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

Refer to NMFS No: WCRO-2019-00185

July 22, 2019

Ryan T. Larson, P.E.
Chief, Flood Protection and Navigation Section
California North Branch Office
U.S. Army Corps of Engineers
1325 J Street
Sacramento, California 95814-2922

Re: Endangered Species Act Section 7(a)(2) Biological Opinion, and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response and Fish and Wildlife Coordination Act Recommendations for the Reclamation District 341, 2016 Flood System Repair Project for Levee Erosion Repair on Sherman Island Project

Dear Mr. Larson:

Thank you for your letter of March, 11, 2019, requesting initiation of consultation with the National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act of 1973 (ESA) (16 U.S.C. 1531 et seq.) on the U.S. Army Corps of Engineers' issuance of a Section 408 permission, a Clean Water Act section 404 permit, and a Rivers and Harbors Act section 10 permit to Reclamation District 341 for the Levee Erosion Repair on Sherman Island Project.

Thank you, also, for your request for consultation pursuant to the essential fish habitat (EFH) provisions in Section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. 1855(b)) for this project.

Based on the best available scientific and commercial information, the biological opinion concludes that the Levee Erosion Repair on Sherman Island Project is not likely to jeopardize the continued existence of the Federally listed threatened Central Valley spring-run Chinook salmon evolutionarily significant unit (ESU, *Oncorhynchus tshawytscha*), threatened California Central Valley steelhead distinct population segment (DPS, *O. mykiss*), endangered Sacramento River winter-run Chinook salmon ESU (*O. tshawytscha*), 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 nondiscretionary 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 will modify a stream or other body of water, NMFS also provides recommendations and comments for the purpose of conserving fish and wildlife resources under the Fish and Wildlife Coordination Act [16 U.S.C. 662(a)].

Please contact Brittany Cunningham in NMFS' West Coast Region, California Central Valley Office at (916) 930-3606 or via email at brittany.cunningham@noaa.gov, if you have any questions concerning this consultation, or if you require additional information.

Sincerely,

Maria Rea
Assistant Regional Administrator
California Central Valley Office

Enclosure

cc: To the file 151422-WCR2018-SA00480

Electronic copy only:
Mr. Brian Luke, Brian.J.Luke@usace.army.mil
Ms. Kaleigh Maze, Kaleigh.Maze@usace.army.mil

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

Levee Erosion Repair on Sherman Island Project

National Marine Fisheries Service Environmental Consultation Organizer: WCRO-2019-00185

Action Agency: U.S. 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?
Central Valley spring-run Chinook salmon (*Oncorhynchus tshawytscha*)	Threatened	Yes	No	Yes	No
California Central Valley steelhead DPS (*O. mykiss*)	Threatened	Yes	No	Yes	No
Sacramento River winter-run Chinook salmon (*O. tshawytscha*)	Endangered	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: July 22, 2019

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LIST OF ACRONYMS

ACID	Anderson-Cottonwood Irrigation District Diversion Dam
BA	Biological Assessment
BMPs	Best Management Practices
BO	biological opinion
CCV	California Central Valley
CV	Central Valley
CVP	Central Valley Project
DJFMP	Delta Juvenile Fish Monitoring Program
DO	dissolved oxygen
DPS	distinct population segment
DQA	Data Quality Act
EFH	essential fish habitat
ESA	Endangered Species Act
ESU	evolutionarily significant unit
FMP	Fishery Management Plan
FWCA	Fish and Wildlife Coordination Act
HAPCs	Habitat Areas of Particular Concern
HTL	High Tide Line
ITS	incidental take statement
LWD	large woody debris
MHW	Mean High Water
MLLW	Mean Lower Low Water
MSA	Magnuson-Stevens Fishery Conservation and Management Act
NMFS	National Marine Fisheries Service
PAHs	polycyclic aromatic hydrocarbons
PBFs	physical or biological features
PCB	polychlorinated biphenyls
PCE	primary constituent element
PFMC	Pacific Fishery Management Council
RSP	rock slope protection
RPMs	reasonable and prudent measures
sDPS	Southern distinct population segment
SWP	State Water Project
USACE	United States Army Corps of Engineers

LIST OF TABLES

1. INTRODUCTION

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

1.1 Background

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

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

Because the Project 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 U.S.C. 661 et seq.).

We completed pre-dissemination review of this document using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (DQA, section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). A complete record of this consultation is on file at California Central Valley Office.

1.2 Consultation History

On July 1, 2016, NMFS received a request from Sycamore Environmental Consultants for information on Federally listed or candidate fish species, critical habitat, and Essential Fish Habitat occurring within the portion of the Sacramento River that flows through Horseshoe Bend in the area of the Project.

On October 27, 2016, NMFS responded to this request with technical assistance that included a list of listed species and their critical habitat present in the project area, and conservation recommendations for the Project.

On October 11, 2018, NMFS received a request via mail for formal consultation from the United States Army Corps of Engineers (USACE) for project effects to Sacramento River winter-run Chinook salmon, Central Valley (CV) spring-run Chinook salmon, California Central Valley (CCV) steelhead, and the southern DPS (sDPS) of the North American green sturgeon and the critical habitat for these species.

On October 22, 2018, NMFS responded to this request with a letter of insufficiency and requested more information about the Project.

On December 20, 2018, NMFS sent a letter to the USACE closing out the consultation because the requested information was not provided.

On March 11, 2019, NMFS received a new request via mail for formal consultation from the USACE for project effects to winter-run Chinook salmon, CV spring-run Chinook salmon, CCV steelhead, and sDPS green sturgeon, and the critical habitat for these species. This new letter included the additional information NMFS had previously requested. On this date, NMFS initiated consultation.

1.3 Proposed Federal Action

For ESA section 7 consultation, "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)).

USACE proposed to issue a Section 408 permission, a Clean Water Act (CWA) section 404 permit, and a Rivers and Harbors Act section 10 permit to the applicant, Reclamation District 341, to repair an eroded levee on Sherman Island. The purpose of the Levee Erosion Repair on Sherman Island Project (Project) is to repair the levee to meet USACE standards and restore habitat on the waterside levee slope. The repair would be on the north side of Sherman Island, along Horseshoe Bend, a tidally-influenced side channel of the lower Sacramento River. To improve levee stability, up to 500 feet of riprap would be installed from the levee crown down to approximately the two-foot elevation contour.

The Project would include the removal of 5 riparian trees and shrubs growing in existing riprap. At the levee repair location, there is currently also degraded riprap, weeds, and ruderal grasses. The waterside slope of the levee would be grubbed and stripped of existing vegetation. The levee repair design consists of a riprap toe just below Mean Lower Low Water (MLLW). Below the High Tide Line (HTL), rock slope protection (RSP) would be placed on existing riprap and gravel. Below Mean High Water (MHW), only clean RSP would be placed, and above MHW, the RSP would be filled with soil to support growth of vegetation.

To compensate for impacts to salmonids and sDPS green sturgeon resulting from the proposed repair, native vegetation would be planted at a 3:1 ratio for all woody-riparian vegetation removed. The Project would also incorporate a 500-linear-foot vegetated waterside bench, approximately three feet wide, which would be covered in nine inches of soil and replanted with native riparian plant species. This plan proposes to create 0.314 new acres of a native riparian

corridor, including approximately: 0.034 acres of shaded riverine aquatic habitat, 0.109 acres of riparian scrub-shrub habitat, and 0.171 acres of native grassland habitat.

1.3.1 Avoidance and Minimization Measures

- The repair would be completed between August 1 and October 15 to minimize impacts to ESA-listed fish species.
- Work below the maximum HTL would coincide with low tides so that RSP installation remains out of the water to the maximum extent possible.
- Temporary spud pile anchors would be installed during daylight hours. Piles would be driven by their own weight, not by a motor or hammer.
- Removal of existing vegetation in the Project area would be minimized.
- Woody riparian vegetation measuring one inch in diameter or greater at breast height would be replaced on-site with native riparian species at a 3:1 ratio. If replanting and habitat creation/restoration is unsuccessful, as defined in the planting and monitoring plan (called the "Restoration Plan" in the BA), the applicant would satisfy mitigation measures in an alternate manner. This may include purchase of salmonid credits at a ratio of 3:1 for the acres of riparian habitat removed.
- The Project would implement Best Management Practices (BMPs), including a Storm Water Pollution Prevention Program or Water Pollution Control Program.
- If RSP installation in the water cannot be avoided, then RSP would be placed in a manner that limits resuspension of sediments.
- Turbidity measurements would be taken in accordance with the Project's CWA 401 Water Quality Certification.
- All contractors and operators would be given Worker Environmental Awareness training to inform them of special status species and habitats that may be present in the action area.
- All refueling, maintenance, and staging of equipment and vehicles would occur at least 60 feet from riparian habitat or water bodies and not in a location where a spill would drain directly toward aquatic habitat. Refueling of construction equipment and vehicles would occur only within designated areas where possible spills would be readily contained.
- A spill prevention plan would be prepared, describing measures to minimize the risk of fluids or other materials used during construction (e.g., oil, transmission/hydraulic fluid) from entering the channel or contaminating adjacent riparian areas. In addition to a spill prevention plan, a cleanup protocol would be developed before construction begins and would be implemented in case of a spill.

1.3.2 Interrelated and Interdependent Actions

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

2 ENDANGERED SPECIES ACT: BIOLOGICAL OPINION AND INCIDENTAL TAKE STATEMENT

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

2.1 Analytical Approach

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

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

The designations of critical habitat for winter-run Chinook salmon, CV spring-run Chinook salmon, CCV steelhead, and sDPS green sturgeon use the term primary constituent element (PCE) or essential features. The new critical habitat regulations (81 FR 7414) replace this term with physical or biological features (PBFs). The shift in terminology does not change the approach used in conducting a "destruction or adverse modification" analysis, which is the same regardless of whether the original designation identified PCEs, PBFs, or essential features. In this BO, we use the term PBF to mean PCE or essential feature, as appropriate for the specific critical habitat.

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

- Identify the rangewide status of the species and critical habitat expected to be adversely affected by the proposed action.
- Describe the environmental baseline in the action area.
- Analyze the effects of the proposed action on both species and their habitat using an "exposure-response-risk" approach.

- Describe any cumulative effects in the action area.
- Integrate and synthesize the above factors by: (1) reviewing the status of the species and critical habitat; and (2) adding the effects of the action, the environmental baseline, and cumulative effects to assess the risk that the proposed action poses to species and critical habitat.
- Reach a conclusion about whether species are jeopardized or critical habitat is adversely modified.
- If necessary, suggest a RPA to the proposed action.

2.2 Rangewide Status of the Species and Critical Habitat

This BO examines the status of each species that would be adversely affected by the Project. The status is determined by the level of extinction risk that the listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This informs the description of the species' likelihood of both survival and recovery. The species status section also helps to inform the description of the species' current "reproduction, numbers, or distribution" as described in 50 CFR 402.02. The BO also examines the condition of critical habitat throughout the designated area, evaluates the conservation value of the various watersheds and coastal and marine environments that make up the designated area, and discusses the current function of the essential PBFs that help to form that conservation value. See Table 1 for species and Table 2 for critical habitat information.

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

Species	Listing Classification and Federal Register Notice	Status Summary
Sacramento River winter-run Chinook salmon ESU	Endangered, 70 FR 37160; June 28, 2005	According to the National Marine Fisheries Service (2016b) 5-year species status review, the status of the winter-run Chinook salmon ESU, the extinction risk has increased from moderate risk to high risk of extinction since the 2007 and 2010 assessments. Based on the Lindley et al. (2007) criteria, the population is at high extinction risk in 2019. High extinction risk for the population was triggered by the hatchery influence criterion, with a mean of 66 percent hatchery origin spawners from 2016 through 2018. Several listing factors have contributed to the recent decline, including drought, poor ocean conditions, and hatchery influence. Thus, large-scale fish passage and habitat restoration actions are necessary for improving the winter-run Chinook salmon ESU viability.
Central Valley spring-run Chinook salmon ESU	Threatened, 70 FR 37160; June 28, 2005	According to the National Marine Fisheries Service (2016a) 5-year species status review, the status of the CV spring-run Chinook salmon ESU, until 2015, has improved since the 2010 5-year species status review. The improved status is due to extensive restoration,

Species	Listing Classification and Federal Register Notice	Status Summary
		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 2015 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 (California Department of Fish and Wildlife 2018).
California Central Valley steelhead DPS	Threatened, 71 FR 834; January 5, 2006	According to the National Marine Fisheries Service (2016c) 5-year species status review, 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 distinct population segment (sDPS) of North American green sturgeon	Threatened, 71 FR 17757; April 7, 2006	According to the National Marine Fisheries Service (2015) 5-year species status review and the National Marine Fisheries Service (2018b) final recovery plan, 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 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, designation details, and status summary.

Species	Designation Date and Federal Register Notice	Status Summary
Sacramento River winter-run Chinook salmon ESU	September 16, 1993, 58 FR 33212	Critical habitat for winter-run Chinook salmon includes the Sacramento River from Keswick Dam (river mile (RM) 302) to Chipps Island (RM 0) at the westward margin of the 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. Physical and biological features considered essential to the conservation of the species include: spawning habitat; freshwater rearing habitat; freshwater migration corridors; and estuarine areas.
Central Valley spring-run Chinook salmon ESU	September 2, 2005, 70 FR 52488	Critical habitat for CV spring-run Chinook salmon includes stream reaches of the Feather, Yuba, and American rivers, Big Chico, Butte, Deer, Mill, Battle, Antelope, and Clear creeks, the Sacramento River, as well as portions of the northern Delta. Critical habitat includes the stream channels in the designated stream reaches and the lateral extent as defined by the ordinary high-water line. In areas where the ordinary high-water line has not been defined, the lateral extent will be defined by the bankfull elevation. Physical and biological features considered essential to the conservation of the species include: spawning habitat; freshwater rearing habitat; freshwater migration corridors; and estuarine areas.
California Central Valley steelhead DPS	September 2, 2005, 70 FR 52488	Critical habitat for CCV steelhead includes stream reaches of the Feather, Yuba, and American rivers, Big Chico, Butte, Deer, Mill, Battle, Antelope, and Clear creeks, the Sacramento River, as well as portions of the northern Delta. Critical habitat includes the stream channels in the designated stream reaches and the lateral extent as defined by the ordinary high-water line. In areas where the ordinary high-water line has not been defined, the lateral extent will be defined by the bankfull elevation. Physical and biological features considered essential to the conservation of the species include: spawning habitat; freshwater rearing habitat; freshwater migration corridors; and estuarine areas.
Southern distinct population segment (sDPS) of North American green sturgeon	October 9, 2009, 74 FR 52300	Critical habitat includes the stream channels and waterways in the Delta to the ordinary high water line. Critical habitat also includes the 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. Coastal marine areas include waters out to a depth of 60 fathoms, from Monterey Bay in California, to the Strait of Juan de Fuca in Washington. Coastal estuaries designated as critical habitat include San Francisco Bay, Suisun Bay, San Pablo Bay, and the lower Columbia River estuary. Certain coastal bays and estuaries in California (Humboldt Bay), Oregon (Coos Bay, Winchester Bay, Yaquina Bay, and Nehalem Bay), and Washington (Willapa Bay and Grays Harbor) are also included as critical habitat for sDPS green sturgeon. Physical

Species	Designation Date and Federal Register Notice	Status Summary
		and biological features 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.

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 CV 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 CV 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. 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). CV spring-run Chinook salmon adults are vulnerable to climate change because they over-summer in freshwater streams before spawning in autumn (Thompson *et al.* 2011). CV spring-run Chinook salmon spawn primarily in the tributaries to the Sacramento River, and those tributaries without cold water refugia (usually input from springs) will be more susceptible to impacts of climate change. Although CCV 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 CCV 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 CCV steelhead, which range from 14°C to 19°C (57°F to 66°F). The Anderson-Cottonwood Irrigation District Diversion Dam (ACID) is considered the upriver extent of sDPS green sturgeon passage in the Sacramento River (71 FR 17757; April 7, 2006). The upriver extent of sDPS green sturgeon spawning, however, is approximately 30 kilometers downriver of ACID where water temperature is higher than ACID during late spring and summer (Heublein *et al.* 2017). 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 sDPS 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 action area is not the same as the project boundary area because the action area must delineate all areas where Federally-listed populations of salmon, steelhead, and green sturgeon may be affected by the implementation of the proposed action.

The levee repair, which will be 500 feet in length, will occur on the banks of Horseshoe Bend, a tidally-influenced side channel of the lower Sacramento River, on the north side of Sherman Island, and is located along Highway 160 in Unincorporated Sacramento County. The action area includes subtidal unvegetated and vegetated (i.e., coastal and valley freshwater marsh) shallows, intertidal RSP, non-native grasslands, Giant Reed Stand, and paved roads. Vegetation growing in the RPS includes Suisun marsh aster, Mason's lileaopsis, Black and English Walnuts and California button willow.

For projects with in-river construction activities, such as installation of riprap, the downstream extent of the action area is defined by the distance of potential increased turbidity and sediment deposition. Based on turbidity measurements taken during construction for similar bank stabilization projects performed by the USACE, turbidity impacts for the proposed repair are expected to occur up to 100 feet from the shoreline and up to 400 feet downstream of any in-river construction activities. Therefore, the action area includes an approximate 900-foot stretch of Horseshoe Bend.

2.4 Environmental Baseline

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

2.4.1 Water Development, Conveyance, and Flood Control

The diversion and storage of natural flows by dams and diversion structures on Central Valley watersheds has depleted stream flows in the tributaries feeding the Delta and altered the natural cycles by which juvenile and adult salmonids and sDPS green sturgeon base their migrations. Depleted flows have contributed to higher temperatures, lower dissolved oxygen (DO) levels, and decreased recruitment of gravel and large woody debris (LWD). More uniform flows year round have resulted in diminished natural channel formation, altered foodweb processes, and slower regeneration of riparian vegetation (Mount 1995, Herbold *et al.* 2018).

The development of the water conveyance system in the Delta has resulted in the construction of more than 1,100 miles of armored levees to increase channel flood capacity elevations and flow capacity of the channels (Mount 1995). Levee development in the Central Valley affects spawning habitat, freshwater rearing habitat, freshwater migration corridors, and freshwater riverine and estuarine habitat PBFs. Many of these levees use angular rock (riprap) to armor the bank from erosive forces. These changes affect the quantity and quality of nearshore habitat for juvenile salmonids (U.S. Fish and Wildlife Service 2000). Simple slopes protected with rock revetment generally create nearshore hydraulic conditions characterized by greater depths and faster, more homogeneous water velocities than occur along natural banks. Higher water velocities typically inhibit deposition and retention of sediment and woody debris. These changes generally reduce the range of habitat conditions typically found along natural shorelines, especially by eliminating the shallow, slow-velocity river margins used by juvenile fish as refuge and escape from fast currents, deep water, and predators.

2.4.2 Physical Disturbance from Dredging and Boating

Dredging of river channels to enhance inland maritime trade and to provide raw material for levee construction has also significantly and detrimentally altered the natural hydrology and function of the river systems in the Central Valley. This has led to declines in the natural meandering of river channels and the formation of pool and bar segments.

Currently, waters around Sherman Island experience heavy barge and recreational vessel traffic, creating hazards to listed fish species through both physical and acoustic disturbance. These impacts, including increased levels of noise and turbidity, may lead to direct mortality or may induce changes in behavior that impair feeding, rearing, migration, and/or predator avoidance. In a report on Delta boating needs through the year 2020, the California Department of Boating and Waterways stated an expected increase in boating activity in the Delta area (California Department of Boating and Waterways 2003).

2.4.3 Water Quality

Current land use in the Delta has seen a dramatic increase in urbanization, industrial activity, and agriculture. The water quality of the Delta has been negatively impacted over the last 150 years; increased water temperatures, decreased DO levels, and increased turbidity and contaminant loads have degraded the quality of the aquatic habitat for the rearing and migration of salmonids and sDPS green sturgeon. In general, water degradation or contamination can lead to either acute toxicity, resulting in death when concentrations are sufficiently elevated, or more typically, when concentrations are lower, to chronic or sublethal effects that reduce the physical health of the organism, and lessens its survival over an extended period of time.

Multiple studies have documented high levels of contaminants in the Delta such as polychlorinated biphenyls (PCBs), organochlorine pesticides, polycyclic aromatic hydrocarbons (PAHs), selenium, and mercury, among others (Stewart *et al.* 2004, Leatherbarrow *et al.* 2005, Brooks *et al.* 2012), suggesting that fish are exposed to them. Harmful algal blooms also occur in the Delta and, although toxic exposure of estuarine fish has been documented, the extent of their impacts to the aquatic food web is unknown (Lehman *et al.* 2010). More recently, concerns have been raised about ammonia levels in the Delta (Davis *et al.* 2018). Pesticides and herbicides are

found in the water and bottom sediments throughout the Delta. Herbicide use for the treatment and elimination of invasive aquatic vegetation may have important consequences for water quality parameters including: amount of light that reaches the water column, temperature, salinity, turbidity, and food availability, which may also influence the migratory paths that sDPS green sturgeon and salmonids utilize in the Delta (National Marine Fisheries Service 2018a).

2.4.4 Hydrology in the Delta

Substantial changes have occurred in the hydrology of the Central Valley's watersheds over the past 150 years. Many of these changes are linked to the ongoing actions of the Central Valley Project (CVP) and State Water Project (SWP). Reservoir operations flatten the natural hydrograph, resulting in a lack of the variability in seasonal and inter-annual runoff (Herbold *et al.* 2018). Currently, average winter/spring flows are typically reduced compared to natural conditions, while summer/fall flows have been artificially increased by reservoir releases.

These changes in the hydrographs of the two main river systems in the Central Valley are also reflected in the inflow and outflow of water to the Delta. The operations of the dams and water transfer operations of the CVP and SWP have reduced the winter and spring flows into the Delta, while artificially maintaining elevated flows in the summer and late fall periods. The Delta has become a stable freshwater body, which is more suitable for introduced and invasive exotic freshwater species of fish, plants, and invertebrates than for the native organisms that evolved in a fluctuating and "unstable" Delta environment. Additionally, operating the CVP and SWP and the resultant conditions that are created, reduce survival of juvenile salmonids outmigrating through the Delta. Prior to the protections established by the CVP and SWP operations Opinion (National Marine Fisheries Service 2009), mortality of winter-run Chinook salmon juveniles entering the interior of the Delta, was estimated to be approximately 66 percent, with a range of 35-90 percent mortality (Burau *et al.* 2007, Perry and Skalski 2008, Vogel 2008). Studies indicate overall mortality through the Delta for late fall-run Chinook salmon releases near Sacramento from 2006 through 2010 ranged from 46 to 83 percent (Perry *et al.* 2016).

2.4.5 Predation

Predation of juvenile salmonids and sDPS green sturgeon is thought to be a contributing factor to high mortality at this life stage (Hanson 2009, Vogel 2011, Michel *et al.* 2015). There have been significant alterations to aquatic habitat that are conducive to the success of non-native piscivorous fish such as creating a largely freshwater system out of the naturally estuarine, variable salinity Delta, riverbank armoring, and reduction of habitat complexity (Vogel 2011). The altered habitat and modified flow regimes have benefitted non-native striped bass, catfish, largemouth bass, and smallmouth bass, and Vogel (2011) found that predation was likely the highest source of mortality to anadromous fish in the Delta.

2.4.6 Status of ESA-listed Species in Action Area

The action area, which encompasses the banks of Horseshoe Bend, at and adjacent to the levee repair, functions as a migratory corridor for winter-run Chinook salmon, CV spring-run Chinook salmon, CCV steelhead, and sDPS green sturgeon. In addition, it also provides some use as holding and rearing habitat for each of these species. Juvenile salmonids may use the area for

rearing for several months during the winter and spring. sDPS green sturgeon use the area for rearing and migration year-round.

It is likely that adult winter-run Chinook salmon, CV spring-run Chinook salmon, CCV steelhead, and sDPS green sturgeon will pass through the action area on their way to their spawning grounds. Adult CCV steelhead utilize the area as a migration corridor to and from spawning grounds. No spawning of salmonids or sDPS green sturgeon occurs within the action area, therefore no eggs or fry of these species is expected to occur in the action area.

2.4.6.1 Status of Sacramento River Winter-run Chinook Salmon in the Action Area

Adult winter-run Chinook salmon typically migrate through the Delta between November and June with the peak occurring in March on their way to their spawning grounds. They travel to Sacramento River Basin tributaries as late as July (Lindley *et al.* 2004), and then hold in the upper tributaries. Spawning occurs from August through October, with a peak in September (Moyle 2002). Generally, juveniles migrate downstream in the winter and spring. Juvenile winter-run Chinook salmon occur in the Delta primarily from November through early May, using length-at-date criteria from trawl and seine data in the Delta (U.S. Fish and Wildlife Service 2016). Winter-run Chinook salmon may be present in the action area from November to June for adults, and November to early May for juveniles. Since in-river work will not be occurring during these months, winter-run Chinook salmon are not expected to be present during the Project's construction (August 1 to October 15).

2.4.6.2 Status of Central Valley Spring-run Chinook Salmon in the Action Area

Adult CV spring-run Chinook salmon migrate through the Delta from January to June, primarily from February to April (California Department of Fish and Game 1998). As with winter-run Chinook salmon, adult CV spring-run Chinook salmon may migrate through and rear within the action area, but are not expected to be present in the action area during the Project. From the tributaries, juveniles migrate downstream soon after emergence as young-of-the-year, or they remain in the creeks until the following fall, which appears to be more typical (Moyle *et al.* 1995). According to trawl and seine data in the Delta, juvenile CV spring-run Chinook salmon may be present in the Delta from January to May (U.S. Fish and Wildlife Service 2016). CV spring-run Chinook salmon may be present from January to June for adults, and January to May for juveniles. Since in-river work will not be occurring during these months, CV spring-run Chinook salmon are not expected to be present during the Project's construction.

2.4.6.3 Status of California Central Valley Steelhead in the Action Area

Adult CCV steelhead enter freshwater in August (Moyle 2002) and peak migration of adults move upriver in late September (Hallock *et al.* 1957). They will hold until flows are high enough in the tributaries to migrate upstream where they will spawn from December to April (Hallock *et al.* 1961). A small percentage of CCV steelhead (typically females) migrate back downstream from the tributaries and reach the Sacramento River during March and April, and have a high presence in the Delta in May. CCV steelhead juveniles (smolts) can start appearing in the action area as early as October (California Department of Fish and Wildlife 2016, U.S. Fish and Wildlife Service 2016). In the Sacramento River, juvenile CCV steelhead generally migrate to

the ocean in spring and early summer at 1 to 3 years of age, with peak migration through the Delta in March and April (Reynolds *et al.* 1993). CCV steelhead presence in CVP and SWP fish salvage facilities increases from November through January and peaks in February and March before rapidly declining in April. By June, emigration essentially ends, with only a small number of fish being salvaged through the summer. Since adult CCV steelhead may be present in the Delta during their migration upstream, they have a higher chance of being present during the Project than Chinook salmon. Though unlikely, juvenile CCV steelhead may be present during the month of October, towards the end of the in-river construction period (August 1 to October 15).

2.4.6.4 Status of Southern Distinct Population Segment of North American Green Sturgeon in the Action Area

For sDPS green sturgeon, the action area functions as migratory, holding, and rearing habitat for adults, sub-adults, and juveniles; their presence is considered year-round in the Delta. Both non-spawning adults and sub-adult sDPS green sturgeon use the Delta and estuary for foraging during the summer. sDPS green sturgeon spawning primarily occurs in cool sections of the upper mainstem Sacramento River (National Marine Fisheries Service 2018b), therefore no eggs or larval sDPS green sturgeon are expected to occur in the action area. Adult and juvenile sDPS green sturgeon may be present during the Project since they occur in the Delta year-round, but due to their small population size, few are expected to be present during in-river work activities.

2.4.7 Status of Critical Habitat within Action Area

The PBFs for winter-run Chinook salmon, CV spring-run Chinook salmon, and CCV steelhead critical habitat within the action area include freshwater rearing habitat and freshwater migration corridors. The features of the PBFs essential to the conservation of the above species include the following: sufficient water quantity and floodplain connectivity to form and maintain physical habitat conditions necessary for salmonid development and mobility, sufficient water quality, food and nutrients sources, natural cover and shelter, migration routes free from obstructions, no excessive predation, holding areas for juveniles and adults, and shallow water areas and wetlands. Habitat within the action area is primarily utilized for freshwater rearing and migration by CCV steelhead, CV spring-run Chinook salmon, and winter-run Chinook salmon smolts and for adult migration of mainly CCV steelhead. Adult winter-run Chinook salmon and CV spring-run Chinook salmon likely pass the area on their way to their spawning grounds. No spawning of CCV steelhead, CV spring-run Chinook salmon, or winter-run Chinook salmon occurs within the action area.

In regards to the designated critical habitat for sDPS green sturgeon, the action area includes PBFs which provide: adequate food resources for all life stages utilizing the Delta; water flows sufficient to allow adults, sub-adults, and juveniles to orient to flows for migration and normal behavioral responses; water quality sufficient to allow normal physiological and behavioral responses; unobstructed migratory corridors for all life stages utilizing the Delta; a broad spectrum of water depths to satisfy the needs of the different life stages present in the Delta and estuary; and sediment with sufficiently low contaminant burdens to allow for normal physiological and behavioral responses to the environment.

The substantial degradation over time of several of the essential critical elements has diminished the function and condition of the freshwater rearing and migration habitats in the action area. Even though the habitat has been substantially altered and its quality diminished through years of human actions, its conservation value remains high for winter-run Chinook salmon, CV spring-run Chinook salmon, CCV steelhead, and sDPS green sturgeon. A number of juvenile and adult salmonids and sDPS green sturgeon likely pass the site and spend some time there on their way to or from the ocean.

2.5 Effects of the Action

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

To evaluate the effects of the Project, NMFS analyzed construction-related impacts and the fish response to habitat alterations. We also reviewed and considered the proposed conservation measures. This assessment relied heavily on the information from the biological assessment for this Project.

Our assessment considered the nature, duration, and extent of the Project relative to the spawning, rearing, and migration timing, behavior, and habitat requirements of all life stages of Federally listed fish in the action area. Effects of the levee repair on aquatic resources include both short- and long-term effects. Short-term effects, which are related primarily to construction activities (i.e., increased suspended sediment and turbidity, noise, etc.), may last several hours to several weeks. Long-term effects may last months or years and generally involve physical alteration of the riverbank.

The levee repair will also contribute to the continued confinement of the riverine system that in turn negatively impacts listed fish species and their designated critical habitats. This analysis also evaluates the long-term impacts of the levee repair on fish species and their critical habitat.

2.5.1 Construction Impact Analysis for Salmonids and sDPS Green Sturgeon

Adult and juvenile winter-run Chinook salmon, CV spring-run Chinook salmon, CCV steelhead, and sDPS green sturgeon are likely to occur in the action area; however, only CCV steelhead and sDPS green sturgeon are likely to be present during the in-water construction work window (August 1 to October 15), and only in low numbers. No spawning habitat for CCV steelhead, CV spring-run Chinook salmon, winter-run Chinook salmon, or sDPS green sturgeon is present in the action area; therefore, no adverse effects to spawning adults or incubating eggs are expected.

Direct effects associated with in-river construction work will involve equipment and activities that will produce underwater noise and vibration, thereby temporarily altering in-river conditions. These changes can also impair feeding behaviors, which in turn impact ability to grow and survive. Juvenile fish are the most vulnerable to these changes, since adults are better able to quickly swim away from the construction sites and escape injury. Construction

disturbance can cause injury or harm by increasing the susceptibility of some individuals to predation by temporarily disrupting normal sheltering behaviors. Only those fish that are holding adjacent to or migrating past the levee repair site will be directly exposed or affected by construction activities. Those fish that are exposed to the effects of construction activities will encounter short-term (i.e., minutes to hours) construction-related noise and physical disturbance.

Construction-related noise has the potential to disrupt behavior of any CCV steelhead or sDPS green sturgeon present in the action area, causing them to travel away from the disturbance to adjacent areas with similar habitats. This could result in temporary displacement from rearing habitat. However, CCV steelhead and sDPS green sturgeon are expected to avoid the work area, and based on salvage and DJFMP monitoring data, we expect that fish will either be present at low numbers or not present at all. Additionally, sDPS green sturgeon are expected to be present in benthic environments and closer to the mid-channel of the river, and not the shallow, near-bank habitats. Furthermore, barge anchor piles will be driven by their own weight and not by hammer, which will minimize acoustic stress during construction. Therefore, listed fish species are unlikely to be negatively affected by the low levels of noise produced during construction activities.

Turbidity and sedimentation events are not expected to affect visual feeding success of sDPS green sturgeon, as they are not believed to utilize visual cues (Sillman *et al.* 2005). sDPS green sturgeon, which can occupy waters containing variable levels of suspended sediment and, thus, turbidity, are not expected to be impacted by the slight increase in the turbidity levels anticipated from the Project. Increases in turbidity can harm salmonids by temporarily burying submerged aquatic vegetation that supports invertebrates for feeding juvenile fish, leading to reduced growth and survival. High turbidity can also damage a fish's gills, interfere with cues necessary for orientation in homing and migration, and reduce available spawning habitat (Bash *et al.* 2001). However, BMPs for the Project will minimize the amount of turbidity caused by the Project, such that turbidity levels are not likely to result in negative affects to listed fish species.

Toxic substances used at construction sites, including gasoline, lubricants, and other petroleum-based products, could enter the waterway as a result of spills or leakage from machinery, and could potentially injure listed salmonids and sDPS green sturgeon. Petroleum products also tend to form oily films on the water surface that can reduce DO available to aquatic organisms. The exposure to these substances can kill fish directly in high enough concentrations through acute toxicity or suffocation from lack of oxygen. These chemicals may also kill the prey of listed fish species, reducing their ability to feed and therefore grow and survive. However, due to adherence of BMPs that dictate the use, containment, and cleanup of contaminants, the use of toxic substances at the construction site is not likely to result in negative affects to listed fish species.

Five riparian trees and shrubs growing in existing riprap will be removed from the water side of the levee. Riparian forests provide habitat for adult terrestrial insects once they emerge from the water. Salmonids prey on the aquatic life stage of these insects. Removal of riparian vegetation can impact an important food source for salmonids. However, since the area of disturbance is small in size and there are surrounding areas with similar habitat type, the removal of five riparian trees and shrubs is not expected to impact the population of aquatic insects in the action area.

The waterside slope currently consists of riprap, grasses and sparse riparian trees and shrubs. A total of 0.277 acres of habitat below MHW will be covered with new riprap along a 500-foot stretch. A 500-foot waterside bench will be created along the 500-foot repair. Below MHW, only clean RSP will be placed, and above MHW, the RSP will be filled with soil to support growth of vegetation. The waterside bench, approximately three feet wide, will be covered in nine inches of soil and replanted with native riparian plant species, which may have beneficial effects, such as aquatic cover and decreased water temperature. RSP placed below MHW will provide habitat for bass and other predators that feed on outmigrating smolts. We expect there to be negative affects to the listed species in the form of harm from habitat degradation and death from predation along 500 feet (0.277 acres) of shoreline below MHW for a period of at least 50 years, which is the standard engineered life expectancy of a levee repair project.

2.5.2 Project Effects on Critical Habitat

The Project is located within critical habitat for winter-run Chinook salmon, CV spring-run Chinook salmon, CCV steelhead and sDPS green sturgeon. Revetment will be placed along a total of 500 linear feet along Horseshoe Bend. Approximately 0.277 acres of riprap will be placed below MHW, creating an area of unproductive, low quality habitat along the interface of the channel bottom and the bank slope. The effects of the Project will result in continued fragmentation of existing habitat, and conversion of nearshore aquatic to simplified habitats that have negative effects on salmonids and sDPS green sturgeon. This Project is expected to negatively impact several of the PBFs of critical habitat for salmonids, including freshwater rearing habitat and migration corridors for juveniles. Implementing the proposed repair would negatively affect freshwater rearing sites due to the installation of RSP, which reduces natural cover and support of juvenile growth and mobility.

The PBF of migratory corridors for adults is not expected to be impacted, as migrating adult salmonids tend to stay in deeper waters and are unlikely to use the nearshore habitat that will be affected by the Project. Furthermore, the site will not include the installation of any features that are expected to block or impede juvenile or adult migration. No spawning habitat for winter-run Chinook salmon, CV spring-run Chinook salmon, or CCV steelhead is present in the action area, therefore adverse effects to spawning habitat PBF are not expected.

The Project is expected to negatively impact several of the PBFs of critical habitat for sDPS green sturgeon, including food resources and substrate. The PBF of food resources, which refers to the availability of prey items for juvenile, sub-adult, and adult life stages, is expected to be negatively affected by the installation of 500 linear feet of rock revetment at the levee repair site. The installation of rock revetment below MHW will impair sDPS green sturgeon foraging habitat, thereby reducing the availability of prey. Similarly, the PBF of sediment quality will also be negatively affected, as part of the natural substrate will be permanently covered with large rocks and will no longer be available as foraging habitat. The levee repair is not expected to permanently impact the PBFs of water flow or water quality, migration corridors (i.e., pathways necessary for the safe and timely passage of all life stages), or depth (i.e., availability of deep pools for use as holding habitat), since the site will not include the installation of any features that are expected to block or impede juvenile or adult migration, alter any deep pools, or

permanently alter water quality. No spawning habitat for sDPS green sturgeon is present in the action area, therefore adverse effects to spawning habitat PBF are not expected.

To address permanent impacts to riparian and aquatic habitat, the Project includes replanting riparian vegetation with native species at a 3:1 ratio for all woody-riparian vegetation removed. Native vegetation, including a variety of trees, shrubs, and herbaceous plants, will be installed in the soil-filled RSP section of the repair and on the constructed 500-foot waterside bench. The proposed habitat creation will work toward restoring the loss of ecosystem functions due to the modification of the riverbank. The lag time between the installation of the plantings and vegetation growth, means that the site will not reap the full benefits of the riparian corridor habitat for several months to a year, or longer depending on the success of the planting. However, minimal vegetation currently exists on the levee, so the addition of native vegetation will improve conditions and the affected area will recover some of the habitat values lost.

2.6 Cumulative Effects

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

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

2.6.1 Agricultural Practices

Agricultural practices may negatively affect riparian and wetland habitats through upland modifications that lead to increased siltation or reductions in water flow. Grazing activities from dairy and cattle operations can degrade or reduce suitable critical habitat for listed salmonids by increasing erosion and sedimentation. These practices introduce nitrogen, ammonia, and other nutrients into the watershed, which then flow into receiving waters (Lehman *et al.* 2014). Salmonid and sturgeon exposure to contaminants is inherent in the Delta, ranging in the degree of effects. Stormwater and irrigation discharges related to agricultural activities contain numerous pesticides, herbicides, and other contaminants that may disrupt various physiological mechanisms and negatively affect reproductive success and survival rates of listed anadromous fish (Dubrovsky 1998, Scott and Sloman 2004, Whitehead *et al.* 2004, Scholz 2012).

2.6.2 Recreational Activities in the Region

From 2016 to 2060, California's population is projected to grow by 30 percent: from 39.4 million to 51.1 million (0.6 percent annually; California Department of Finance 2017). Furthermore, growth projections through 2050 indicate that all counties overlapping the Delta

are projected to grow at a faster rate than the state as a whole (Delta Protection Commission 2012). Accompanying population growth will be 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 suspending contaminated sediments and degrading areas of submerged vegetation. This in turn will reduce habitat quality for the invertebrate forage base required for the survival of juvenile salmonids and sDPS green sturgeon moving through the action area. 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.

2.7 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 diminishes the value of designated or proposed critical habitat for the conservation of the species.

2.7.1 Status of the Sacramento River Winter-run Chinook Salmon ESU

Lindley *et al.* (2007) determined that the winter-run Chinook salmon population is at a moderate extinction risk according to population viability analysis, and at a low risk according to other criteria (i.e., population size, population decline, the risk of wide-ranging catastrophe, hatchery influence). Data used in Lindley *et al.* (2007) did not include the significant decline in escapement numbers from 2007 to 2012. Lindley *et al.* (2007) also states that the winter-run Chinook salmon ESU fails the "representation and redundancy rule" because it has only one population and that population spawns outside of the eco-region in which it evolved. An ESU represented by only one spawning population at moderate risk of extinction is at a high risk of extinction (Lindley *et al.* 2007). The National Marine Fisheries Service (2016b) 5-year Status Review of the winter-run Chinook salmon ESU demonstrated that the winter-run Chinook salmon ESU has further declined, and that continued loss of historical habitat and the degradation of remaining habitat continue to be major threats to the winter run Chinook salmon ESU (National Marine Fisheries Service 2016b). NMFS concludes that winter-run Chinook salmon ESU remains at high risk of extinction.

The population impacted is considered a Core 1 population by NMFS recovery plan for the ESU, meaning it has the potential to support a viable population, and recovery of the population through threat abatement efforts and recover actions should be considered a high priority (National Marine Fisheries Service 2014). Given the high priority nature of the population to recovery, harm to this population is considered especially detrimental to the ESU.

2.7.2 Status of the Central Valley Spring-run Chinook Salmon ESU

In the 2016 status review (National Marine Fisheries Service 2016a), NMFS found, with a few exceptions, CV spring-run Chinook salmon populations had increased through 2014 returns since the last status review (2010/2011), which moved the Mill and Deer creek populations from the high extinction risk category, to moderate, and Butte Creek remaining in the low risk of extinction category. Additionally, the Battle Creek and Clear Creek populations continued to show stable or increasing numbers in that period, putting them at moderate risk of extinction based on abundance. Overall, the Southwest Fisheries Science Center concluded in their viability report that the status of CV spring-run Chinook salmon (through 2014) had probably improved since the 2010/2011 status review and that the ESU's extinction risk may have decreased. However, the 2015 returning fish were extremely low (1,488), with additional pre-spawn mortality reaching record lows. Since the effects of the 2012 to 2015 drought have not been fully realized, NMFS anticipates at least several more years of very low returns, which may result in severe rates of decline (National Marine Fisheries Service 2016a). This is supported by monitoring data which shows sharp declines in adult returns from 2014 through 2018 (California Department of Fish and Wildlife 2018).

2.7.3 Status of the California Central Valley Steelhead DPS

The 2016 status review (National Marine Fisheries Service 2016c) found that overall the status of CCV steelhead appears to have changed little since the 2011 status review, and concluded that the DPS was likely to become endangered within the foreseeable future throughout all or a significant portion of its range. Further, there is still a general lack of data on the status of natural-origin populations. There are some encouraging signs, as several hatcheries in the Central Valley have experienced increased returns of CCV steelhead over the last few years. Video counts at Ward Dam show that Mill Creek likely supports one of the best natural-origin steelhead populations in the Central Valley, though at much reduced levels from the 1950s and 60s. Restoration efforts in Clear Creek continue to benefit CCV steelhead. There has also been a slight increase in the percentage of natural-origin CCV steelhead in salvage at the south Delta fish facilities, and the percentage of natural-origin fish in those data remains much higher than at Chipps Island. However, the catch of unmarked (natural-origin) steelhead at Chipps Island is still less than 5 percent of the total smolt catch (U.S. Fish and Wildlife Service 2019), which indicates that natural production of CCV steelhead throughout the Central Valley remains at very low levels. Despite the positive trend on Clear Creek and encouraging signs from Mill Creek, all other concerns raised in the previous status review (National Marine Fisheries Service 2016c)remain.

2.7.4 Status of the North American Green Sturgeon DPS

The viability of sDPS green sturgeon is constrained by factors such as a small population size, lack of multiple populations, and concentration of spawning sites into just a few locations. The risk of extinction is believed to be moderate because, although threats due to habitat alteration are thought to be high and indirect evidence suggests a decline in abundance, there is much uncertainty regarding the scope of threats and the viability of population abundance indices (National Marine Fisheries Service 2018b).

Although the population structure of sDPS green sturgeon is still being refined, it is currently believed that only one population of sDPS green sturgeon exists. Lindley *et al.* (2007), in discussing winter-run Chinook salmon, states that an ESU represented by a single population at moderate risk of extinction is at high risk of extinction over the long run. This concern applies to any DPS or ESU represented by a single population, and if this were to be applied to sDPS green sturgeon directly, it could be said that sDPS green sturgeon face a high extinction risk. However, NMFS, upon weighing all available information (and lack of information) has stated the extinction risk to be moderate (National Marine Fisheries Service 2018b).

There is a strong need for additional information about sDPS green sturgeon, especially with regards to a robust abundance estimate, a greater understanding of their biology, and further information about their micro- and macro-habitat ecology.

2.7.5 Status of the Environmental Baseline and Cumulative Effects

The Cumulative Effects and Environmental Baseline sections of this BO describe how past and present actions such as discharge of point and non-point source chemical contaminant discharges, flood control, water diversions, and physical disturbance (ex. boating) affect the species in the action area. These actions typically result in habitat fragmentation, and conversion of complex nearshore aquatic habitat to simplified habitats that incrementally reduces the carrying capacity of the rearing and migratory corridors.

The action area, which encompasses the banks of Horseshoe Bend and adjacent to the levee repair, functions primarily as a rearing and migratory habitat for winter-run Chinook salmon, CV spring-run Chinook salmon, and CCV steelhead smolts. Even though the habitat has been substantially altered and its quality diminished through years of human actions, its conservation value remains high for the winter-run Chinook salmon ESU, the CV spring-run Chinook salmon ESU, the CCV steelhead DPS, and the sDPS green sturgeon. A number of juvenile and adults representing these DPSs and ESUs likely pass the action area and spend some time there on their way to or from the ocean.

2.7.6 Summary of Project Effects on Salmonids and sDPS Green Sturgeon

2.7.6.1 Temporary Construction-Related Effects

Construction activities are expected to result in impacts to ESA-listed anadromous fish species due to noise, turbidity, or predation related to displacement of individuals away from the shoreline or at the margins or turbidity plumes. However, since these construction actions will occur during the in-water work window (August 1 to October 15), when the abundance of individual salmonids and sDPS green sturgeon is low, and with the implementation of the avoidance and minimization measures, impacts are not expected to reach the level where fish are negatively affected.

2.7.6.2 Effects Related to the Presence of Project Features

For outmigrating juvenile Chinook salmon and CCV steelhead, the Project will result in some short-term and long-term negative effects to individuals that are exposed to the project features along Horseshoe Bend. Five riparian trees and shrubs are proposed for removal below MHW. Above MHW soil-filled riprap will be planted with native riparian vegetation; however, the toe of the repair will remain bare rock. The loss of aquatic habitat in existing riprap is expected to decrease food availability, reduce cover and increase temperatures in the action area, resulting in reduced growth and survival.

Migrating adult Chinook salmon and CCV steelhead kelts (post spawning steelhead adults) will not be impacted because adult salmonids are unlikely to use the nearshore habitat that will be affected by the Project since they tend to remain in deeper waters instead of shallow areas. Furthermore, the Project will not cause an increase in predation on adults or install any structural features that might impede adult migration. The Project is in the migration corridor for adult Chinook and CCV steelhead on the way to their spawning grounds. No spawning occurs in the action area, therefore eggs and fry will not be impacted by the Project.

For fry and juvenile rearing sDPS green sturgeon, shoreline habitat conditions are negatively impacted compared to the environmental baseline. The worsened conditions begin immediately after construction, but will gradually recover as the plantings on the waterside slope mature and soil accumulates on top of the riprap. The Project will permanently cover some benthic substrate that provides food resources of juvenile and adult sDPS green sturgeon, although this area covered represents a very small fraction of the adjacent habitat available in the Delta. The loss of benthic substrate is expected to reduce food availability to juvenile and adult sDPS green sturgeon, resulting in decreased growth and survival.

2.7.7 Summary of Project Effects on Salmonids and Green Sturgeon Critical Habitat

Within the action area, the relevant PBFs of the designated critical habitat for listed salmonids are migratory corridors and rearing habitat, and for sDPS green sturgeon the PBFs include food resources, substrate type/size, flow, water quality, migration corridor free of passage impediments, depth (holding pools), and sediment quality.

The PBFs of freshwater rearing habitat and migration corridors for juvenile salmon and CCV steelhead is expected to be affected by the removal of degraded riprap with established benthic substrate and the permanent installation of bare RSP at the toe of the repair. These activities are expected to reduce the quality of this habitat for rearing and migrating juvenile salmonids. The PBF of migratory corridors for adults will not be impacted, as migrating adult Chinook salmon and CCV steelhead are unlikely to use the nearshore habitat that will be affected by this Project, as they tend to stay in deeper waters. Furthermore, the Project will not include the installation of any features that are expected to block or impede juvenile or adult migration.

sDPS green sturgeon PBFs of substrate type/size and food resources will be negatively affected by the proposed Project, as project features will cover the soft benthic substrate where sDPS green sturgeon forage for food within riprap, reducing food availability. However, the amount of

benthic substrate lost is small compared to the amount of available habitat in the lower Sacramento River and Delta.

As compensatory mitigation for these impacts, the RSP above MHW will be mixed with soil and planted with native vegetation. Additionally, a 500-foot habitat bench will be constructed and covered in a layer of soil. This bench will be replanted to create an area of riparian corridor habitat, which is expected to lessen the impacts of the Project in the long-term.

2.7.8 Summary

Although there are some permanent impacts from the proposed Project, when added to the environmental baseline and cumulative effects, the impacts from the proposed Project in the action area are small, and in some cases occur during seasons when fish abundance is low. As compensatory mitigation for the effects of the Project, the applicant plans to install riparian plantings along the 500-foot long waterside bench at a 3:1 ratio for all woody-riparian vegetation removed. This amount of restoration spans the spatial footprint of the levee repair. The replanting will create 0.314 new acres of a native riparian corridor, including approximately: 0.034 acres of shaded riverine aquatic habitat, 0.109 acres of riparian scrub-shrub habitat, and 0.171 acres of native grassland habitat, at the repair location. Therefore, the Project is not expected to reduce appreciably the likelihood of either the survival and recovery of a listed species in the wild by reducing their numbers, reproduction, or distribution; or appreciably diminish the value of designated critical habitat for the conservation of the species.

2.8 Conclusion

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

2.9 Incidental Take Statement

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

2.9.1 Amount or Extent of Take

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

NMFS anticipates incidental take of winter-run Chinook salmon, CV spring-run Chinook salmon, CCV steelhead, and the sDPS green sturgeon in the action area through alteration of habitat conditions in a manner that would disrupt normal behavior. Because of proposed Project timing, actual numbers of fish negatively affected are expected to be low. NMFS cannot, using the best available information, precisely quantify and track the amount or number of individuals that are expected to be incidentally taken (injure, harm, kill, etc.) per species as a result of the Project due to the variability and uncertainty associated with the long-term response of listed species to the effects of the Project, the varying population size of each species, annual variations in the timing of spawning and migration, individual habitat use within the action area, and difficulty in observing harassed, injured, or dead fish. 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 negative effects to listed species, that are more predictable and/or measurable, with the ability to monitor those surrogates to determine the extent of take that is occurring.

The most appropriate threshold for incidental take is an ecological surrogate of habitat degradation, which includes the degradation of aquatic habitat, through the placement of rock revetment below MHW. The behavioral modifications or fish responses that result from the habitat disturbance are described below. NMFS anticipates annual take will be limited to the following forms:

1. Take in the form of harm to rearing juvenile winter-run Chinook salmon, CV spring-run Chinook salmon, CCV steelhead, and adult and juvenile sDPS green sturgeon from the degradation of aquatic habitat from the placement of 0.277 acres of RSP below MHW along 500 feet of levee. This habitat loss will affect juvenile winter-run Chinook salmon, CV spring-run Chinook salmon, CCV steelhead, and juvenile and adult sDPS green sturgeon through displacement, increased predation, and loss of food, resulting in decreased growth and survival for a period of up to 50 years, which is the standard engineered life expectancy of rock revetment placed on a levee project.

Incidental take will be exceeded if the amount of habitat disturbance described in the surrogate is exceeded.

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 Project, is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

2.9.3 Reasonable and Prudent Measures

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

1. Measures shall be taken to ensure that contractors, construction workers, and all other parties involved with this Project implement the Project as proposed in the biological assessment (BA) and this BO.

2. Measures shall be taken to monitor the survival of on-site plantings.

2.9.4 Terms and Conditions

The terms and conditions described below are non-discretionary, and the USACE or any applicant must comply with them in order to implement the RPMs (50 CFR 402.14). The 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. The USACE shall provide a copy of this BO to the prime contractor, making the prime contractor responsible for implementing all requirements and obligations included in this document and to educate and inform all other contractors involved in the Project of the requirements of the BO. A notification that contractors have been supplied with this information will be provided to the reporting address below.

    b. A NMFS-approved Worker Environmental Awareness Training Program for construction personnel shall be conducted by a NMFS-approved biologist for all construction workers prior to the commencement of construction activities. The program shall provide workers with information on their responsibilities with regard to Federally-listed fish species, their critical habitats, an overview of the life history of all the species, information on take prohibitions, protections afforded these animals under the ESA, and an explanation of the relevant terms and conditions of the BO.

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

    a. The USACE/Reclamation District 341 shall monitor the on-site plantings for a minimum of five years, at which point they should achieve the success criteria detailed in the planting and monitoring plan (called the “Restoration Plan” in the BA). Remediation shall occur if the plantings do not meet this success criteria at the end of the five-year period.

    b. The USACE/Reclamation District 341 shall submit an annual monitoring report to NMFS regarding the status of their on-site plantings. All reports for NMFS shall be sent to:

        California Central Valley Office
        National Marine Fisheries Service
        650 Capitol Mall, Suite 5-100

Sacramento, California 95814
FAX: (916) 930-3629
Phone: (916) 930-3600

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 continue to work cooperatively with other State and Federal agencies, private landowners, governments, and local watershed groups to identify opportunities for cooperative analysis and funding to support salmonid habitat restoration projects.

2. USACE should consider minimizing the impacts of bank protection by implementing off-site conservation measures and should only purchase salmon and steelhead credits from NMFS-approved mitigation banks.

3. USACE should make set-back levees an integral component of the USACE's authorized bank protection or ecosystem restoration efforts, and should begin early intervention bank protection efforts using setback levees and biotechnical approaches, which may preclude later use of rock revetment.

4. USACE should conduct or fund studies to identify set-back levee opportunities, at locations where the existing levees are in need of repair or where set-back levees could be built. Removal of the existing riprap from abandoned levees should be considered.

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 Levee Erosion Repair on Sherman Island Project.

As 50 CFR 402.16 states, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained or is authorized by law and if: (1) The amount or extent of incidental taking specified in the ITS is exceeded, (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this BO, (3) the agency action is subsequently modified in a manner that causes an effect on the listed species or critical habitat that was not considered in this BO, 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 the USACE and descriptions of EFH for Pacific Coast salmon (PFMC 2014) contained in the Fishery Management Plan (FMP) developed by the Pacific Fishery Management Council (PFMC) and approved by the Secretary of Commerce.

3.1 Essential Fish Habitat Affected by the Project

EFH designated by the Pacific Coast Salmon FMP may be affected by the proposed action. Habitat Areas of Particular Concern (HAPCs) that may be either directly or indirectly adversely affected include (1) complex channels and floodplain habitats, and (2) estuaries.

3.2 Adverse Effects on Essential Fish Habitat

The effects of the proposed action on Pacific Coast salmon EFH will be similar to those discussed in the *Effects of the Action* section (2.5) for winter-run and CV spring-run Chinook salmon. Based on the information provided, NMFS concludes that the proposed action would adversely affect EFH for federally managed Pacific salmon. Adverse effects to HAPCs are appreciably similar to effects to critical habitat, therefore no additional discussion is included. Listed below are the adverse effects on EFH reasonable certain to occur. Affected HAPCs are indicated by number, corresponding to the list in Section 3.1:

1. Sedimentation and Turbidity
   - Reduced habitat complexity (1, 2)
   - Degraded water quality (1, 2)
   - Reduction in aquatic macroinvertebrate production (1, 2)

2. Contaminants and Pollution-related Effects
   - Degraded water quality (1, 2)
   - Reduction in aquatic macroinvertebrate production (1, 2)

3. Installation of RSP
- Permanent loss of natural substrate at levee toe (1, 2)
- Reduced habitat complexity (1, 2)
- Increased bank substrate size (1, 2)
- Increased predator habitat (1, 2)

The terms and conditions and conservation recommendations in the preceding BO contain adequate measures to avoid, minimize, or otherwise offset the adverse effects to EFH, and are incorporated here by reference. NMFS has no additional EFH conservation recommendations to provide.

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

The USACE must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a way that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH Conservation Recommendations (50 CFR 600.920(l)).

4. 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. The applicant should recommend that contractors use biodegradable lubricants and hydraulic fluid in construction machinery. The use of petroleum alternatives can greatly reduce the risk of contaminants such as polycyclic aromatic hydrocarbons (PAHs) or heavy metals directly or indirectly entering the aquatic ecosystem.

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

5.1 Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended users of this BO are the USACE and Reclamation District 341. Other interested users could include the United States Fish and Wildlife Service, the California Department of Fish and Wildlife, and the California Department of Water Resources. Individual copies of this BO were provided to the USACE. The format and naming adheres to conventional standards for style.

5.2 Integrity

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

5.3 Objectivity

Information Product Category: Natural Resource Plan

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

Best Available Information: This consultation and supporting documents use the best available information, as referenced in the References section. The analyses in this BO 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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