chinook salmon upstream migration suggest that in wet years about 50 percent of the run has passed the RBDD by March, and in dry years, migration is typically earlier, with about 72 percent of the run having passed the RBDD by March (Poytress et al. 2014).

The upper Sacramento River contains the only remaining habitat that is currently used by spawning Sacramento River winter-run Chinook salmon. As reported by NMFS (2014a), historical winter-run Chinook salmon population estimates, were as high as over 230,000 adults in 1969, but declined to under 200 fish in the 1990s (Good et al. 2005). A rapid decline occurred from 1969 to 1979 after completion of the RBDD. Over the next 20 years, the population eventually reached a low point of only 186 adults in 1994. At that point, winter-run Chinook salmon were at a high risk of extinction, as defined by Lindley *et al*. (2007). However, several conservation actions, including a very successful conservation hatchery and captive broodstock program at Livingston Stone National Fish Hatchery (LSNFH), construction of a temperature control device (TCD) on Shasta Dam, maintaining the RBDD gates up for much of the year, and restrictions in ocean harvest, have likely prevented the extinction of natural-origin winter-run Chinook salmon. LSNFH, which is located at the base of Keswick Dam, annually supplements

the in-river production by releasing on average 180,000 winter-run Chinook salmon smolts into the upper Sacramento River. The LSNFH operates under strict guidelines for propagation that include genetic testing of each pair of adults and spawning no more than 10 percent of the hatchery returns. This program and the captive broodstock program (phased out in 2007) were instrumental in stabilizing the winter-run Chinook salmon population following very low returns in the 1990s.

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

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

2.4.5.2. CV spring-run Chinook Salmon

The upper mainstem of the Sacramento River serves as a primary upstream and downstream migratory corridor for CV spring-run Chinook salmon populations in Clear, Battle, and Cottonwood Creeks. Within the mainstem Sacramento River upstream of RBDD, the CV spring-run Chinook salmon population appears to have declined from a high of 25,000 in the 1970s to an average low of less than 800 counted at RBDD beginning in 1991. Significant hybridization with fall-run has made identification of a spring-run Chinook salmon population in the mainstem very difficult to determine, and there is speculation as to whether a true spring-run Chinook salmon population still exists below Keswick Dam within the mainstem of the Sacramento River. This shift may have been an artifact of the manner in which spring-run Chinook salmon were identified at RBDD. More recently, fewer spring-run Chinook salmon were counted at RBDD because an arbitrary date, September 1, was used to determine spring-run Chinook salmon, and, beginning in 2012, gates are open year-round (NMFS 2014b). The extent of non-hybridized spring-run Chinook salmon spawning in the Sacramento River mainstem is unknown. However, the physical habitat conditions below Keswick Dam are capable of supporting spring-run Chinook salmon, although in some years high water temperatures can result in substantial levels of egg mortality. Recent redd surveys (2001-2014) have observed an average of 41 salmon redds in September, from Keswick Dam downstream to the RBDD, ranging from zero to 105 redds (CDFG, unpublished data, 2015). This is typically when spring-run Chinook salmon spawn,

however, there is no peak that can be separated out from fall-run spawning, so these redds also could be early spawning fall-run. Additionally, even though habitat conditions may be suitable for spring-run Chinook salmon occupancy, spring-run Chinook salmon depend on spatial segregation and geographic isolation from fall-run Chinook salmon to maintain genetic diversity. With the onset of fall-run Chinook salmon spawning occurring at the same time and place as potential spring-run Chinook salmon spawning, it is likely to have caused extensive introgression between the populations (CDFW 1998).

2.4.5.3. CCV steelhead

CCV steelhead are well-distributed throughout the Central Valley below the major rim dams (Good et al. 2005). The mainstem of the Sacramento River serves as a primary migratory corridor for both upstream and downstream migration for all Sacramento River Basin populations, connecting spawning habitat within the Sacramento River and tributaries to the San Francisco Bay estuary and the Pacific Ocean. Adults can be found in the mainstem Sacramento River primarily during the fall and winter seasons while juveniles occupy the river year-round (Figure 3). Juvenile rearing tends to occur in areas with cool, clear fast-moving water where riffle habitat is predominant over pool habitat (Moyle 2002). Therefore, it is more likely that juveniles found within the action area will be migrating rather than rearing.

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

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

2.4.5.4. sDPS green sturgeon

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

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

2.4.5.5. Status of Critical Habitat

Designated critical habitat occurs within the upper Sacramento River for all four listed species discussed in this opinion. The action area contains PBFs that support rearing and migration for Chinook salmon, steelhead, and sturgeon. Some spawning habitat may occur in the action area, though higher quality spawning habitat is found further upstream for winter-run Chinook salmon and sDPS green sturgeon and in upper Sacramento tributaries for CV spring-run Chinook salmon and CCV steelhead. The upper Sacramento River has a high value for the conservation of the species, because it supports several life stage functions for each of the four listed species.

2.4.6. Factors Affecting Species and Critical Habitat

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

2.4.7. Climate Change

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

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

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

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

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

Spring-run Chinook salmon adults are vulnerable to climate change because they over-summer in freshwater streams before spawning in autumn (Thompson et al. 2011). Spring-run Chinook salmon spawn primarily in the tributaries to the Sacramento River, and those tributaries without cold water refugia, usually provided by springs, will be more susceptible to impacts of climate change. In years of extended drought and warming water temperatures, unsuitable conditions may occur even in tributaries with cool water springs. Additionally, juveniles often rear in the natal stream for one to two summers prior to emigrating and would be susceptible to warming water temperatures. In Butte Creek, fish are limited to low elevation habitat that is currently

thermally marginal, as demonstrated by high summer mortality of adults in 2002 and 2003, and will become intolerable within decades if the climate warms as expected. Ceasing water diversion for power production from the summer holding reach in Butte Creek resulted in cooler water temperatures, more adults surviving to spawn, and extended population survival time (Mosser et al. 2013).

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

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

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

2.4.8. Mitigation Banks and the Environmental Baseline

Mitigation banks present a unique factual situation, and this warrants a particular approach to how they are addressed. Specifically, when NMFS is consulting on a proposed action that

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

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

The project occurs within the service area of two mitigation and conservation banks approved by NMFS, with available credits for purchase:

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

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

2.4.9. Species Survival and Recovery in the Action Area

Winter-run Chinook salmon, CV spring-run Chinook salmon, CCV steelhead, and sDPS green sturgeon utilize the Sacramento River. The upper Sacramento River has a high value for the

conservation of these species because of the location and the habitat features provided that are essential to meeting nearly all of the freshwater life history requirements of these species. Improving population trends and ongoing habitat improvements to the Sacramento River is needed for these species to continue to survive and recover within the action area. The recovery plan for winter-run Chinook salmon, CV spring-run Chinook salmon, and CCV steelhead identifies the mainstem Sacramento as a core 1 population for winter-run Chinook salmon, a core 2 population for CV spring-run Chinook salmon, and a core 2 population for CCV steelhead (NMFS 2014b). Core 1 populations have a known ability or potential to support independent viable populations (NMFS 2014b). Core 1 populations form the foundation of the recovery strategy and must meet the population-level biological recovery criteria for low risk of extinction, as described in the Recovery Plan (NMFS 2014b). Core 2 populations are assumed to have the potential to meet the moderate risk of extinction criteria. Core 2 populations are of secondary importance for recovery efforts. The upper Sacramento River (RM 206 to RM 280) is the only known spawning habitat continuously used by sDPS green sturgeon. After the decommissioning of the Red Bluff Diversion Dam in 2013, sDPS green sturgeon now have volitional passage above the dam during all months that they are present in the river (NMFS 2018). Adults, eggs, and larvae can occur in the spawning area (RM 206 to RM 280) during the spawning (April to July) and rearing periods, and usually move out of the area with environmental cues such as increased flow (NMFS 2018). Restoring habitat below Keswick Dam is a priority recovery action; suitable spawning and rearing habitat downstream of Keswick is needed (NMFS 2018).

2.5. Effects of the Action

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

The effects assessment will consider the nature, duration, and extent of the effects of the proposed action relative to the migration timing, behavior, and habitat requirements of federally listed species and the magnitude, timing, frequency, and duration of project impacts to these listed species.

To evaluate the effects of the Red Bluff Riverfront Park Boat Facilities Project, NMFS examined the proposed actions in the designated action area. We analyzed construction-related impacts and the expected fish response to habitat modifications. We also reviewed and considered USACE's proposed conservation and mitigation measures. This assessment relied heavily on the information from the BA project description and discussions with consulting biologists.

Specifically, the assessment will consider the potential short-term impacts related to these species resulting from the construction components of the proposed action, including:

- potential for contaminants hazardous materials entering the water;

- increased turbidity and suspended sediment;
- temporal loss of riparian vegetation; and
- direct injury or death from in-channel/in-water work.

Additionally, the assessment will consider the potential beneficial impacts to critical habitat, including:

- elimination of stranding in gravel pits;
- reduction in turbidity and contaminants in the river due to typical use; and
- long-term increase in riparian vegetation.

2.5.1. Effects of the Proposed Action to Listed Fish Species

The in-water work window is November 1 to February 15 but may be adjusted due to flows. NMFS expects that various life stages of listed species may be present in the action area during project activities including migrating adults and rearing and emigrating juveniles.

Within the proposed work window, winter-run Chinook salmon adults are expected to be present in the action area with medium relative abundance (Yoshiyama et al. 1998, Moyle 2002) and winter-run Chinook salmon juveniles are expected to be present in medium abundance from November to December and low relative abundance from January through February (Martin et al. 2001). CV spring-run Chinook salmon adults are not expected to be in the action area from November through early January and may be present in low numbers from mid-January through February (Yoshiyama et al. 1998, Moyle 2002). CV spring-run Chinook salmon juveniles are expected to be present from November through January with high relative abundance and through February with low relative abundance (Myers et al. 1998). CCV steelhead adults are expected to be in the action area from November through December with low relative abundance (McEwan 2001). Juvenile CCV steelhead are expected to be present in the action area during the proposed in-water work window (Hallock et al. 1957, McEwan 2001, Johnson and Merrick 2012). Sexually mature adult sDPS green sturgeon are expected to have high relative abundance in the action area for the first half of November, medium relative abundance for the second half of November through December and low relative abundance in January and February (Klimley et al. 2015, Poytress et al. 2015, DuBois and Danos 2018, Mora et al. 2018). Larval sDPS green sturgeon are not expected to be present in the action area from November through February (Poytress et al. 2015, Heublein et al. 2017). Juvenile sDPS green sturgeon are expected to be present in the action area with medium relative abundance from November through December and are not expected to be in the action area in January and February (Radtke 1966, California Department of Fish and Game 2002, Poytress et al. 2015, Heublein et al. 2017).

These species may spawn within the action area; therefore, adverse effects to incubating eggs may occur.

2.5.1.1. Increased Sedimentation and Turbidity

Increased sedimentation and turbidity may result from a number of sources associated with the proposed project. The use of heavy equipment in and along the river banks may cause turbidity within the action area. Sedimentation and turbidity are expected to have varying effects among different listed species and different life stages that are expected to be present in the action area during the proposed in-water construction window. Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, CCV steelhead, and sDPS green sturgeon juveniles and adults may be present within the action area. High levels of suspended sediment reduce the ability of listed fish to feed and respire, resulting in increased stress levels and reduced growth rates, and reduce tolerance to fish diseases and toxicants (Waters 1995). Some spawning may occur within the action area, therefore egg life stages may be impacted by sedimentation and turbidity. In a lab study, juvenile steelhead and coho salmonids were found to occupy a parcel of water by choice between 57 and 77 nephelometric turbidity units (NTU) (Sigler et al. 1984a). This result suggests that juvenile salmonids may not exhibit avoidance behavior in low to moderate turbidities during migration. One effect of turbidity that has important implications for juvenile salmonids is that predator avoidance behavior has been shown to decrease at increased levels of turbidity (Gregory 1993). Growth and survival amidst increased sediment and turbidity levels have also been shown to decrease resulting from reduced prey detection and availability and physical injury due to increased activity, aggression, and gill fouling (Sigler et al. 1984a, Suttle et al. 2004, Kemp et al. 2011).

Although less is known about the timing of rearing and migration of sDPS green sturgeon, both adult and juvenile life stages are known to utilize the Sacramento River as a migration corridor and may exhibit rearing behavior there as well. Less is known about the specific detrimental physical and physiological effects of sedimentation and turbidity to sturgeon. However, it is thought that high levels of turbidity can generally result in gill fouling, reduced temperature tolerance, reduced swimming capacity and reduced forage capacity in lotic fishes (Wood and Armitage 1997).

Fish responses to increased turbidity and suspended sediment can range from behavioral changes (*e.g.*, alarm reactions, abandonment of cover which could lead to predation, and avoidance) to sublethal effects (*e.g.*, reduced feeding rate), and, at high suspended sediment concentrations for prolonged periods, lethal effects (Newcombe and Jensen 1996). Temporary spikes in suspended sediment may result in behavioral avoidance of the site by fishes; several studies have documented active avoidance of turbid areas by juvenile and adult salmonids (Bisson and Bilby 1982, Sigler et al. 1984b, Lloyd et al. 1987, Servizi and Martens 1992). Individual salmonids that encounter increased turbidity or sediment concentrations will likely move away from affected areas into suitable surrounding habitat.

High turbidity and suspended sediment levels can lead to reduced growth, survival, and reproductive success through a number of potential mechanisms such as reduced foraging ability, impaired disease resistance, and interference with cues necessary for orientation in homing and migration (Lloyd et al. 1987). Laboratory studies have demonstrated that chronic or prolonged exposure to high turbidity and suspended sediment levels can lead to reduced growth rates in juvenile salmonids. For example, Sigler et al. (1984b) found that juvenile Coho salmon and

steelhead trout exhibited reduced growth rates and higher emigration rates in turbid water (25-50 NTU) compared to clear water.

Increases in turbidity associated with instream work are likely to be brief and occur only in the vicinity of the site, attenuating downstream as suspended sediment settles out of the water column. Also, avoidance and minimization techniques will be implemented in this project as well as BMPs pertaining to the prevention of sedimentation and turbidity. These actions will minimize the extent of adverse effects associated with the proposed action outside of the action area. Due to their use of the nearshore habitat in the action area, juvenile listed fish in the action area during construction would be subject to mobilized sediment and short-term increases in turbidity resulting in an increase in predation and reduced feeding and survival.

2.5.1.2. Construction-related Effects

Construction-related activities have the potential to result in injury or death to listed fish species. Construction-related effects may include debris falling into the active channel, tools and/or equipment falling into the active channel, or noise generated by displaced rock and sediment and the operation of construction machinery. Listed fish species are known to migrate through and rear in the action area. Various species and life stages may be present during the in-water work window and may be adversely affected by construction-related effects. BMPs, avoidance, and minimization techniques will be implemented, minimizing the probability of construction-related effects in the action area.

Construction-related effects have the potential for direct or indirect adverse effects to species/life stages that may be present in the action area during construction. Adults and juveniles could potentially encounter falling debris, be hit or become trapped by equipment as work occurs, which could cause physical injury or death. Construction-related noise may alter behavior.

Fish may also exhibit movements that displace them from a position normally occupied in their habitat for short or long durations. Depending on the innate behavior that is being disrupted, the direct and indirect adverse effects could be varied. This is of particular concern for juvenile fish as there are innate behaviors that are essential to their maturation and survival such as feeding, sheltering, and migratory patterns. An example of a significant, direct adverse effect would be cessation or alteration of migratory behavior. In the context of the proposed action area, the migratory behavior of juvenile salmonids and green sturgeon may be affected by various construction-related effects.

Those fishes that are exposed to the effects of construction activities will encounter short-term (*i.e.*, minutes to hours) construction-related noise and physical disturbanceimpacts that are expected to result in injury or harm by increasing the susceptibility of some individuals to predation by temporarily disrupting normal behaviors and affecting sheltering abilities and potentially crushing or killing juvenile anadromous fish. Adult salmonids and sturgeon generally avoid areas of construction activity; therefore, are not expected to be present.

2.5.1.3. Contaminants and Pollution-related Effects

The project activities described in the proposed action will involve heavy construction equipment and many potential sources of hazardous material contamination in the action area. Potential

sources of pollutants include hazardous material spills, petroleum product leaks in construction equipment, introduction of metals from the operation of equipment and vehicles, and the disturbance of sediments that may contain hazardous suspended particulates. BMPs will be implemented, minimizing the probability of pollutant incursion into the Sacramento River. However, unlike sedimentation, turbidity, and construction-related effects; potential pollution-related effects may be persistent in the action area and may affect multiple life stages if they were to occur.

Incursion of contaminants into the Sacramento River has the potential to directly or indirectly affect Sacramento River winter run, CV spring-run Chinook salmon, CCV steelhead, and/or sDPS green sturgeon that may be migrating or rearing in the action area at the time of a pollution event or possibly afterwards. Construction equipment and heavy machinery will be present in the action area and metals may be deposited through their use and operation (Paul and Meyer 2008). These materials have been shown to alter juvenile salmonid behavior through disruptions to various physiological mechanisms including sensory disruption, endocrine disruption, neurological dysfunction and metabolic disruption (Scott and Sloman 2004). Oil-based products used in combustion engines are known to contain PAHs which have been known to bio-accumulate in other fish taxa such as flatfishes (order Pleuronectiformes) and have carcinogenic, mutagenic and cytotoxic effects (Johnson et al. 2002). The exact toxicological effects of PAHs in juvenile salmonids are not well understood, although studies have shown that increased exposure of salmonids to PAHs, reduced immunosuppression, increasing their susceptibility to pathogens (Arkoosh et al. 1998, Arkoosh and Collier 2002). Listed fish species are expected to be present in the action area during construction activities and would potentially be directly affected by a pollution event. Listed fish could be indirectly affected by a pollution event if contaminants were to settle within substrate in the active channel of the Sacramento River that may become disturbed at a later time.

Avoidance and minimization measures are described in Section 1.3.3 and will aid in minimizing the potential risk of exposure to contaminants, thus direct or indirect adverse effects to listed fish species are not expected to occur.

2.5.2. Effects of the Proposed Action to Critical Habitat and PBFs

Construction is expected to have short and long-term effects on habitat quantity and quality, including effects on the PBFs of designated critical habitat of listed species. The PBFs that occur within the action area for winter-run Chinook salmon are (1) migratory corridors for both upstream and downstream migration, (2) habitat and prey items that are free of contaminants, and (3) riparian habitat for juvenile rearing. The PBFs within the action area for sDPS green sturgeon are (1) food resources, (2) adequate flow regime for all life stages, (3) water quality, (4) migratory corridors, (5) adequate water depth for all life stages, and (6) adequate sediment quality. The PBFs within the action area for CV spring-run Chinook salmon and CCV steelhead are (1) freshwater rearing sites and (2) freshwater migration corridors.

Effects to migratory corridor PBFs for listed species include some incursion of the new ramp into the river but, given the width of the river, migration of adult listed species through this area are not expected to alter course or behavior. Juveniles migrating downstream may need to move around the ramp depending on flows, moving into deeper water, which could result in higher risk

of predation. As the length of the ramp is relatively small, the increased risk is expected to be small.

Some impacts to rearing habitat is expected to occur due to the proposed action. Due to the construction of the new boat ramp, some riparian vegetation will be removed which may provide PBFs for juvenile listed species rearing. The project will result in the permanent loss of 28,735 square feet (0.66 acres) of floodplain habitat that may have been suitable for rearing of juvenile listed fish.

Possible contamination to habitat or prey items for listed species or impacts to food resources, water quality, or sediment quality for sDPS green sturgeon could occur as a result of this project. Given the BMPs and minimization measures that will be in place to prevent contamination to the river, habitat, and prey items, effects due to pollution or contamination are not likely to occur. The project may help to reduce long-term contamination to habitat and prey that may have been occurring due to cars and trucks parking on the gravel bar adjacent to the boat ramp. A result of this project will be a new city ordinance that will ban parking in areas near boat ramps that are not officially designated for parking. River users that park on the gravel bar following the passing of this ordinance will be ticketed. Regulation of the parking in this area may help to reduce contamination from vehicles including petroleum products and particulates from tires.

Adequate flow and adequate water depth for all life stages of green sturgeon are PBFs that are not expected to be impacted by the proposed project.

2.5.3. Mitigation/Conservation Bank Credit Purchase

To address permanent impacts of the proposed action to riparian and aquatic habitats, the proposed action includes the purchase of mitigation bank credits at a 1:1 ratio for permanent impacts to 0.66 acres of floodplain and riparian habitat. Both the riparian and floodplain habitat impacts affect designated critical habitat, as well as listed fish species, described above in this opinion. The purchase of mitigation credits will address the loss of ecosystem functions due to the modification of the riverbank. These credit purchases are ecologically relevant to the PBFs of critical habitat and the species affected by the proposed action because the bank includes riparian forest and floodplain credits with habitat values that are already established and meeting performance standards. Also, the bank is located in areas that will benefit the listed species ESUs and DPSs affected. The purchase of mitigation credits at Bullock Bend bank is expected to benefit the PBFs of freshwater rearing habitat and migration corridors for listed species by providing suitable floodplain and riparian habitat. The floodplains and riparian forest in the bank benefit the growth and survival of rearing salmonids by providing habitat with abundant food in the form of aquatic invertebrates, structural diversity such as instream woody material (IWM), and cooler stream temperatures. While conservation bank credits for sDPS green sturgeon are not currently available, several of the benefits to salmonid habitat from conservation banks may also benefit sDPS green sturgeon, including improving migratory corridors, improving rearing habitat, and additional riparian forest providing prey in the form of aquatic invertebrates.

The purchase of credits provides a high level of certainty that the benefits of a credit purchase will be realized because Bullock Bend has mechanisms in place to ensure credit values are met over time. Such mechanisms include legally binding conservation easements, long-term

management plans, detailed performance standards, credit release schedules that are based on meeting performance standards, monitoring plans and annual monitoring reporting to NMFS, non-wasting endowment funds that are used to manage and maintain the bank and habitat values in perpetuity, performance security requirements, a remedial action plan, and site inspections by NMFS. In addition, Bullock Bend has a detailed credit schedule and credit transactions and credit availability are tracked on the Regulatory In-lieu fee and Bank Information Tracking System (RIBITS). RIBITS was developed by the USACE with support from the Environmental Protection Agency, the USFWS, the Federal Highway Administration, and NMFS to provide better information on mitigation and conservation banking and in-lieu fee programs across the country. RIBITS allows users to access information on the types and numbers of mitigation and conservation bank and in-lieu fee program sites, associated documents, mitigation credit availability, service areas, as well as information on national and local policies and procedures that affect mitigation and conservation bank and in-lieu fee program development and operation.

2.6. Cumulative Effects

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

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

2.6.1. Water Diversions

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

2.6.2. Increased Urbanization

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

Increased urbanization also is expected to result in increased recreational activities in the region. Among the activities expected to increase in volume and frequency is recreational boating. Boating activities typically result in increased wave action and propeller wash in waterways.

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

2.6.3. Rock Revetment and Levee Repair Projects

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

2.6.4. Aquaculture and Fish Hatcheries

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

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

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

2.6.5. Recreational Fishing

While hatchery CCV steelhead and Chinook salmon are targeted, incidental catch of protected species such as naturally produced CV spring-run Chinook salmon and CCV steelhead does occur. Since 1998, all hatchery CCV steelhead have been marked with an adipose fin clip,

allowing anglers to tell the difference between hatchery and wild CCV steelhead. Current regulations restrict anglers from keeping unmarked CCV steelhead in Central Valley streams, except in the upper Sacramento River.

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

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

2.6.6. Habitat Restoration

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

2.6.7. Agricultural Practices

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

Agricultural practices in the Sacramento River may adversely affect riparian and wetland habitats through upland modifications of the watershed that lead to increased siltation or reductions in water flow.

2.6.8. Mining Activities

Increased water turbidity levels for prolonged periods of time may result from adjacent mining activities, and increased urbanization and/or development of riparian habitat, and could adversely affect the ability of young salmonids to feed effectively, resulting in reduced growth and survival. Turbidity may cause harm, injury, or mortality to juvenile anadromous fish in the vicinity and downstream of the project area. High turbidity levels can reduce the ability of listed fish to feed and respire, resulting in increased stress levels and reduced growth rates, and reduce tolerance to fish diseases and toxicants. Mining activities may adversely affect water quality, riparian function, and stream productivity.

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 biological opinion as to whether the proposed action is likely to: (1) Reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing its numbers, reproduction, or distribution; or (2) appreciably diminish the value of designated or proposed critical habitat as a whole for the conservation of the species.

Sacramento River winter-run Chinook salmon ESU, CV spring-run Chinook salmon ESU, CCV steelhead DPS, and sDPS green sturgeon have experienced significant declines in abundance and available habitat in the California Central Valley relative to historical conditions. The status of the species (Section 2.2) details the current range-wide status of these ESUs and DPSs and their critical habitat. The environmental baseline (Section 2.3) describes the current baseline conditions found in the Sacramento River, where the proposed action is to occur. Section 2.4.7 discusses the vulnerability of listed species and critical habitat to climate change projections in the California Central Valley and specifically in the Sacramento River. Reduced summer flows and increased water temperatures will likely be exacerbated by increasing surface temperatures in the Sacramento River. The Sacramento River is a highly manipulated system with flow and temperature regimes that differ drastically from their historical condition. Cumulative effects (Section 2.6) are likely to include decreased water flow, increased river traffic, and increased stormwater runoff from increased urbanization and from concurrent state and local projects in the action area.

2.7.1. Effects of the Proposed Action to Listed Species

The proposed action has the potential to affect adult and juvenile winter-run Chinook salmon, CV spring-run Chinook salmon, and CCV steelhead; and adult, juvenile, and subadult sDPS green sturgeon. The project is likely to result in sediment and turbidity pulse events which are expected to result in adverse effects to listed fish species due to increased activity, gill fouling, and reduced foraging capability. Incubating eggs are also susceptible to a multitude of adverse effects resulting from sedimentation. Construction-related effects are also expected to result in adverse effects to listed fish species as a result of construction equipment operation in and near

the river and placement of RSP. All species and life stages present will likely be impacted by adverse construction-related effects. Adverse effects due to contaminants and pollution are expected to be avoided given the BMPs and avoidance and minimization measures that will be implemented.

2.7.2. Effects of the Proposed Action to Critical Habitat

The project will cause a permanent loss of 0.66 acres of floodplain habitat, adversely affecting migration and rearing habitat PBFs of critical habitat. The project will reduce the risk of long-term contamination in the action area by modifying the designated areas of vehicle use.

As discussed in Section 2.5.3 above, as mitigation for these impacts, the applicant has purchased credits from Bullock Bend Mitigation Bank at a 1:1 ratio for floodplain and riparian habitats impacted. The purchase of mitigation credits at this bank is expected to benefit the PBFs of freshwater rearing habitat and migration corridors for listed species by providing suitable floodplain and riparian habitat. The floodplains and riparian forest in the bank benefit the growth and survival of rearing salmonids by providing habitat with abundant food in the form of aquatic invertebrates, structural diversity such as IWM, and cooler stream temperatures. Improved riparian cover may also provide increased prey resources for sDPS green sturgeon.

2.7.3. Survival and Recovery

The Sacramento River contains spawning populations of Sacramento River winter-run and CV spring-run Chinook salmon, CCV steelhead, and sDPS green sturgeon, making it an important river in terms of range-wide recovery for these species. Further, the Sacramento River is the only spawning location for Sacramento River winter-run Chinook salmon and the only known spawning location for sDPS green sturgeon. The adverse effects to Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, CCV steelhead, and North American green sturgeon within the action area are not expected to (1) reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing its numbers, reproduction, or distribution; or (2) appreciably diminish the value of designated or proposed critical habitat as a whole for the conservation of the species. . This is largely due to the fact that although construction is expected to cause adverse effects to some listed salmonids, the impacts will be relatively short in duration and will avoid higher river and peak migration time periods, so that abundance would be low within the project footprint. Additionally, most of the effects are minimal or minor in nature, not lethal. Construction-related harassment will be temporary and will not impede adult fish from reaching upstream spawning and holding habitat, or juvenile fish from migrating downstream. Long-term impacts of the incursion of the new ramp structure into the river is expected to result in some brief minor behavioral modifications of migrating or rearing juvenile fish, as they move past the structure to adjacent shoreline.

To mitigate the effects of the project, the applicant purchased mitigation credits at Bullock Bend Mitigation Bank at a 1:1 ratio for floodplain and riparian habitats impacted, for a total of 0.66 of an acre purchased. These compensatory mitigation credits serve as a form of advanced mitigation because the habitat at the bank was restored approximately five years (before the impact of the construction activity will occur. The purchase of mitigation bank credits will improve floodplain and riparian habitat for listed species.

2.8. Conclusion

After reviewing and analyzing the current status of the listed species and critical habitat, the environmental baseline within the action area, the effects of the proposed action, the effects of other activities caused by the proposed action, and cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, CCV steelhead, or the sDPS of North American green sturgeonor destroy or adversely modify their designated critical habitat.

2.9. Incidental Take Statement

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

2.9.1. Amount or Extent of Take

In the biological opinion, NMFS determined that incidental take is reasonably certain to occur as follows. NMFS anticipates incidental take of adult and juvenile winter-run Chinook salmon, adult and juvenile CV spring-run Chinook salmon, adult and juvenile CCV steelhead, and adult and sub-adult sDPS green sturgeon as a result of the Red Bluff Riverfront Park Boat Facilities Project. NMFS anticipates that listed fish will be harassed, harmed, or killed due to impacts directly related to sedimentation and turbidity, construction-related effects, and long-term permanent impacts from the riparian loss and new structure.

Incidental take is expected to occur in the form of harassment, harm, or death. NMFS cannot precisely quantify and track the amount or number of individuals per species that are expected to be taken incidentally as a result of the proposed project. This is due to the variability and uncertainty associated with the response of listed species to the effects of the proposed action, the varying population size of each species, annual variations in the timing of migration, individual habitat use within the action area, and difficulty in observing injured or dead fishes. However, it is possible to estimate the extent of incidental take by designating as ecological surrogates, those elements of the project that are expected to result in incidental take. Ecological surrogates are more predictable and/or measurable and monitoring those surrogates will determine the extent to which incidental take is occurring. The most appropriate threshold for incidental take are ecological surrogates of temporary habitat disturbance during the project construction activities.

The behavioral modifications or fish responses that result from habitat disturbance are described below. NMFS anticipates incidental take will be limited to the following forms:

(1) Harassment, harm, or death resulting from habitat-related disturbances during construction activities, resulting in turbidity increases that may extend up to 100 feet from the bank and 300 feet downstream. Increases in turbidity are reasonably certain to result in harm to the species through modification or degradation of the PBFs for rearing and migration that will result in physiological impacts (*i.e.*, to the gills of fishes), temporary displacement of individuals, reduced feeding, and increased predation. A very small proportion of fish present would be expected to die as a result of turbidity increases.

(2) Harassment, harm, or death during construction 100 feet beyond the construction footprint in all directions on the river side of the project, including moving, removal, or addition of material into the active channel during construction of the boat ramp and parking pad. Fish present in the action area would startle and move to adjacent deeper water resulting in increased predation and reduced survival. Fish present and unable to avoid the construction site activities would be crushed and killed.

(3) Harm from temporary and permanent physical disturbance to a total area of 0.66 acres. Removal of vegetation is reasonably certain to result in harm to the species through modification or degradation of the PBFs for rearing and migration that will result in temporary displacement of individuals, loss of cover, increased predation, and reduced growth due to decreased food inputs.

If any specific parameter of these ecological surrogates are exceeded, the anticipated incidental take levels described are also exceeded, triggering the need to reinitiate consultation.

2.9.2. Effect of the Take

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

2.9.3. Reasonable and Prudent Measures

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

(1) USACE shall include the following in the permit:

a. Measures shall be taken by the applicant to minimize sedimentation and turbidity plumes in the action area and their direct and indirect effects to listed species and their critical habitat.

b. Measures shall be taken by the applicant to minimize impacts to riparian vegetation in the action area and its direct and indirect effects to critical habitat.

c. Measures shall be taken by the applicant to ensure that contractors, construction workers, and all other parties involved with these projects implement the BMPs as detailed in the BA and this opinion.

(2) Measures shall be taken by USACE and the applicant to monitor and provide NMFS with a report associated with the proposed action.

2.9.4. Terms and Conditions

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

(1) The following terms and conditions implement reasonable and prudent measure 1(a):

a. BMPs shall be implemented to prevent soil erosion and sediment incursion into the active channel of the Sacramento River. Straw wattles and silt fences shall be installed at source sites for the project, as appropriate. Any non-biodegradable materials (e.g. silt fence) shall be removed at project completion.

b. Operation of heavy machinery in the active channel shall be minimized to avoid disturbance of substrates and releasing of contaminants.

c. Turbidity and settleable solids shall be monitored according to water quality permits. If acceptable limits are exceeded, work shall be suspended until acceptable measured levels are achieved.

d. Disturbed areas adjacent to the active channel that are deemed unstable shall be vegetated with native plant species and/or hydroseeded upon project completion.

(2) The following terms and conditions implement reasonable and prudent measure 1(b):

a. Equipment used for the project shall be thoroughly cleaned off-site to remove any invasive plant material or invasive aquatic biota prior to use in the action area.

b. Environmentally sensitive areas, sensitive plant species, and wetland areas shall be avoided during project activities to the maximum extent practicable. High visibility fencing shall be placed around these areas to minimize disturbance.

c. Soil and excavated material and/or fill material shall be stockpiled in existing clearings when possible.

d. Stockpiles shall be covered prior to a rain event or when there is a greater than 50 percent possibility of rain forecasted by the National Weather Service during the next 24 hours.

(3) The following terms and conditions implement reasonable and prudent measure 1(c):

a. USACE and the applicant shall provide a copy of this opinion to the construction crew, making them responsible for implementing all requirements and obligations included in this document and for educating and informing all other contractors involved in the project as to the requirements of this opinion. A notification that the construction crew have been supplied with this information shall be provided to the reporting address below. A copy of this opinion will be available on-site at all times during work activity.

(4) The following terms and conditions implement reasonable and prudent measure 2:

a. USACE and the applicant shall submit to NMFS an annual report describing the incidental take resulting from the proposed project. This shall include any fishes known to have been killed or injured during project activities. This report shall be filed not later than June 1st, covering the instream construction window from the previous year. The report should be submitted to the following address:

Maria Rea
California Central Valley 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) USACE should encourage their applicants to minimize any potential take whenever possible, and implement practices that avoid or minimize negative impacts to salmon, steelhead, sturgeon, and their critical habitat.

(2) USACE should encourage the applicant to post interpretative signage within the boat ramp area to inform boat users of the endangered and threatened salmon, steelhead, and sturgeon that occur within the Sacramento River and actions that they can take to help and/or prevent further harm to those species.

(3) USACE and the applicant should support and promote aquatic and riparian habitat restoration within the Sacramento River and other watersheds, especially those with listed aquatic species. Practices that avoid or minimize negative impacts to listed species should be encouraged.

(4) USACE and the applicant should continue to work cooperatively with other state and Federal agencies, private landowners, governments, and local watershed groups to identify opportunities for cooperative analysis and funding to support recovery actions in the NMFS Salmonid Recovery Plan (NMFS 2014b).

In order for NMFS to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, NMFS requests notification of the implementation of any conservation recommendations.

2.11. Reinitiation of Consultation

This concludes formal consultation for the Red Bluff Riverfront Park Boat Facilities Project.

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

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

Section 305(b) of the MSA directs Federal agencies to consult with NMFS on all actions or proposed actions that may adversely affect EFH. 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 USACE and descriptions of EFH for Pacific Coast Salmon (Pacific Fishery Management Council [PFMC] 2014) contained in the fishery management plans (FMPs) developed by the PFMC and approved by the Secretary of Commerce.

3.1. Essential Fish Habitat Affected by the Project

EFH is designated under the Pacific Coast Salmon FMP, which includes the action area of the proposed action. EFH in the action area consists of adult migration habitat and juvenile rearing and migration habitat for the four Chinook salmon runs (winter-, spring-, fall-, and late fall-run 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. The other HAPCs for Pacific Coast Salmon,(4) estuaries, and (5) marine and estuarine submerged aquatic vegetation, are not present in the action area.

3.2. Adverse Effects on Essential Fish Habitat

Construction activities would result in increased sedimentation, turbidity, and the potential for contaminants to enter the waterway. Channel grading would result in adverse effects to EFH due to losses of riparian habitat and disturbance of natural substrate. Long-term effects of the project are expected to include a loss of approximately 0.66 acres of EFH within the action area. Temporary effects to EFH will occur within the entire action area, an area of 4.88 acres.

Consistent with the ESA portion of this document, which determined that aspects of the proposed action would result in impacts to listed fish species and critical habitat, we conclude that aspects of the proposed action would also adversely affect EFH for Chinook salmon. Effects to the HAPCs listed in Section 3.1 were described in detail in Section 2.5 and subsections. A list of temporary and permanent adverse effects to EFH HAPCs is included in this EFH consultation. We conclude that the following adverse effects on EFH designated for Pacific Coast Salmon are reasonably certain to occur (affected HAPCs are indicated by number, corresponding to the HAPCs listed above in Section 3.1).

3.2.1. Sedimentation and Turbidity

- Reduced habitat complexity (1)
- Degraded water quality (1, 2, 3)
- Reduction in aquatic macroinvertebrate production (1)

3.2.2. Contaminants and Pollution-related Effects

- Degraded water quality (1, 2, 3)
- Reduction in aquatic macroinvertebrate production (1)

3.2.3. Removal of Riparian Vegetation

- Reduced shade (2, 3)
- Reduced supply of terrestrial food resources (1)
- Reduced supply of LWM (1)

3.3. Essential Fish Habitat Conservation Recommendations

The following conservation recommendations are necessary to avoid, mitigate, or offset the impact of the proposed action on EFH:

(1) To protect HAPC #1 (Complex Channels and Floodplain Habitats), NMFS recommends that USACE and the applicant adopt term and conditions 1 (a, b, c, and d) and 2 (a, b, and c).

(2) To protect HAPC #2 (Thermal Refugia), NMFS recommends that USACE and the applicant adopt term and condition 2 (b).

(3) To protect HAPC #3 (spawning habitat), NMFS recommends that USACE and the applicant adopt term and conditions 1 (a, b, c, and d) and 2(a, b, and c).

Fully implementing the above-listed EFH conservation recommendations would protect, by avoiding or minimizing the adverse effects described in section 3.2, above, 4.88 acres of designated EFH for Pacific Coast Salmon.

3.4. Statutory Response Requirement

As required by section 305(b)(4)(B) of the MSA, USACE must provide a detailed response in writing to NMFS within 30 days after receiving an EFH Conservation Recommendation. Such a response must be provided at least 10 days prior to final approval of the action if the response is inconsistent with any of NMFS' EFH Conservation Recommendations unless NMFS and the Federal 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

USACE and the applicant 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 recommendations apply to the proposed action:

(1) USACE should recommend that the applicant install interpretive signs near visitor parking areas to help educate visitors about the ecological value of anadromous fish resources in the the Sacramento River watershed.

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

This concludes the FWCA portion of this consultation.

5. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

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

5.1. Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. USACE and the applicant are the intended users of this opinion. Other interested users could include the USFWS, CDFW, or the California Department of Water Resources. Individual copies of this opinion were provided to USACE and the applicant. The document will be available within two weeks at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. The format and naming adheres to conventional standards for style.

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 3 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 opinion and EFH consultation contain more background on information sources and quality.

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

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

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