RECLAMATION

Managing Water in the West

Environmental Assessment

Delta Smelt Fall Outflow in 2017

U.S. Department of the Interior
Bureau of Reclamation
Mid Pacific Region

SEPTEMBER 2017

Mission Statements

The Department of the Interior protects and manages the Nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its trust responsibilities or special commitments to American Indians, Alaska Natives, and affiliated island communities.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

Table of Contents

Table of Contents iii
Section 1 Introduction 5
1.1 Background 5
1.2 Purpose and Need for the Project 9
Section 2 Alternatives Including the Proposed Action 11
2.1 No Action Alternative 11
2.2 Proposed Action Alternative 11
Section 3 Affected Environment and Environmental Consequences 12
3.1 Water Resources 13
3.1.1 Affected Environment 13
3.1.2 Environmental Consequences 15
3.2 Biological Resources 19
3.2.1 Affected Environment 19
3.2.2 Environmental Consequences 20
3.3 Cumulative Effects 25
Section 4 Consultation & Coordination 26
4.1 Public Review Period 26
4.2 Federal Laws, Regulations, and Policies 26
Section 7 of the Endangered Species Act (16 USC § 1531 et seq.) 26
Magnuson-Stevens Fishery Conservation and Management Act 26
Fish and Wildlife Coordination Act 27
Section 5 References 28

List of Figures and Tables

Figure 1. Delta water quality locations of interest and distances from Golden Gate in km 10
Figure 2. Distance from the Golden Gate for Mallard Slough and Collinsville 14
Figure 3. Forecasted Daily X2 Location 16
Figure 4. Forecasted Daily Electrical Conductivity at Collinsville, CA 18
Figure 5. Forecasted Daily Electrical Conductivity at Mallard Slough. 19
Figure 6. Percentage of time with salinity <6 for X2 = 80 km. 23
Figure 7. Percentage of time with salinity <6 for X2 = 81 km 23
Table 1. Location of X2 for 2017 (no more eastward than) 12
Table 2. Monthly Mean X2 from Mean Daily Forecast, September – November 2017 15
Table 3. End of Month Storage in San Luis (State) (TAF) (50% exceedance) 16
Table 4. End of Month Storage in San Luis (Federal) (TAF) (50% exceedance) 17

List of Appendices

Appendix A - Effects Analysis for the Proposed 2017 Fall X2 Action
Appendix B – Exceedance Forecasts (50% and 90% for SWP and CVP)
Appendix C – Request for Reinitation and Service Response
Appendix D – Comments and Responses
Appendix E – Responses to Delta Smelt Scoping Team and NRDC on the Effects Analysis

List of Acronyms and Abbreviations

Action 4	Component 3 - Action 4: Estuarine Habitat During Fall
AMP	Adaptive Management of Fall Outflow for Delta Smelt and Water Supply Reliability
BO	Biological opinion
CCWD	Contra Cost Water District
CDFW	California Department of Fish and Wildlife
CFR	Code of Federal Regulations
cfs	cubic feet per second
COA	Coordinated Operation Agreement
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
D-1641	SWRCB Decision 1641
Delta	Sacramento-San Joaquin Delta Estuary
DPS	Distinct Population Segment
DSM2	Delta Simulation Model II
DWR	Department of Water Resources
EA	Environmental Assessment
EC	electrical conductivity
EDSM	Enhanced Delta Smelt Monitoring
EFH	Essential Fish Habitat
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FLaSH	Fall Low Salinity Habitat Studies and Adaptive Management
FR	Federal Register
IEP	Interagency Ecological Program
JPOD	Joint Point of Diversion
km	kilometer
LSZ	Low-salinity zone
MAST	Management, Analysis, and Synthesis Team
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
PCE	Primary Constituent Elements
ppt	parts per thousand salinity
psu	practical salinity units
Reclamation	Bureau of Reclamation
RPA	Reasonable and Prudent Alternative
Service	U.S. Fish and Wildlife Service
SWP	State Water Project
SWRCB	California State Water Resources Control Board
USC	U.S. Code
X2	two parts per thousand salinity isohaline
SWRCB	State Water Resources Control Board
TAF	thousand acre-feet
TDS	total dissolved solids

Section 1 Introduction

In conformance with the National Environmental Policy Act, 42 U.S.C. § 4431 et seq. (NEPA), as amended, the Bureau of Reclamation (Reclamation) has prepared this Environmental Assessment (EA) to evaluate and disclose potential environmental impacts associated with implementation of the Delta Smelt Fall Outflow in 2017 (Proposed Action).

This EA describes the existing environmental resources in the project area, evaluates the impacts of the No Action and Proposed Action alternatives on the resources The Proposed Action, as described below, was updated to avoid adverse impacts to Delta Smelt. This EA was prepared in accordance with NEPA, Council on Environmental Quality regulations (40 Code of Federal Regulations (CFR) 1500-1508), and Department of the Interior Regulations (43 CFR Part 46).

Compliance with NEPA is a Federal responsibility and involves the participation of Federal, State, tribal, and local agencies, as well as concerned and affected members of the public in the planning process. NEPA requires that Federal agencies analyze and disclose the potential environmental impacts and possible mitigation for Federal actions and a reasonable range of alternatives to the proposed action. NEPA is required when a discretionary Federal action is proposed. The regulations (40 CFR 1508.18(a)) define a Federal action as including new and continuing activities, actions partly or entirely financed by Federal agencies (where some control and responsibility over the action remain with the Federal agency [43 CFR 46.100]), actions conducted by Federal agencies, actions approved by Federal agencies, new or revised agency rules or regulations, and proposals for legislation.

1.1 Background

In 2008, the US Fish and Wildlife (Service) provided Reclamation a Biological Opinion (BO) on the Coordinated Long-Term Operation of the Central Valley Project (CVP) and State Water Project (SWP) under Section 7 of the Endangered Species Act (ESA). The 2008 BO concluded that, as proposed, the CVP and SWP operations were likely to jeopardize the continued existence of Delta Smelt (*Hypomesus transpacificus*). The 2008 BO set forth a Reasonable and Prudent Alternative (RPA) with actions that allow for continued operation of the CVP and SWP in compliance with ESA. The RPA actions include revised water operations and habitat restoration and enhancement.

The low-salinity zone (LSZ) is where freshwater meets saltwater (Kimmerer 2004). Changes in the low-salinity zone (LSZ) are indexed by changes in the two parts per thousand salinity (ppt) isohaline (X2), which is described as distance in kilometers (km) from the Golden Gate Bridge (Jassby et al 1995). For example, an X2 at 81 km is when the average daily salinity at the bottom of the water is 2 ppt near Collinsville, California. The location of X2 is commonly reported in practical salinity units (psu), in accordance with a change in units in 1978, but psu are approximately equivalent to ppt. The location of X2 is also used as an indicator of delta outflow and habitat suitability for organisms in the San Francisco Estuary. A lower X2 – i.e. salts pushed further out to sea – results in more LSZ habitat.

The Proposed Action is an effort to respond to RPA Component 3 - Action 4: *Estuarine Habitat During Fall* (Action 4). Action 4 expressly requires that the Fall X2 action be adaptively

managed, to ensure that the implementation of the action addresses the uncertainties of its effectiveness and water-efficiency. The action also states that as new information is developed and as circumstances warrant, changes to the Fall X2 action itself may be necessary. As described in more detail below, in 2011 Reclamation provided the Service with an updated Adaptive Management Plan that provided a framework to implement Fall X2.

The objective of Action 4 is to improve Delta Smelt fall habitat by increasing Delta outflow in an Above Normal or Wet Year. Specifically, the action calls for providing sufficient Delta outflow to maintain average X2 for September and October no greater (more eastward) than 74 km in the fall following Wet Years and 81 km in the fall following Above Normal Years based upon the Sacramento Basin 40-30-30 index in the State Water Resources Control Board (SWRCB) Decision 1641 (D-1641). In November of these years, there is no specific X2 requirement; however, there is a requirement that all inflow into SWP and CVP upstream reservoirs be conveyed downstream to augment Delta outflow to maintain X2 at the locations in September and October. If storage increases during November under this action, the increased storage volume is to be released in December in addition to the requirements under SWRCB D-1641 net Delta Outflow Index.

The 2008 Service BO uses X2 as a surrogate indicator of habitat suitability and availability for Delta Smelt in all years. Action 4 focuses on Wet and Above Normal years because these years are most affected by operations in the fall. In 2014, the U.S. Court of Appeals for the Ninth Circuit upheld the 2008 BO, including Fall X2 action, under the ESA.

In 2016, Reclamation signed the Record of Decision (ROD) for the Coordinated Long-term Operation of the CVP and SWP (LTO) Environmental Impact Statement (EIS). Reclamation selected the No Action Alternative analyzed in the EIS, which included the RPA actions in the 2008 BO.

Changes in operations at Oroville Dam for public safety resulted in less carryover storage in 2017. In addition, new science and monitoring information on the Delta Smelt (*Hypomesus transpacificus*) are being considered as part of the adaptive management component of the 2008 BO. On September 7, 2017, Reclamation submitted a request to the Service to modify the implementation of Action 4 of the 2008 BO for October of 2017. The request included the *Effects Analysis for the Proposed 2017 Fall X2 Action* which is included in this document as Appendix A. On September 27, 2017, the Service responded with a memo that amends the 2008 BO to allow Reclamation to operate to achieve an average X2 location no greater than 80 km in October of 2017. The Reclamation letter and Service memo response are included in this document as Appendix C.

Coordinated Operation of the CVP and SWP

The CVP and SWP are operated in a coordinated manner in accordance with Public Law 99-546 (October 27, 1986) directing the Secretary to execute the Coordinated Operation Agreement (COA). The COA is an agreement between the United States of America and the State of California for the coordinated operation of the CVP and the SWP. COA defines the project facilities and their water supplies, coordinates operational procedures, identifies formulas for sharing joint responsibilities for meeting Delta standards (as the standards existed in State Water Resources Control Board [SWRCB] Decision 1485) and other legal uses of water, identifies how

unstored flow would be shared, establishes a framework for exchange of water and services between the CVP and SWP, and provides for periodic review of the agreement.

The CVP and SWP are permitted by the SWRCB to store water during wet periods, divert water that is surplus to the Sacramento-San Joaquin Delta Estuary (Delta) as a common water supply, and re-divert CVP and SWP water that has been stored in upstream reservoirs. The CVP and SWP have built water storage and water delivery facilities in the Central Valley to deliver water supplies to affected water rights holders as well as CVP and SWP water contractors. The CVP's and SWP's water rights are conditioned by the SWRCB to protect the beneficial uses of water within each respective project and jointly for the protection of beneficial uses in the Delta.

As conditions of the water right permits and licenses, the SWRCB requires the CVP and SWP to meet specific water quality and operational criteria within the Delta. Reclamation and DWR coordinate operation of the CVP and SWP, respectively, to meet these and other operating requirements pursuant to COA.

Adoption of the Central Valley Project Improvement Act (CVPIA) in 1992 changed purposes and operations of the CVP and water quality and flow standards have been revised by the SWRCB since 1986, such as SWRCB D-1641 adopted in 2000. DWR and Reclamation have operational arrangements to accommodate new facilities, water quality and flow objectives, the CVPIA, SWRCB criteria, and ESA.

Adaptive Management of Fall Outflow for Delta Smelt and Water Supply Reliability

In August 2011, Reclamation transmitted to the Service the Adaptive Management of Fall Outflow for Delta Smelt and Water Supply Reliability (AMP), which the Service found consistent with the RPA. Although the AMP did not establish specific management actions beyond 2011, it provided a framework that could be used for adaptively managing the action in future years. The AMP includes a review of Action 4 and evaluates habitat, X2 as a surrogate, evidence for the link between habitat and abundance, hydrology, and specifics of action. The key questions identified in the AMP that remain unanswered include ecological mechanisms that link outflow to abundance, other drivers of abundance, and if there are more water-efficient ways to provide the necessary benefits.

New scientific information has been developed since the 2008 BO. In 2011, the Interagency Ecological Program (IEP) Management, Analysis, and Synthesis Team (MAST) released the Fall Low Salinity Habitat report to suggest studies to explore the importance of fall low-salinity habitat for Delta Smelt. The IEP MAST also developed the Final MAST Report in 2015, which included an updated Delta Smelt conceptual model. Results from these studies, and other new scientific information, are included in the attached effects analysis.

Collaborative Science and Adaptive Management Program (CSAMP)

The Collaborative Science and Adaptive Management Program (CSAMP), consisting of a policy group of stakeholders and resources agencies, including Reclamation and the Service, formed in 2013. CSAMP has ongoing discussions on critical science-based management questions for the operation of the CVP and SWP. A subset of CSAMP, the Collaborative Adaptive Management Team (CAMT) is composed of senior scientists and high-level managers from State and Federal

agencies, public water agencies, and environmental non-governmental organizations. The Delta Smelt Scoping Team (DSST) comprises technical experts that help design and review the products of studies focused on addressing the science needs identified by the CAMT and CSAMP. The DSST and CAMT meet regularly to promote collaborative development of scientific information to inform future decisions. The proposal was discussed and reviewed through CSAMP and the DSST and Appendix A incorporates comments received.

Other Delta Smelt Actions

Reclamation is leading several efforts to improve the scientific understanding of Delta Smelt ecology. Among these efforts are the "Directed Outflow Project", the "Drivers of Delta Smelt Health" study, the "Salinity-history and Growth Rate of Delta Smelt" study, and the "Delta Outflow Augmentation Modeling" study. Below are brief summaries of each of these efforts.

The Directed Outflow Project is designed to collect biotic and abiotic habitat data to evaluate the effect of outflow alteration on Delta Smelt habitat. The habitat data will be collected concurrently with fish data collected by USFWS's Enhanced Delta Smelt Monitoring (EDSM) Program and will be used to identify benefits of outflow alteration actions and improve our understanding of the mechanisms and drivers affecting Delta Smelt vital rates and behavior. This project builds on knowledge gained and lessons learned from previous studies, such as the Fall Low Salinity Habitat (FLaSH) (Brown et al. 2014) Studies, and provides a quantitative evaluation of the hypothesized benefits of flow alteration to Delta Smelt.

The purpose of Drivers of Delta Smelt Health study is to retain Delta Smelt collected from existing monitoring programs to evaluate fish health and condition. This will be accomplished by determining how fish health indices (e.g., biomarkers of exposure and effects, nutritional status) relate to Delta Smelt health and reproductive condition, by conducting a regional comparison of juvenile Delta Smelt condition using archived Delta Smelt, by quantifying the foraging and metabolic consequences of semi-anadromy for Delta Smelt, and by determining the sensitivity of the biomarkers through the use of starvation experiments with captive-bred Delta Smelt. This data will be used to establish a conceptual framework that investigates relationships among stressor effects, ecosystem variables, and the health indices of Delta Smelt to improve our understanding of the species and its decline.

The Salinity-history and Growth Rate of Delta Smelt study will use otoliths to determine growth rates and salinity history (habitat use) of Delta Smelt captured by existing monitoring programs. Growth rates will be determined by enumerating otolith increments and quantifying growth increment widths. Salinity history will be determined by using strontium isotope ratios by determining the mixture of freshwater strontium isotope ratios, which are associated with the volume of Sacramento and San Joaquin River, with the globally stable marine strontium isotope ratio. This technique will be used to reconstruct the salinity history using the strontium isotope ratios and will be reported as the amount of time spent in different salinity habitats prior to and during the outflow augmentation period.

The Delta Outflow Augmentation Modeling study will use the UnTRIM San Francisco Bay-Delta model (a three-dimensional hydrodynamic model of San Francisco Bay and the Sacramento-San Joaquin Delta) to predict salinity, tidal flows, and water levels throughout the

San Francisco Bay and Sacramento-San Joaquin Delta under a wide range of conditions. UnTRIM will be used to simulate various potential outflow actions, help select the best option, and will be used to evaluate the outcomes of selected actions as compared to other potential outflow actions.

Reclamation is committed to these actions that will help provide scientific information for use in the recovery of Delta Smelt. Reclamation has voluntarily funded the Enhanced Delta Smelt Monitoring (EDSM) program to improve understanding of Delta Smelt distribution and better support lifecycle modeling of the species. The University of California-Davis, through funding from Reclamation, will perform analyses of the health, growth, diet, movement, and reproductive and habitat history of captured (wild) and cultured Delta Smelt. The project will help better link augmentation of outflow to observed responses of Delta Smelt. Through the IEP, Reclamation and DWR maintain an extensive network of monitoring for parameters relevant to Delta Smelt, e.g. the Environmental Monitoring Program.

Increased monitoring, such as EDSM, could lead to better understanding of operative mechanisms between habitat and abundance for Delta Smelt and the development of causal mechanisms to inform species recovery. These additional activities provide biological and scientific value to adaptive management. Information gathered could inform ongoing collaborative discussions such as CSAMP and the Reinitation of Consultation on the LTO, a separate process that began August 2, 2016.

1.2 Purpose and Need for the Project

The purpose of the Proposed Action is to improve fall habitat for Delta Smelt relative to 2017 conditions and constraints, through adaptively managing the implementation of Fall X2 and meeting the objectives of Action 4 of the 2008 BO RPA. The need for the action derives from damage that occurred at Oroville Dam in early 2017.

The damage requires operations that differ significantly from a normal Wet Year. Reservoir levels were lowered in the interest of public safety. The Federal Energy Regulatory Commission has required that DWR keep levels as low as feasible through November 1, 2017. This has impacted the water supply in Oroville to the point that the current and projected levels of water in storage nearly mimic those of Below Normal and Dry Water Years. Thus, it is challenging for DWR to, in coordination with Reclamation, operate the system to release water to meet Wet Year Fall X2 prescriptions and still meet other requirements for water supply.

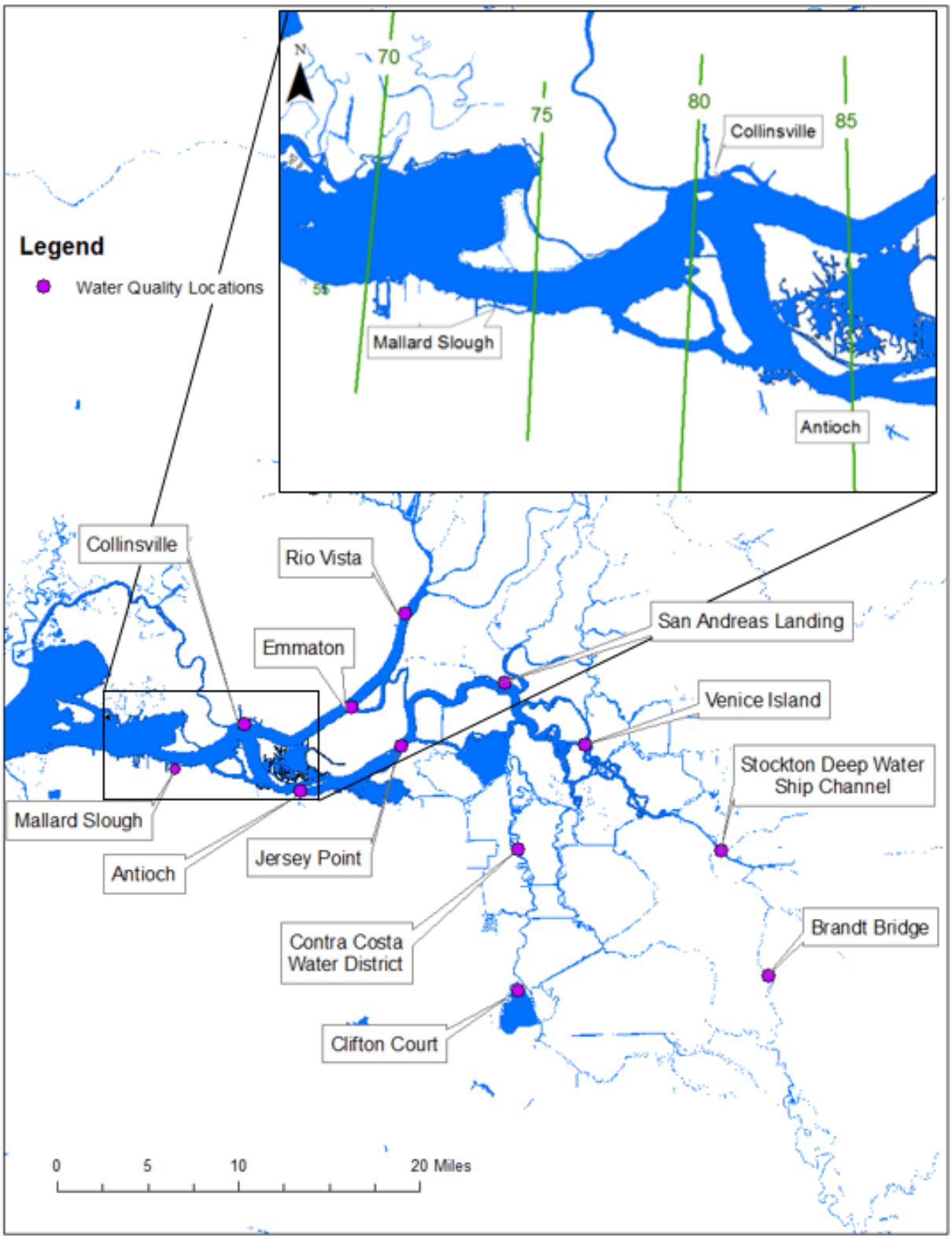


Figure 1. Delta water quality locations of interest and distances from Golden Gate in km

Section 2 Alternatives Including the Proposed Action

This EA considers two possible alternatives: the No Action Alternative and the Proposed Action. The No Action Alternative reflects future conditions without the Proposed Action and serves as a basis of comparison for determining potential impacts to the human environment that would result from implementation of the Proposed Action.

Identification of the reasonable range of alternatives for this EA was based upon consideration of the purpose and need. Additional alternatives were considered but eliminated due to them being substantially similar in design and impacts as the Proposed Action (40 CFR § 1502.14(a)).

This EA is tiered (40 CFR 1502.20 and 1508.28) from LTO EIS and 2016 ROD and hereby incorporates it by reference. Analyses included in this EA are based on the information and analyses included in the LTO EIS. The LTO EIS and ROD are available online at:

https://www.usbr.gov/mp/nepa/nepa_projdetails.cfm?Project_ID=21883

2.1 No Action Alternative

Under the No Action Alternative, Reclamation and DWR would not implement an adaptively managed fall outflow for Delta Smelt as outlined in this EA. Reclamation and DWR would maintain a monthly average X2 of 74 km in September and October, consistent with the 2008 BO existing prescriptions following a Wet Year. The LTO EIS (Section 3.3.2 and Appendix 3A) and the decision in the 2016 ROD form the basis for the No Action Alternative.

2.2 Proposed Action Alternative

In its letter to the Service and the draft EA, Reclamation initially proposed to operate to achieve a monthly average X2 location of 74 km in September and no greater (more eastward) than 81 km in October (Table 1). The Service sent a memo on September 27, 2017, amending the 2008 BO to allow Reclamation to operate to achieve an average X2 location no greater than 80 km in October of 2017. The Proposed Action is consistent with Action 4 of the RPA in that it seeks to work within the Adaptive Management parameters of the action described in the 2008 BO and selected alternative in the LTO ROD. Additionally, the Proposed Action represents an X2 location downstream of the Action 4 prescription for an Above Normal Water Year. Upstream reservoir releases and storage would not change under the Proposed Action. The only operational changes that would occur under the Proposed Action are differences in south Delta exports. Under the Proposed Action, the current export levels for September would not change. Available forecasts suggest that X2 could be located as low 78 km average in October. Reclamation would maintain an average X2 location of no greater than 80 km as approved by the Service.

Table 1. Location of X2 for 2017 (no more eastward than)

Month	Proposed Action	No Action
September	74 km[a]	74 km[a]
October	80 km[b]	74 km[a]

[a] Existing 2008 BO prescription
[b] Proposed Adaptive Management action approved by the Service

Section 3 Affected Environment and Environmental Consequences

This section describes the affected environment and evaluates the environmental consequences that may occur with implementation of the Proposed Action and the No Action Alternative. Potential impacts on several environmental resources were examined and found to be minimal or nonexistent. Impacts to these resources would be similar to those in the LTO EIS and include:

Air Quality and Greenhouse Gas Emissions (Chapter 16); Geology and Soil Resources (including Seismicity and Subsidence) (Chapter 11); Socioeconomics (Chapter 19); Recreation Resources (Chapter 15); Land Use (Chapter 13); and Agriculture (Chapter 12).

Potential impacts on several environmental resources not evaluated in detail in the LTO EIS were also found to have minimal or nonexistent impact: Aesthetic Resources; Hazards and Hazardous Materials; Noise; Transportation; and Utilities, Public Services, and Service Systems.

Cultural Resources: No significant impacts to historic properties would result from the Proposed Action. This type of undertaking does not have the potential to cause effects to historic properties pursuant to 36 CFR Part 800.3(a)(1). There would be no new construction or ground-disturbing activities and no changes in land use as a result of this action. In such cases Reclamation has no further obligations pursuant to Section 106 of the National Historic Preservation Act of 1966 and consultation with the California State Historic Preservation Officer is not required.

Indian Trust Assets: The Proposed Action does not have a potential to affect Indian Trust Assets, which are legal interests in assets that are held in trust by the U.S. for federally recognized Indian tribes or individuals. There would be no new construction or ground-disturbing activities and no changes in land use as a result of this action.

Indian Sacred Sites: The Proposed Action does not have a potential to affect Indian Sacred sites as defined in Executive Order 13007 (May 24, 1996). There would be no new construction or ground-disturbing activities and no changes in land use as a result of this action; therefore this project would not inhibit use or access to any Indian Sacred Sites.

Environmental Justice: Executive Order 12898 requires each Federal agency to identify and address disproportionately high and adverse human health or environmental impacts, including social and economic effects of its program, policies, and activities on minority populations and

low-income populations. There would be no new construction or ground-disturbing activities and no changes in land use as a result of this action; therefore the Proposed Action would not result in adverse human health or environmental impacts to minority or low-income populations.

This EA will analyze the affected environment of the Proposed Action compared to the No Action Alternative in order to determine the potential impacts and cumulative effects to the following environmental resources:

- Water Resources
- Biological Resources

3.1 Water Resources

3.1.1 Affected Environment

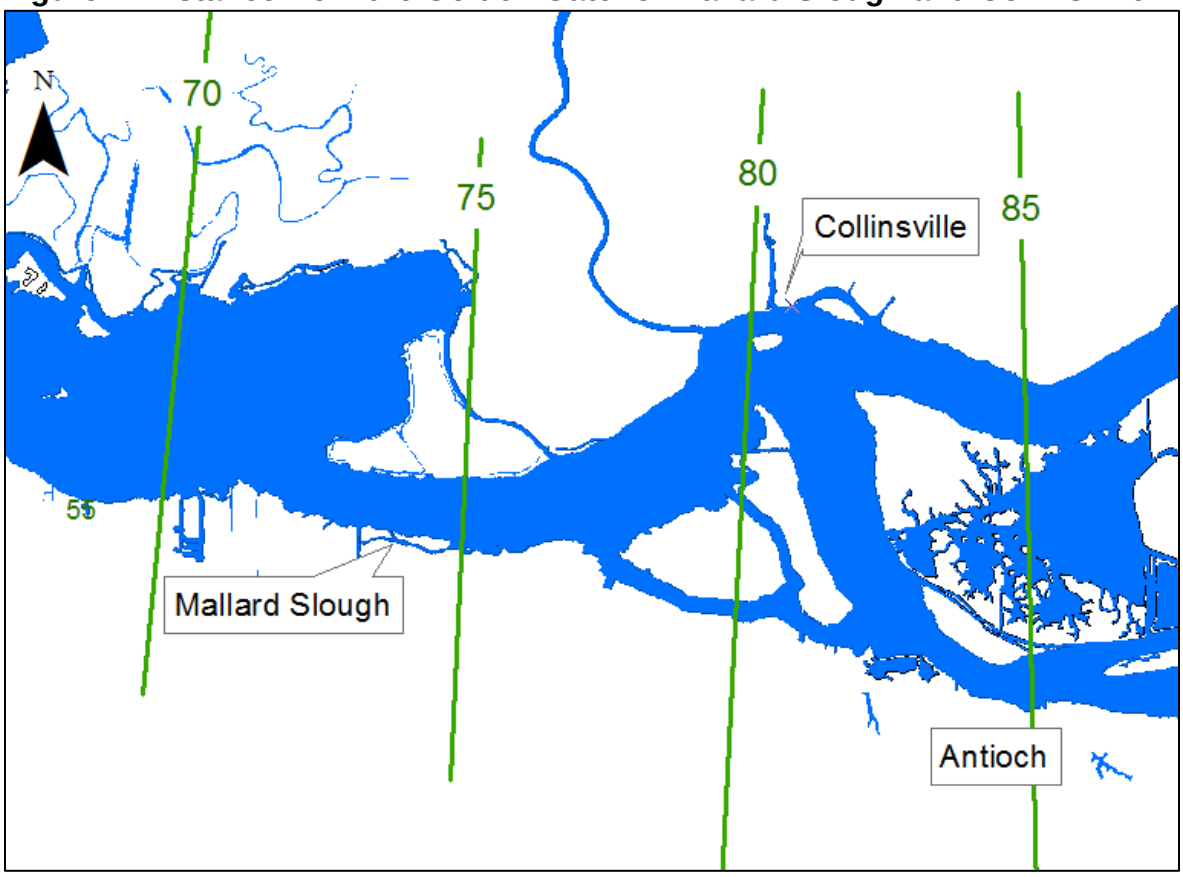
The affected environment for water resources is further described in the LTO EIS Chapter 5: Surface Water Resources and Water Supplies and Chapter 6: Surface Water Quality. The LTO EIS (Section 5.4.3.1 and Appendix 5A) includes analysis with and without Fall X2 and Fall X2 following a Wet Year (74 km) and following an Above Normal Year (81 km) (LTO EIS Appendix 5A Section C-15). Table C-15-1-1 in Appendix 5A of the LTO EIS compares the implementation of Action 4 (No Action Alternative) to not implementing Action 4 (Alternative 1).

Hydrology

In addition to the 2008 USFWS BO Action 4, the SWRCB D-1641 includes two Delta outflow criteria. A Net Delta Outflow Index is specified for all months in all water year types. A "spring X2" Delta outflow is specified from February through June to maintain freshwater and estuarine conditions in the western Delta to protect aquatic life. The criteria require operations of the CVP and SWP upstream reservoir releases and Delta exports in a manner that maintains a salinity objective at an "X2" location. X2 refers to the horizontal distance from the Golden Gate Bridge up the axis of the 2 parts of salt in 1,000 parts of water occurs; the X2 standard was established to improve shallow water estuarine habitat in the months of February through June and relates to the extent of salinity movement into the Delta. The location of X2 is important to both aquatic life and water supply beneficial uses, as Delta agricultural users require freshwater at their diversions. Figure 2 shows the locations of Collinsville and Mallard Slough, which represent approximately 81 and 74 km from Golden Gate, respectively.

X2 also affects Joint Point of Diversion (JPOD). All JPOD diversions under excess conditions in the Delta are junior to Contra Costa Water District (CCWD) water right permits for the Los Vaqueros Project, and must have an X2 location west of certain compliance locations consistent with the 1993 Los Vaqueros Biological Opinion for Delta Smelt.

Figure 2. Distance from the Golden Gate for Mallard Slough and Collinsville



Water Quality

Salinity is commonly measured in units of electrical conductivity (EC) or total dissolved solids (TDS). It also can be measured in psu or ppt. Salinity in the Delta can affect water quality for drinking water and non-potable uses such as industrial processes, irrigation, groundwater recharge, and water recycling. Changes in operation of the CVP and SWP can alter levels of salinity in the Delta.

The LTO EIS utilizes Delta Simulation Model II (DSM2), a one-dimensional hydrodynamic and water quality simulation model, to evaluate changes in salinity and CalSim II outputs to evaluate changes in the location of X2 in the Delta (described in Appendix 5A of the LTO EIS).

The LTO EIS analyzed operation of the CVP and SWP with and without a Fall X2 Action (Action 4 of the 2008 BO). The average September through December X2 position in km modeled in CalSim II was used to evaluate changes in salinity and other factors under the alternatives in the LTO EIS (Section 6.4.3.1). X2 values simulated in the CalSim II model for each alternative were averaged over September through December, and compared. Results indicate that under Action 4 in the 2008 BO, the X2 position would range from 75.9 km to 92.4 km, depending on the water year type, with a long term average X2 position of 84 km (Section 9.4.3.1, page 9-204). CalSim II results indicate that without Action 4 of the 2008 BO, the X2 position would range from 85.6 km to 92.3 km, depending on the water year type, with a long term average X2 position of 88.1 km (page 9-343), a location that does not provide for the

advantageous overlap of the low salinity zone with Suisun Bay/Marsh. The most eastward location of X2 is predicted under Critical water year conditions. The X2 positions predicted with and without Action 4 of the 2008 BO Fall X2 prescription would be similar in drier water year types. In wetter years (Above Normal and Wet Year types), the X2 location would be further west under Action 4 of the 2008 BO by 6.1 to 9.8 km than without the 2008 BO in the LTO EIS (page 9-204).

3.1.2 Environmental Consequences

No Action Alternative

Under the No Action Alternative, Reclamation and DWR would not implement an adaptively managed fall outflow for Delta Smelt in 2017 and would maintain a monthly average X2 of 74 km in September and October. Impacts to water resources would be the same as described in the LTO EIS (Chapter 5). The forecasted location of X2 under the No Action Alternative is estimated to be approximately 73 km (Table 2) and the forecasted outflow for October is estimated be approximately 12,200 cfs (Appendix B).

Proposed Action

Hydrology

The Proposed Action would be no more eastward than 80 km, which is downstream of the Above Normal Year (81 km) prescription from the 2008 BO. Water Year 2017 was classified as a Wet Year, however extraordinary circumstances such as the damage at Oroville Dam have created certain limitations.

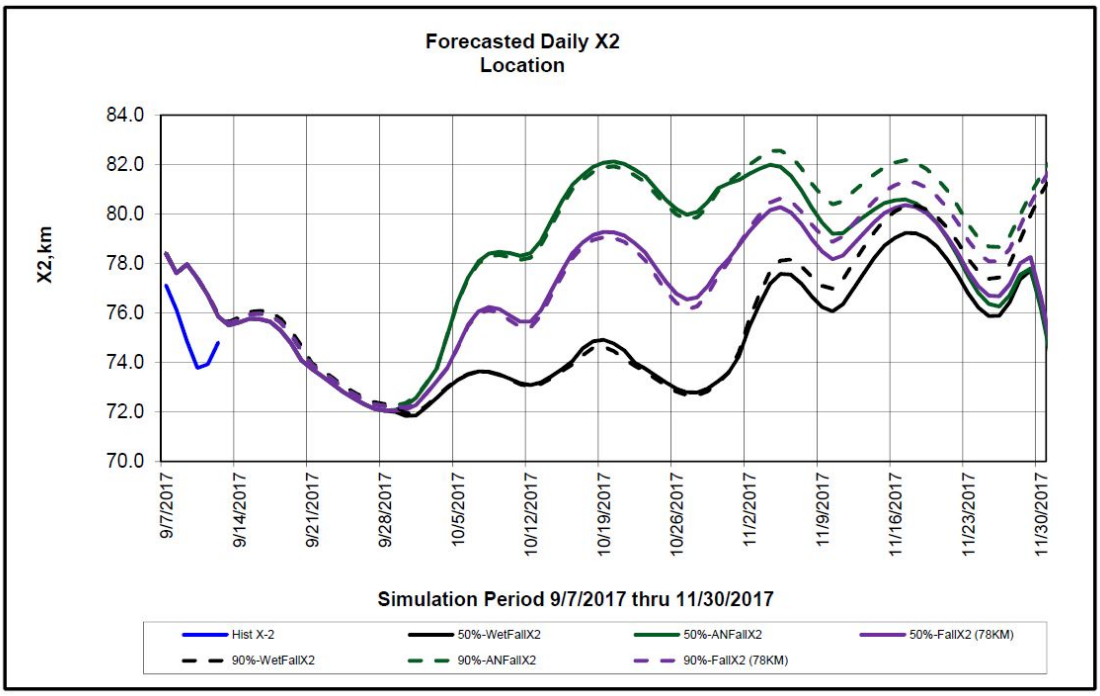
DWR ran additional DSM2 modeling showing the forecasted daily X2 location (Figure 3). Forecasts show that X2 could be as low as 78 km in October under the Proposed Action. As described in Table 2 (Appendix A), the No Action Alternative is estimated to result in an X2 location of approximately 73 km. DWR also ran additional modeling on 50 percent and 90 percent exceedance forecasts to determine storage, outflow, and exports for the months of September through December (Appendix B). With an average X2 location in October of 81 km and the average location in September of 74 km, the two-month average would be 77.5 km. With 80 km in October, the two-month average would be 77 km.

Table 2. Monthly Mean X2 from Mean Daily Forecast, September – November 2017

Month	2008 BO (Wet)	Proposed Action (Wet)	2008 BO (Dry)	Proposed Action (Dry)
September	74.6	74.7	74.4	74.5
October	73.3	77.4	73.2	78.8
November	72.4	72.1	74.9	77.7

Appendix A

Figure 3. Forecasted Daily X2 Location



Reclamation estimates End of Month Storage at Shasta, Folsom and Oroville would not change between the Proposed Action and the No Action Alternative for the months of September through December. Upstream reservoir releases and storage are expected to be dictated by needs for flood control operations and other downstream needs. The only operational changes that are expected to occur are differences in south Delta exports. Therefore, the Proposed Action would have no upstream effects to storage or releases compared to the No Action Alternative.

As described in Table 3 and 4 and Appendix B, the Proposed Action is estimated to result in approximately 151 thousand acre-feet (TAF) additional water stored in San Luis (State) (894 TAF – 743 TAF) as compared to the No Action Alternative. The Proposed Action is estimated to result in approximately 28 TAF (796 TAF – 768 TAF) additional water stored in San Luis (Federal). Therefore, the Proposed Action would have beneficial impacts to downstream storage.

Table 3. End of Month Storage in San Luis (State) (TAF) (50% exceedance)

Month	Wet Year (74 km)	Above Normal Year (81 km)	Forecast under the Proposed Action (78 km)
September	1010	1010	1010
October	**743**	**1030**	**894**
November	806	1062	964

Table 4. End of Month Storage in San Luis (Federal) (TAF) (50% exceedance)

Month	Wet Year (74 km)	Above Normal Year (81 km)	Forecast under the Proposed Action (78 km)
September	695	695	695
October	**768**	**796**	**796**
November	946	966	966

Computed outflow (Appendix B) for October under 81 km and the forecast (78 km) is 7,100 cubic feet per second (cfs) and 9,300 cfs (50% exceedance), respectively. Under the No Action Alternative (74 km) the computed outflow for October would be 12,200 cfs. Under the 50% exceedance forecast, an X2 location of 81 km is estimated to result in 7,100 cfs of outflow in October compared to 12,200 cfs of outflow under the No Action Alternative. An X2 location of 81 km is estimated to result in no greater than 5,100 cfs decreased outflow in the Delta for the month of October compared to the No Action Alternative. The forecast (78 km) is estimated to result in decreased outflow in the Delta by approximately 2,900 cfs over the month of October compared to the No Action Alternative.

Monthly average releases from Shasta, Folsom, and Oroville dams would not change between the Proposed Action and the No Action Alternative. There would be on change in operations from the Proposed Action compared to the No Action Alternative in the months of September, November and December. The Proposed Action represents a change to exports and outflow for the month of October only.

In the 2008 LTO EIS Table C-16-1 (X2, End of Month Position), the average X2 position projected to the year 2030 was 73.9 km for a Wet Year, 81.0 km for an Above Normal Year, 89.1 km for a Below Normal Year, 91.5 km for a Dry Year, and 93.6 km for a Critical Year.

Water Quality

DWR ran additional DSM2 modeling showing the forecasted daily EC at Collinsville, CA (Figure 2) and Mallard Slough (Figure 3). Collinsville and Mallard Slough represent approximately 81 and 74 km from Golden Gate, respectively.

Decision D-1641 includes water quality requirements for a range of beneficial uses. For municipal and industrial beneficial uses, requirements at Contra Costa's pumping plant, the Jones and Banks pumping plants, North Bay Aqueduct Intake and City of Vallejo Intake are set. The maximum mean daily Chloride concentration in milligrams / liter (mg/l) is not allowed over 250 mg/l in all water year types and in all years. At Contra Costa Canal at Pumping Plant #1 or San Joaquin River at the Antioch Water Works Intake, the maximum mean daily chloride concentration is not allowed over 150 mg/l for between 155 and 240 days per calendar year, depending on water year type.

Most of D-1641's agricultural water quality objectives only apply from April 1 to August 15 at the latest. Southern Delta and Export Area requirements apply during October. Several San Joaquin River and Old River locations have maximum 30-day running average electrical conductivity of 1 mmhos/cm, or 1000 umhos/cm in October in all water year types. The West Canal at the mouth of Clifton Court Forebay and the Delta Mendota Canal at the Tracy Pumping Plant have requirements of 1000 umhos/cm all year and in all water year types.

In D-1641, Collinsville has an electrical conductivity objective of 19 mmhos/cm for October for fish and wildlife beneficial uses, based on the maximum monthly average of both daily high tide EC values. This is equivalent to 1900 umhos/cm. The proposed action (purple lines on Figure 4) is anticipated to exceed 1900 umhos/cm during part of October, but would not exceed the D-1641 requirements after the monthly average is calculated.

The available California Data Exchange Center (CDEC) data suggests Fall X2 has little potential influence on mean water temperature in September, October, or November at various Delta stations (Appendix A). This is consistent with general observations from the Delta that flow does not greatly affect temperature (Kimmerer 2004; Wagner et al. 2011).

Figure 4. Forecasted Daily Electrical Conductivity at Collinsville, CA.

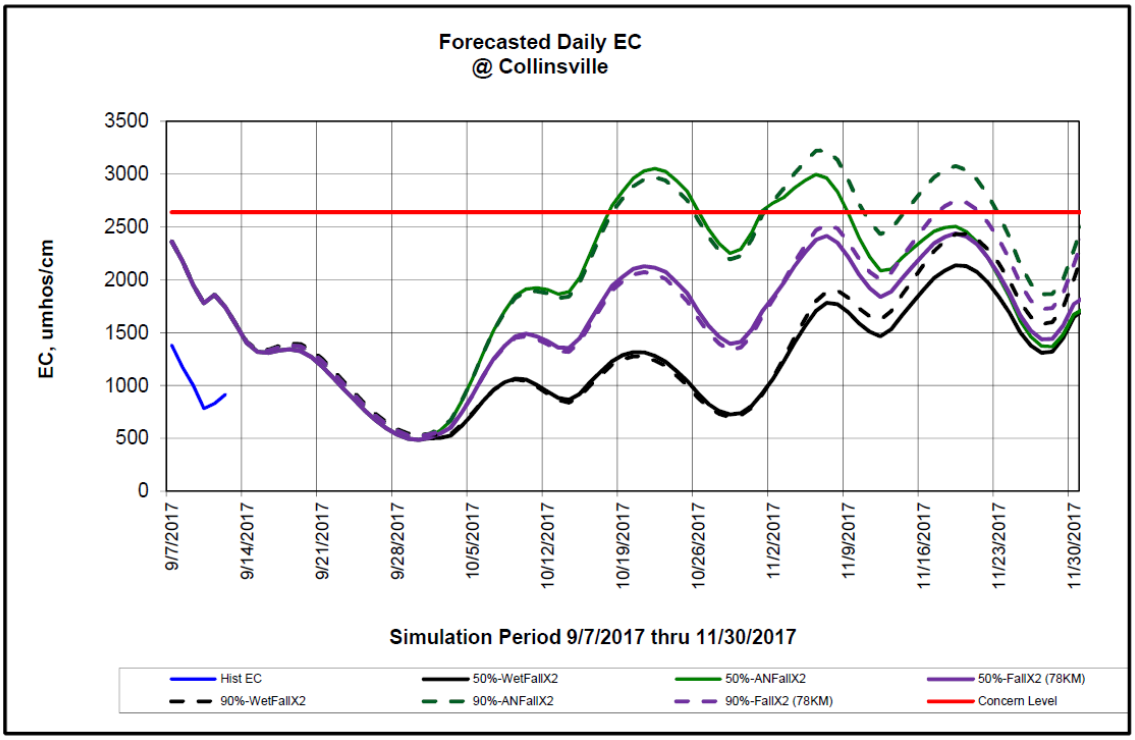
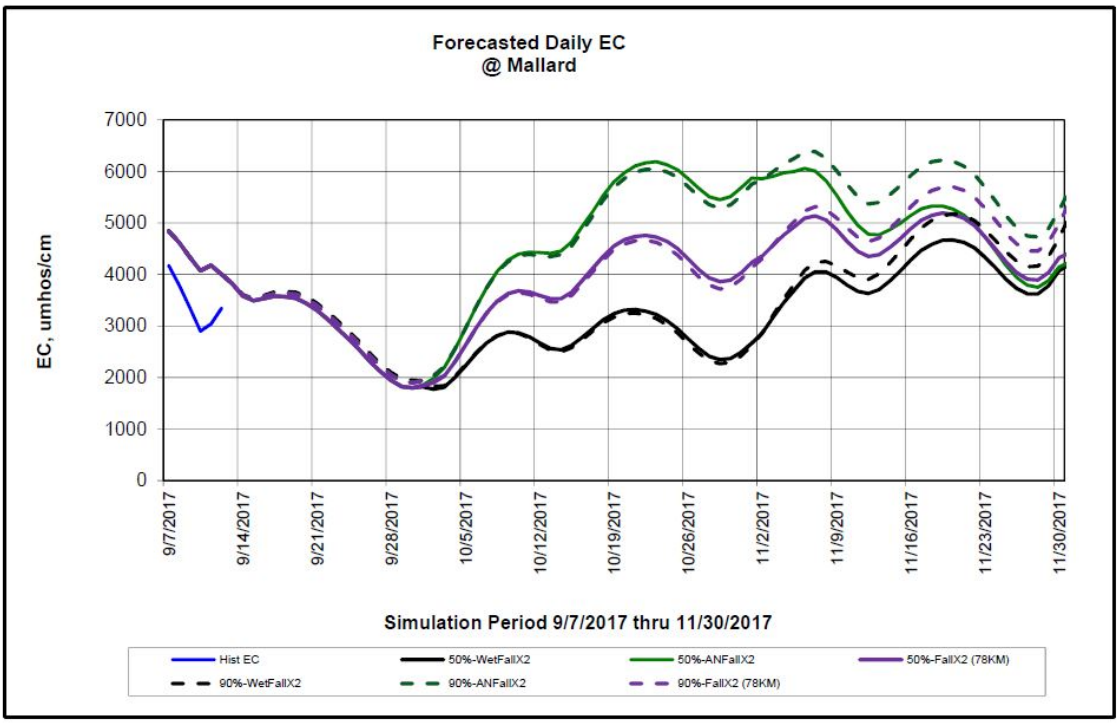


Figure 5. Forecasted Daily Electrical Conductivity at Mallard Slough.



3.2 Biological Resources

3.2.1 Affected Environment

The affected environment for biological resources in the Delta is further described in the LTO EIS Chapter 9: Fish and Aquatic Resources and Chapter 10: Terrestrial Biological Resources.

Delta Smelt

Delta Smelt (*Hypomesus transpacificus*) was listed as threatened on March 5, 1993 (58 Federal Register [FR] 12854). The species has been proposed for re-listing as endangered under the ESA. The up-listing was found warranted-but-precluded on April 7, 2010 (75 FR 17667). Additional information on the status of Delta Smelt, including long-term abundance trends and spatial distribution can be found in Appendix A and the LTO EIS (Section 9.3.4.12).

Salmonids

For the purposes of this analysis, threatened Central Valley spring-run Chinook salmon evolutionarily significant unit (ESU) (*Oncorhynchus tshawytscha*), endangered Sacramento River winter-run Chinook salmon ESU (*Oncorhynchus tshawytscha*), and threatened California Central Valley steelhead Distinct Population Segment (DPS) (*Oncorhynchus mykiss*) are described collectively as salmonids. Salmonids pass through the Delta as adults migrating upstream and juvenile outmigrating downstream. Additional information on the status of salmonids in the Delta can be found in the LTO EIS (Section 9.3.4.12).

Critical Habitat

The federal ESA requires that the Service and NMFS designate critical habitat for species listed as federally endangered or threatened. "Critical habitat" is defined in ESA as: (1) specific areas within the geographical area occupied by the species at the time of listing, if they contain physical or biological features essential to a species' conservation, and those features may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by the species if the agency determines that the area itself is essential for conservation (16 USC 1531 et seq). Critical habitat has been designated for the following located within the project area:

- Delta Smelt (56 FR 65256)
- Central Valley spring-run Chinook salmon ESU (70 FR 52488)
- Sacramento River winter-run Chinook Salmon ESU (58 FR 33212)
- California Central Valley steelhead DPS (70 FR 52488)

Delta Smelt

Reclamation understands recent guidance by the Service to move towards physical and biological features in relation to critical habitat, however PCEs were evaluated to ensure consistency with the 2008 BO. In designating critical habitat for Delta Smelt, Service identified the following physical or biological features, described as Primary Constituent Elements (PCEs) in the 2008 BO, essential to the conservation of Delta Smelt (DS-PCE): (DS-PCE1) suitable substrate for spawning; (DS-PCE2) water of suitable quality and depth to support survival and reproduction (e.g., temperature, turbidity, lack of contaminants); (DS-PCE3) sufficient Delta flow to facilitate spawning migrations and transport of larval Delta Smelt to appropriate rearing habitats; and (DS-PCE4) salinity, which influences the extent and location of the low salinity zone where Delta Smelt rear.

Critical habitat for Delta Smelt includes all water and submerged lands below ordinary high water and the entire water column bounded by and contained in Suisun Bay (including the contiguous Grizzly and Honker bays); the length of Goodyear, Suisun, Cutoff, First Mallard (Spring Branch), and Montezuma sloughs; and the existing contiguous waters contained in the legal Delta (as defined in Section 12220 of the California Water Code) (USFWS 1994). Additional information on Delta Smelt Critical Habitat can be found in the LTO EIS (Section 9.3.2.3) and Appendix A.

Salmonids

Primary constituent elements of anadromous salmonid (AS-PCE) critical habitat are similar and are essential for supporting one or more life stages of each ESU or DPS (spawning, rearing, migration, and foraging). PCEs specific to the Delta include (AS-PCE3) unobstructed freshwater migration corridors with sufficient cover and water quantity and quality suitable for juvenile and adult movement and survival; and similarly (AS-PCE4) estuarine areas free of obstruction and excessive predation. Additional information on Salmonid Critical Habitat in the Delta can be found in the LTO EIS (Section 9.3.2.1).

3.2.2 Environmental Consequences

No Action Alternative

Under the No Action Alternative, Reclamation and DWR would not implement an adaptively managed fall outflow for Delta Smelt in 2017 and would maintain a monthly average X2 of 74 km in September and October. Impacts to biological resources would be the same as described in the LTO EIS (Chapters 9 and 10). Based on forecasts, the No Action Alternative would likely result in an X2 location of approximately 73 km in October.

Proposed Action

The environmental consequences for biological resources in the Delta are further described in the LTO EIS Chapter 9: Fish and Aquatic Resources (Sections 9.4.1.3 and 9.4.3.1) and Chapter 10: Terrestrial Biological Resources (Sections 10.4.1 and 10.4.3). The No Action Alternative in this EA is represented by Action 4 of the 2008 BO in the LTO EIS (Section 3.3.2 and Appendix 3A). The Proposed Action would not change upstream storage or releases and would not alter instream flows upstream of the Delta. Impacts from the Proposed Action would be focused to Delta outflow due to south of Delta exports.

Delta Smelt

The Proposed Action would be no more eastward than 80 km. The 81 km prescription in the 2008 BO was designed to improve fall habitat for Delta Smelt. The Proposed Action would an average location of 80 km, downstream of the Above Normal Water Year prescription in the 2008 BO. In 2011, X2 for the months of September and October was at approximately 74 km. Since the 2008 BO, an X2 prescription of 81 km has not been implemented. Much of the existing data looks at an X2 location of 74 km in 2011 compared to other years, in which an X2 prescription was not implemented. The LTO EIS found the X2 position ranged from 85.6 km to 92.3 km, depending on the water year type, with a long term average X2 position of 88.1 km (page 9-343).

The September-October average under the Proposed Action (74 km and 80 km, respectively) would be approximately 77 km. The Above Normal Water Year prescription under Action 4 is for an 81 km location for both months, resulting in an 81 km average. The analysis in Appendix A looks at an X2 location of 81 km as a conservative upper bound.

Given the conditions resulting from the damage at Oroville, the Proposed Action seeks to improve fall habitat similar to an Above Normal Water Year through adaptive management within the constraints of the extraordinary circumstances in 2017. The Effects Analysis for the Proposed 2017 Fall X2 Action was used for the reinitiation of consultation with the Service and is included as Appendix A. The appendix goes into greater detail on the effects to Delta Smelt and its critical habitat, and are summarized below.

Important biotic (food) and abiotic (salinity, water clarity, and water temperature) parameters were identified as potentially important to Delta Smelt and its critical habitat. This approach is consistent with the MAST Report (IEP 2015) and 2011 FLaSH (Brown et al. 2014) investigations.

Appendix A suggests that in order to provide a greater probability of an increase in survival of Delta Smelt, large changes would be necessary to Fall X2. Under the Proposed Action, the X2

locations would be 74 km in September and 80 km in October. Available forecasts suggest that X2 could be as low as 78 km in October under the Proposed Action. The average location of X2 for September-October in 2017 under the Proposed Action would be approximately 77 km compared to 74 km under the No Action Alternative. Figure 4, included in Appendix A, shows that simulations show the change in survival from an X2 location of 74 km to 77.6 km.

As described in Appendix A and using lookup tables (Table 2-1 in Brown et al. 2014) an X2 of 74 km would give a LSZ area of approximately 8,408 hectares (20,777 acres) and an X2 location of 81 km would give a LSZ area if approximately 5,313 hectares (13,129 acres). This would represent about 37% reduction in LSZ area. An X2 location of 80 would give a LSZ area of approximately 6,653 hectares (16,440 acres). An X2 location of 80 km would be approximately 21% less low salinity zone than 74 km (compared to approximately 37% less LSZ between 81 km and 74 km). The X2 location estimated in October in the Proposed Action (approximately 78 km) compared to the location estimated in the No Action (approximately 73 km) is estimated to result in approximately 630 acres (7%) reduction in the area of the LSZ.

As explained further in Appendix A and using lookup Table 3-1 (Brown et al. 2014) an X2 location of 74 km would give an approximate abiotic habitat index of 7,261; whereas X2 of 81 km would give an approximate abiotic habitat index of 4,835. An X2 location of 80 km would give an approximate predicted habitat index of 5,292. Compared to 74 km, an X2 of 81 km and 80 km would give an approximately 33% and 27% lower abiotic habitat index, respectively.

Under the Proposed Action, compared to the No Action Alternative, X2 would occur further upstream and the LSZ would overlap areas with marginally greater mean water temperature, although well within the range of Delta Smelt tolerance, and therefore likely to have little influence on habitat quality. Appendix A also looks at any differences in invertebrate prey density in the LSZ.

The analysis in Appendix A and work by others (Mac Nally et al. 2010; Thomson et al. 2010; Miller et al. 2012) did not find a significant population-level response to changes in habitat associated with Fall X2. These studies, as well as Maunder and Deriso (2011) show that recruitment is based on a variety of factors acting on different life-stages.

The UnTRIM Bay-Delta model, along with analysis in 2011 by Feyrer, show effects from the location of X2 are not linear. The UnTRIM model shows a change in salinity between 80 and 81 km (Figures 6 and 7, Appendix A). As described in Bever et al (2016), Grizzly Bay and Honker Bay are key regions for Delta Smelt. An X2 location of 80 km results in parts of Grizzly Bay and all of Honker Bay remaining at salinities favorable to Delta Smelt for 100% the month of October (Appendix C, D). Reclamation would lessen effects to habitat anticipated at 81 km by instead operating to 80 km.

Figure 6. Percentage of time with salinity <6 for X2 = 80 km.

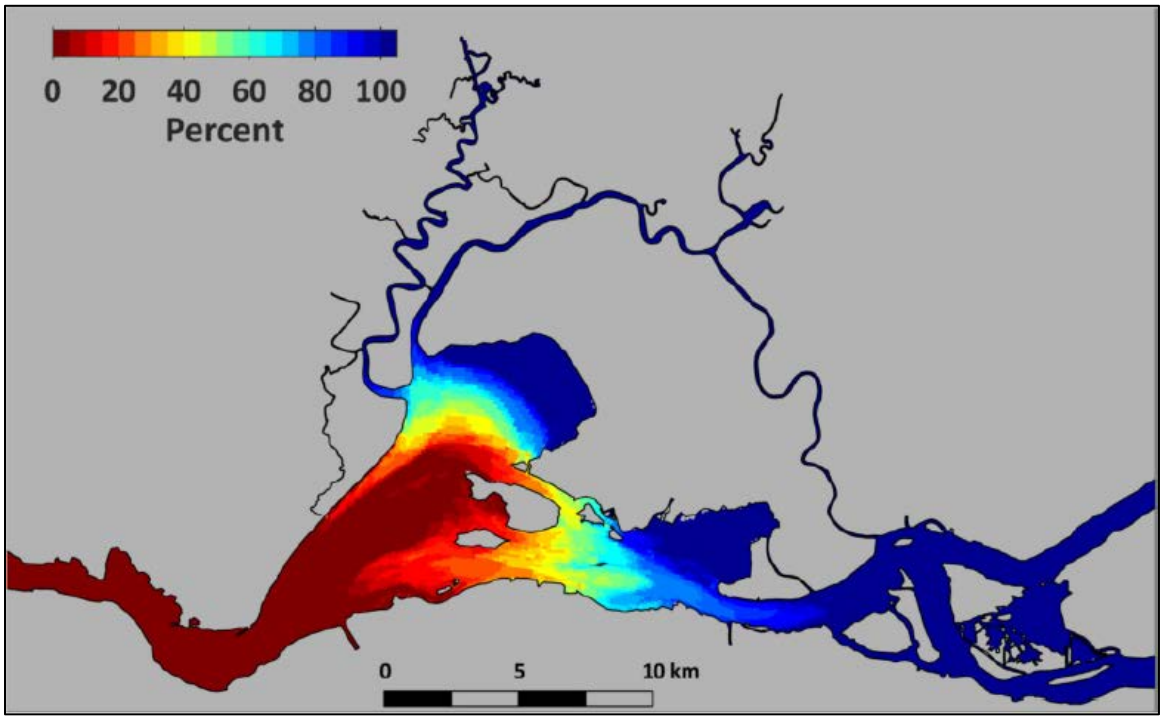
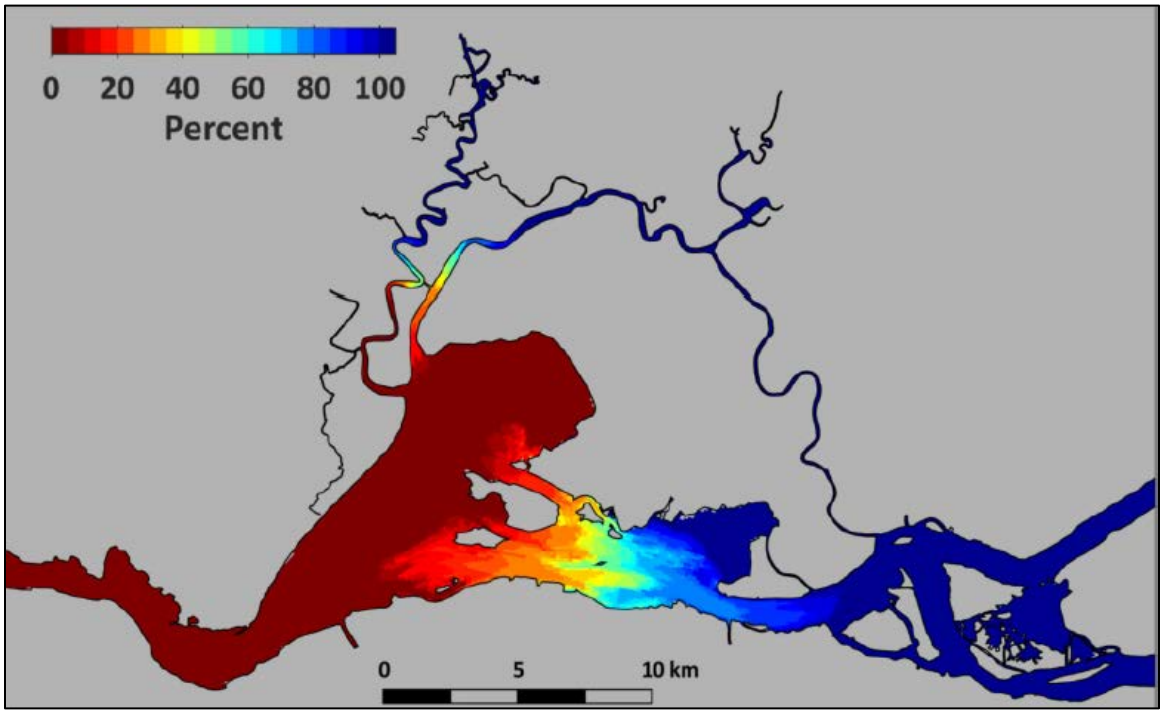


Figure 7. Percentage of time with salinity <6 for X2 = 81 km



As described by the Service in Appendix C, the stock-recruit analysis has limitations in determining effects to Delta Smelt because of the short duration of the action and that multiple factors affect recruitment. Increased sampling and monitoring, including the Enhanced Delta

Smelt Monitoring (EDSM), may provide more conclusive effects of short-term actions such as the Proposed Action.

Additional information on the effects to Delta Smelt, including recruitment, entrainment, and critical habitat can be found in Appendix A.

Salmonids

The Delta includes corridors for juvenile and adult migration (PFMC 2003). As described above and in Appendix B, forecasted outflow under the Proposed Action (78 km) is 9,300 cubic feet per second (cfs) (in both the 50% and 90% exceedance). Under the No Action Alternative (73 km) the forecasted outflow for October would be 12,200 cfs.

The Proposed Action compared to the No Action Alternative would temporarily affect Delta outflow which could reduce attraction of adult salmonids migrating into the Delta and upstream. This could slow migration into and through the Delta compared to the No Action Alternative. Steelhead entering the San Joaquin River Basin appear to have a later spawning run, with adults entering the system starting in late October through December (LTO EIS page 9-61). The effect would occur primarily on salmonids migrating towards the San Joaquin River and its tributaries. However, the impacts would be temporary and limited to the month of October following a Wet Year. Flows upstream of the Delta would be the same under the No Action Alternative so the ultimate success of adult salmonids reaching the spawning areas should be unaffected. Adult migration in October typically occurs through the Delta for steelhead and fall-run Chinook salmon.

Information on the effects of the implementation of Action 4 on salmonids in the Delta can be found in the LTO EIS (Section 9.4.3.1).

Critical Habitat

Delta Smelt

Appendix A focuses on the extent of the low salinity zone, food availability, and abiotic parameters (DS-PCEs 2-4). Although Delta Smelt fall occurrence is generally greatest in the low salinity zone and Delta Smelt generally moves upstream as the salinity field moves upstream (Sommer et al. 2011), the overall distribution occurs over a broader range of salinity than solely the low salinity zone (Sommer and Mejia 2013; Moyle et al. 2016).

Appendix A found that the Proposed Action would adversely affect Delta Smelt critical habitat, specifically river flow affecting the extent and salinity influencing the location and extent of the low salinity zone. Therefore, the proposed 2017 Fall X2 action could affect the critical habitat currently being occupied by a large proportion of the Delta Smelt population by reducing the area of the low salinity zone, and its overlap with areas of relatively high turbidity and low current speed. It is possible Delta Smelt could, however, to move upstream to the northern Delta.

In Appendix A, an X2 location of 80 km results in parts of Grizzly Bay and all of Honker Bay remain at salinities favorable to Delta Smelt for 100% of the month of October. As such,

Reclamation has modified the Proposed Action to lessen the impacts to critical habitat, as compared to 81 km.

The Proposed Action would occur only in 2017 and thus would be a temporary action. Impacts would be temporary and occur only in the month of October in 2017. In addition, the effects would be localized to the low salinity zone, the area between Collinsville and Mallard Slough. Additional information on the effects to Delta Smelt Critical Habitat can be found in Appendix A.

Salmonids

Adult migration in October typically occurs through the Delta for steelhead and fall-run Chinook salmon (LTO EIS Section 9.3.4.12.1). Critical habitat PCEs for salmonids specific to the Delta include (AS-PCE3) unobstructed freshwater migration corridors with sufficient cover and water quantity and quality suitable for juvenile and adult movement and survival; and similarly (AS-PCE4) estuarine areas free of obstruction and excessive predation. As described above, the Proposed Action compared to the No Action Alternative would temporarily affect Delta outflow which could reduce adult migration cues into the Delta and potentially delay subsequent movement upstream. However, the Proposed Action would not obstruct freshwater or estuarine corridors, would not create excessive predation, and would not substantially alter the water quantity or quality suitable for movement and survival of adult salmonids compared to the No Action. Impacts would be temporary and limited to the month of October, which follows Wet Water Year 2017.

The Proposed Action would not alter Delta habitat and would be limited to temporary changes in Delta outflow for the month of October in 2017.

3.3 Cumulative Effects

Cumulative effects are impacts on the environment that result from the incremental impacts of an alternative when added to other past, present, and reasonably foreseeable future actions of Federal, state, or local agencies or individual entities or persons (40 CFR 1508.7). Such impacts can result from individually minor, but collectively significant, actions taking place over time (40 CFR 1508.8). Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the project area.

Past, present, and reasonably foreseeable future actions were identified and considered in the analysis in the LTO EIS (Sections 3.5). Cumulative Effects analyses in the LTO EIS are included at the end of each chapter (e.g., Section 9.4.3.9 for Fish and Aquatic Resources).

No past, present, or probable future projects were identified in the project vicinity that when added to project-related impacts, would result in a significant cumulative impact, and that would be cumulatively considerable. Other projects occurring in and around the Delta, but outside of the waterway, would not be affected by changes in outflow. The Proposed Action is limited to the month of October in 2017.

Most of the future reasonably foreseeable actions are anticipated to reduce water supply impacts due to climate change, sea level rise, and increased water allocated to improve habitat conditions.

It is unclear how these future reasonably foreseeable actions would influence aquatic resources because project details are not available. However, these actions would be subject to environmental regulations and permitting.

Section 4 Consultation & Coordination

Several Federal laws, permits, licenses and policy requirements have directed or guided the NEPA analysis and decision making process included in this EA.

4.1 Public Review Period

This EA was available for public comment and additional analysis will be prepared if substantive comments identify impacts that were not previously analyzed or considered.

On September 25, 2017, the Natural Resources Defense Council (NRDC) submitted comments to Reclamation and the Service. On September 27, 2017, James Hay, Tom Cannon, and James Hobbs submitted comments individually. The State Water Contractors also submitted comments on September 27, 2017. The comments and responses are included in Appendix D added to this EA. Additional responses to comments related to the effects analysis received from the Delta Smelt Scoping Team and NRDC are addressed in more detail in Appendix E.

4.2 Federal Laws, Regulations, and Policies

Section 7 of the Endangered Species Act (16 USC § 1531 et seq.)

Section 7 of the Endangered Species Act requires Federal agencies to ensure that discretionary federal actions do not jeopardize the continued existence of threatened or endangered species or result in the destruction or adverse modification of the critical habitat of these species. Adverse effects to critical habitat elements may not necessarily rise to the level of adverse modification to critical habitat as a whole. Reclamation sent a letter to Service on September 7, 2017 requesting a reinitiation of consultation, in accordance with the 2008 BO and 50 CFR §402.16, in relation to proposed modifications to Fall X2 for 2017. On September 27, 2017, the Service responded with a memo that amends the 2008 BO to allow Reclamation to operate to achieve an average X2 location no greater than 80 km in October of 2017. The Service determined that under the Proposed Action there may be some effect to Delta Smelt related to the effects to Critical Habitat. As described in the Service response and this EA, 80 km represents an inflection point where key regions for Delta Smelt provide habitat with favorable salinities.

Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act, as amended by the Sustainable Fisheries Act (Public Law 104 to 297), mandates all federal agencies consult with NMFS on any activities or proposed activities authorized, funded, or conducted by that agency that may adversely impact essential fish habitat (EFH) of commercially managed marine and anadromous fish species (Section 305(b)(2)).

The Delta is designated by NMFS to contain EFH for Chinook salmon, as defined by the Magnuson-Stevens Fisheries Conservation and Management Act of 1994, as amended. EFH

refers to those waters and substrates necessary for spawning, breeding, feeding, or growth to maturity. Specific components for EFH in the Delta include juvenile migration corridors and adult migration corridors (Pacific Fishery Management Council 2003). As described in the LTO EIS, adult Central Valley fall- and late fall-run Chinook salmon use the Delta as a migration pathway from June through December and October through April, respectively (page 9-59). Adult migration in October typically occurs through the Delta for steelhead and fall-run Chinook salmon.

The Proposed Action compared to the No Action Alternative would temporarily affect Delta outflow which could reduce adult migration cues into the Delta and subsequent movement upstream. However, the Proposed Action would not obstruct corridors for adult salmon compared to the No Action. The Proposed Action would not alter Delta habitat and would be limited to temporary changes in Delta outflow for the month of October, which follows Wet Water Year 2017.

Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act (16 USC 661 et seq.) amended 1946, 1958, 1978, and 1995, was enacted to protect fish and wildlife when Federal actions result in the control or modification of a natural stream or body of water. The statute requires Federal agencies to take into consideration the effect that water-related projects would have on fish and wildlife resources. Consultation and coordination with the Service and State fish and game agencies are required to address ways to prevent loss of and damage to fish and wildlife resources and to further develop and improve these resources.

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