

Attachment 2 – Adaptive Management Program

Record of Decision

**Long-Term Operation of the Central Valley Project and
State Water Project**

Long Term Operations of the State Water Project and the Central Valley Project – Adaptive Management Program

1. Introduction

Adaptive management is a science and decision analytic-based approach to evaluate and improve management actions, with the aim to reduce uncertainty over time and increase the likelihood of achieving and maintaining a desired management objective. Decision analysis tools can be used to determine which uncertainties are important for management decisions, and which scientific approaches should be deployed to address those uncertainties considered necessary to inform subsequent decisions. When correctly designed and executed, adaptive management provides a means to evaluate management actions or programs (collectively “actions”) and allows for evidence-based adjustments to the actions defined, to improve their effectiveness in achieving management objectives, if warranted. The adaptive management approach can provide a scientific basis for continuing or modifying an action or allow for an alternative action to be evaluated and implemented, if determined.

The Department of Water Resources (DWR), the Department of Fish and Wildlife (CDFW), Bureau of Reclamation (Reclamation), U.S. Fish and Wildlife Service (USFWS), and National Marine Fisheries Service (NMFS) (collectively, “the Implementing Entities”) intend to utilize adaptive management to inform the long-term operations of the State Water Project (SWP) and the Central Valley Project (CVP) and related activities described as a part of this Adaptive Management Program (Program).

The Implementing Entities anticipate that it may be necessary to undertake additional monitoring and research that builds on existing efforts in order to carry out this Program. The Implementing Entities will establish an Adaptive Management Steering Committee (AMSC) that will serve as the primary decision group for implementation of this Program. Members of the AMSC will include one designated sub-Director representative¹ and one designated alternate each from DWR, CDFW, Reclamation, USFWS, and NMFS. The AMSC’s role in implementing this Program is described in Section 4a.

The Implementing Entities intend to use the AMSC to provide direction and guidance for work under this AMP through Adaptive Management Technical Teams (AMTs), coordinate each agencies participation, and assign existing work groups to the extent possible (for example the Delta Coordination Group (DCG)) to serve as AMTs, only creating new work groups if needed. Appendix A describes the role of adaptive management, as envisioned by this Program, to inform the long-term operations of the SWP and CVP. The AMSC will utilize AMTs and outside experts (as needed) to develop adaptive management plans or work plans to implement Adaptive Management Actions (AMAs) identified in this Program (Appendix B) and track required monitoring, data collection, research, and publications that inform future decisions (see Section 4b).

The Program will utilize a suite of decision support tools tailored to each action with consideration of each AMA’s management objective, timeline, stage of development (i.e., initiating a new AMAs or continuing an existing longer-term effort), the anticipated application and or incorporation of information gained. The AMSC and its AMTs agree to use the fundamental components of Structured Decision Making (SDM) for AMAs identified in the Program including independent, floating facilitators to assist with problem framing, objective development, and information synthesis. Floating facilitators are intended to serve as independent, neutral facilitators of the entire AMP. Their role is to facilitate each

¹ “Designated Sub-Director Representative” means the official representative designated by the director of an Implementing Entity to act on her or his behalf.

individual AMT, ensuring the AMTs follow guidance and sideboards provided by the AMSC, fostering cross communication among AMTs when helpful, and working closely with assigned leads of each AMT. In addition to working directly with AMTs they will also facilitate the AMSC, foster communication between AMTs and the AMSC as needed to inform discussions and decision making, and assist in communicating guidance and sideboards from the AMSC to individual AMTs. Given the scope of the AMP, it is likely that a team of independent facilitators will be needed to serve these roles.

Appendix B provides an initial list of AMAs and expectations for monitoring and science activities to be implemented by the AMTs. Roles and responsibilities of the AMSC and AMTs are described in Sections 4a and 4b of this document. Independent science reviews may be used to evaluate progress towards reducing uncertainty and utilizing the best available science for informing CVP and SWP management (see Section 7c). Appendix B also sorts AMAs into Bins (1-3) based on the timeframe of their evaluation and the level of SDM tools anticipated to be needed for evaluation and decision making. AMAs to be included in Bin 1 will be managed adaptively based on present conditions, such as hydrology or annual species status, and will require quick decision-making relative to full SDM. Consultation and ITP amendment inquiries will be conducted, but reinitiation of consultation or an ITP amendment is not expected to be required to refine the approach to implementation after each evaluation. Bin 2 will apply to those AMAs that are iterated or linked over time whereby actions taken early on may result in learning that improves management within the next 3-8 years. The evaluation may trigger re-initiation of consultation or an ITP amendment for the actions, or not, depending on scope and scale of recommended change. Bin 3 will include AMAs for which agencies evaluate data over longer periods of implementation, on the order of 10-15 years. These AMAs require a full SDM process whereby qualified and independent facilitators will guide a structured decision-making process. It is anticipated that Bin 3 AMAs will require substantial time to plan, evaluate, and implement to facilitate learning opportunities for future action management.

The use of decision support tools will help the AMSC make transparent, evidence-based decisions by comparing the expected outcomes of alternative actions with regard to meeting management objectives, identifying key sources of uncertainty affecting the ability to predict action outcomes, and highlighting tradeoffs between competing management objectives. There are additional studies that may be at different stages of development and do not provide for the shared consideration of alternatives but warrant the sharing of information and the use of components of SDM.

Working through the collaborative process outlined in this Program, the Implementing Entities commit to reach consensus within the AMSC to the maximum extent possible, while still retaining individual agency discretion to make decisions (as appropriate). Should the AMSC not come to consensus, the Implementing Entities would follow the governance process identified in the associated Biological Opinion and ITP. The Implementing Entities seek to use the potential flexibility provided by an adaptive management approach to ensure the specific management objectives identified for each action are met, maintained, and/or improved upon. The full implementation of an independently facilitated AMP is an approach that the Implementing Entities believe best balances positive outcomes for species listed under the federal Endangered Species Act (ESA) and the California Endangered Species Act (CESA) with operation of the CVP and SWP.

Nothing in this Program is intended to modify each Implementing Entity's roles, authorities, or obligations under statute or regulation. Each Implementing Entity retains discretion to make decisions as appropriate within its authority after considering the available information and considering the input of the other Implementing Entities through the AMSC.

2. Purpose and Intent

Scientific uncertainty will always exist regarding Central Valley rivers and Bay-Delta ecosystems, including the needs of the listed species, the effects of coordinated CVP and SWP operations on those species and their habitats, and the efficacy of actions intended to minimize or mitigate those effects. Further, even when scientific certainty is relatively high, the real-world need for trade-offs will increase the complexity of implementing decisions. This Program is being implemented to help reduce important scientific uncertainty where it exists, and to enhance application of decision tools to support decision making related to the long-term operations of the CVP and SWP.

Adaptive management is a structured, iterative process for decision making when confronted with uncertainty. It emphasizes learning through management where knowledge is incomplete and provides a process for building knowledge through monitoring and science, reducing uncertainty, and improving management over time in a goal-oriented and structured way. Key components of adaptive management are establishing clear and measurable objectives, identifying action goals, and determining management options for best achieving those desired goals.

The broad purposes of this Program are: 1) to promote collaborative, participatory, accountable, relevant, innovative, and transparent science and documentation of the decision process, 2) guide (by identifying, prioritizing, and funding) the development and implementation of scientific investigations and monitoring for CVP and SWP management actions necessary to evaluate if management objectives are being achieved, 3) incorporate new information into decision support tools to gain insights to management decisions, actions, and constraints, and 4) maximize the effectiveness of an action toward achieving the management objectives for the operation of the CVP and SWP while considering potential tradeoffs.

This Program creates a structure whereby participants in science workgroups (i.e., AMTs) working with floating, independent facilitators to implement scientific investigations and monitoring that will best reduce important uncertainties specific to each AMA (Appendix B). The science-based decision products of the AMTs are rolled up by the floating, independent facilitators and presented to the steering committee (i.e., AMSC) for consideration by each agency. The members of the AMSC can then make informed resource management decisions such as whether to propose changes to an existing AMA determine whether particular lines of inquiry are no longer able to generate further insight, and other kinds of decisions that can be expected to typify an adaptive response to a set of recurring actions. Decisions regarding potential changes to regulatory approaches will be handled separately, as described in Section 5 of this document.

The intents of this Program are to:

- a. Describe the steps required to implement the adaptive management process (see Appendix A) and explain how the process links to the operations of the CVP and SWP.
- b. Describe how adaptive management for ongoing engagement on the operations of the CVP and SWP will be utilized for specific actions (see Appendix B).

- c. Inform future consultation and permitting processes for the CVP and SWP through the science produced by the Program, which can be thought of as adaptive management of more involved decisions occurring over longer time scales.
- d. If necessary and agreed upon by the Implementing Entities, develop and implement new AMAs.
- e. Describe the decision-making and governance structure that will be used to implement the adaptive management process including how adaptive changes will be made to the AMAs with consideration of how these changes will be coordinated and reflected in corresponding state and federal authorizations.
- f. Describe the structure for communication among the Implementing Entities and the broader stakeholder community regarding implementation of this Program.
- g. Describe the role of the AMSC in tracking, on an annual basis, funding for this Program.

3. Scope of Adaptive Management Program

a. Actions

The CVP and SWP have been operated for decades. Scientific research and monitoring of the projects' ecological impacts has been extensive, and these impacts are thoroughly discussed and described. Operational approaches have varied over time, in part guided by the accumulation of ecological data and improved understanding of the projects' impacts on species and their habitats. However, constraints on successfully reducing impacts to listed species caused by operations of the projects under varying climatic conditions are also understood and documented, yet difficult to achieve while maintaining project objectives. The initial adaptive decision space proposed in this Program involves the application of decision analysis and scientific inquiry into topic areas where the Implementing Entities believe that further understanding might improve one or more aspects of CVP and SWP operations. Decision support tools will be used to facilitate evaluation of effects of components of the AMAs identified (Appendix B) and inform Implementing Entities about whether and how best to adapt those AMAs, if needed. The AMAs to be evaluated include, but are not limited to, the following:

- Winter-run Chinook Salmon OMR Management
- Spring-run Chinook Salmon OMR Management
- Larval and Juvenile Delta Smelt OMR Management
- Larval and Juvenile Longfin Smelt OMR Management
- Summer-Fall Habitat Action for Delta Smelt
- Tidal Habitat Restoration Effectiveness for Smelt Fishes
- Tributary Habitat Restoration Effectiveness for Salmonid Fishes
- Shasta Spring Pulse Flow Studies
- Winter-run Chinook Salmon Through Delta Survival and Salvage Thresholds
- Longfin Smelt Science Plan Actions
- Delta Smelt Supplementation
- Steelhead JPE
- Alternative Salmonid Loss Estimation Pilot Study

- Shasta Cold Water Pool Management
- Georgiana Slough Migratory Barrier Effectiveness for Salmonid Fishes
- Spring Outflow
- Clear Creek

b. Compliance and Effectiveness Monitoring

Compliance and effectiveness monitoring programs will include the elements as described in Appendix B, unless the AMSC, through its adaptive management process, recommends a modification, DWR and Reclamation request modifications, and the regulatory agencies accept those modifications. Such modifications may be subject to independent review (see Section 7). Changes to the compliance and effectiveness monitoring (Section 3.10 of the Proposed Action) may require ESA consultation and may require amendments to the relevant CESA authorization before being implemented (see Section 5).

4. Program Structure, Roles, and Responsibilities

a. Adaptive Management Steering Committee (AMSC)

The Implementing Entities will establish the AMSC to implement the Program. The Implementing Entities through the AMSC are responsible for support, coordination, and implementation of the Program. The Program will address important uncertainties and trade-offs (policy and ecological) associated with adaptively managing actions identified in Appendix B. AMSC decisions will be informed by AMTs dedicated to each individual AMA identified in Appendix B. The agencies comprising the AMSC will hire a team of floating independent facilitators to help each AMT identify management objectives and goals, identify and synthesize information areas related to those objectives, determine critical uncertainties affecting management decisions, define additional information needs to reduce critical uncertainties, and integrate products of the various AMTs in a way that clarifies what decisions need to be made, what trade-offs may need to be considered, and how confidently the outcomes of those decisions can be predicted.

i. Purpose and Function

The purpose of the AMSC is to provide guidance and direction for the Program and ensure effective and efficient implementation of all AMAs. Specifically, the AMSC will:

- Provide recommendations to Agency Directors based on recent science, including the need to re-initiate consultation and request an ITP amendment.
- Elevate issues for resolution to Agency Directors, as needed, including disputes and results of adaptive management processes conducted through AMTs and the AMSC.
- Serve as primary management level review of AMA implementation. All considerations involving a regulatory change under CESA or ESA do not fall under the purview of the AMSC, see Section 5.
- Provide direction and guidance for action-specific AMTs including articulation of management objectives, dispute resolution, and coordinating participation by each agency.

- Request annual presentations from each AMT to track the status of AMA implementation and look ahead to next steps.
- Review AMT suggestions for identified areas of uncertainty, needed data improvements, proposals for enhanced monitoring or focused research, as appropriate, to assure they are effectively supporting the information needs of the members of the AMSC.
- Request proposals from AMTs to conduct new data collection or conduct focused research to reduce uncertainty or fill data gaps relevant to components of identified AMAs.
- Discuss recommendations from AMTs based on the decision-making process.
- Form and direct AMTs as necessary. Existing teams and workgroups will be used to the maximum extent practicable.
- Assure that all AMSC and AMT activities are conducted in a transparent manner. To allow time for coordination with interested parties meeting schedules will allow for at least 30-day review and consideration of relevant documentation prior to any decision making regarding potential changes to an action in the ITP or PA by the AMSC.
- Post meeting notes, AMT presentations, documentation of decisions, and rationale to support decisions on a publicly available website.
- Identify the need for independent review of specific adaptive management plans and results.
- Set the course for scope and facilitation of reviews, identify the appropriate group to conduct independent reviews, and develop any draft charges for independent review.
- Conduct outreach to the broader stakeholder community regarding implementation of the Program.
- Review annual AMP budget annually to assess potential gaps in funding relevant to overall implementation.

ii. Membership

The AMSC will include one designated sub-Director level representative and one designated alternate each from each of the Implementing Entities. Upon unanimous approval, the members of the AMSC may invite additional staff from any of the Implementing Entities or consultants engaged by one or more of the Implementing Entities to provide technical assistance or other support for specific topics. AMSC meetings will be organized and facilitated by a floating, independent facilitator (or team of facilitators) agreed upon by all Implementing Entities to ensure continuity across meetings and efficient use of time.

b. Adaptive Management Technical Teams (AMTs)

AMTs will be dedicated to each AMA identified in Appendix B. AMTs are charged with identifying uncertainty, building knowledge, and implementing each AMA.

i. Purpose and Function

The purpose of individual AMTs is to convene scientific technical staff from each of the Implementing Entities and interested parties in working groups to plan, implement, and assess each of the actions identified in Appendix B. AMTs formed by the AMSC will have at least one designated team leader from an Implementing Entity and will report to the members of the AMSC on progress in addressing uncertainty associated with each AMA identified in Appendix B (see Appendix A for additional details regarding required reporting). The AMTs will design and implement monitoring and science plans to gather data necessary to build knowledge and decrease uncertainties and conduct the analysis and synthesis of the information gained. The AMTs will evaluate whether actions identified in Appendix B are achieving their intended management goal, and identify potential adaptive management changes based on the science if objectives and or those goals are not being achieved, to be considered by the members of the AMSC for implementation in the future. Generally, each AMT will:

- Utilize decision support tools to define relevant uncertainty, develop action alternatives, estimate expected consequences of the alternatives, and evaluate trade-offs and preferences when making choices between alternative courses of action. Depending on the scope and timeline of each AMA, and the level of SDM tools used by the AMA, these could include:
 - Development of performance metrics for each AMSC-defined management objective to allow evaluation of ongoing and proposed actions relative ability to achieve those objectives.
 - Development of potential alternative actions and synthesis of existing information to evaluate expected action performance.
 - Identification of uncertainties in expected action performance that are most influential in decision tradeoffs.
 - Development of monitoring and science plans to reduce uncertainty around management action outcomes.
 - For AMAs in Bin 1, develop experimental actions supported by monitoring and science, and review outcomes of experimental actions and revise experimental actions as appropriate.
- As requested by the AMSC, prepare necessary documentation for independent reviews, and participate in post-review dialogue.
- Provide data to support the members of the AMSC to track Adaptive Management Program implementation.
- Track other monitoring and research relevant to the subject of the AMA.
- Assure transparency in the implementation and investigation of the AMA.
- Prepare annual presentations of AMA implementation status to the AMSC and subsequently post presentations on a publicly available website.

The scope and responsibilities of each AMT, and timelines for deliverables, are described in more detail for each AMA in Appendix B. The descriptions in Appendix B may be refined using decision support tools by each AMT and documented in a work plan describing the monitoring and or science that the AMTs plan to conduct, which will be submitted to the AMSC for review and approval.

ii. Membership

Membership in individual AMTs will be open to technical staff from each of the Implementing Entities. AMTs will also be open to tribes, consultants, stakeholders, other local, State or federal agencies, or academic researchers, as described in the individual team charter.

c. Decision-making

The Implementing Entities commit to working collaboratively through the AMSC and AMTs to reach consensus on adaptive management changes (including decisions not to make changes) to the maximum extent feasible, and to elevate any disputes over decisions to the Directors for each Implementing Entity. In the event that resolution of the dispute cannot be reached by the AMSC, review of the issue in dispute may occur through the presentation of alternative viewpoints as part of an annual review, or a separate independent science review. Decision support tools, including structured decision making, as described in Appendices A and B, will be used to provide a rational and organized framework for evaluating management objectives relative to each action's goal, as well as any alternative decisions.

Nothing in this Program is intended to modify each Implementing Entity's roles, authorities, or obligations under statute or regulation. Each Implementing Entity retains discretion to make decisions as appropriate within its authority after considering the available information and considering the input of the other Implementing Entities through the AMSC.

5. Link between AMP and Regulatory Processes

a. Federal Endangered Species Act

The Code of Federal Regulations at 50 CFR § 402.16 describe the process for reinitiating ESA section 7 consultation. Specifically, reinitiation is required and shall be requested by the Federal action agency (in this case, Reclamation) or by the USFWS or NMFS (depending on which species are involved) if any one or more of several criteria are met. Although, there is no regulatory mechanism to modify ESA section 7 biological opinions absent reinitiating the section 7 consultation, there are options to improve understanding or modify an action without reinitiating the section 7 consultation so long as doing so does not meet a reinitiation trigger. Specifically, new information or a change in the proposed action would require reinitiation of consultation if:

1. new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered; or
2. the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion or written concurrence.

Therefore, the additional objectives of this Program, as it pertains to ESA section 7 consultation, are to:

1. identify the areas of potential action uncertainty and the range of effects to species that may occur as the AMP is implemented such that the potential range of effects of the action may be considered during consultation; reinitiation will be required if that range of anticipated effects is exceeded; and

2. provide the mechanism for regular inquiries and evaluation to determine if reinitiation is required as the AMP is implemented.

In the event that a change is required to the Incidental Take Statement (ITS), and the change is fully consistent with the analysis in the biological opinion, the Services can revise the ITS without reinitiating the consultation. Examples include where new information allows for a more specific take surrogate, reduction in the amount or extent of take (which would include surrogates), or for clarification of the terms and conditions. Under these scenarios, the Services would issue a new ITS to the Federal action agency.

- b. California Endangered Species Act

Title 14 of the California Code of Regulations (CCR), section 783.6, subdivision (c) describes general criteria and information pertaining to minor and major amendments to ITPs. If permittee (in this case, DWR) submits a request for changes to an ITP that do not significantly modify the scope or nature of the project or any of the minimization, mitigation, or monitoring conditions of the ITP, as determined by the CDFW, a minor amendment may be processed. However, if a permittee is seeking changes that will significantly modify the scope or nature of the project, or if those changes trigger additional review under the California Environmental Quality Act, as determined by CDFW, the amendment would be processed as a major amendment. CDFW reviews major amendment requests according to processes set out for initial permit applications, including submittal of an application and supporting information, although the amendment application may rely on and supplement the information from the initial application. Approval of both minor and major amendments to ITPs are subject to CDFW finding that the ITP issuance criteria in CCR title 14, section 783.4 continue to be met.

6. Funding

Funding is anticipated from a variety of sources including CDFW, DWR FWS, NMFS, and Reclamation. Federal funding is subject to appropriations. CDFW cannot fund DWR permit obligations but may allocate staff time to provide technical assistance and engage in implementation of this program.

It is expected that the Adaptive Management Plan will require substantial resources to support the required evaluations and independent review. The specific level of support remains to be determined and will likely vary depending on the Adaptive Management Actions conducted each year.

7. Relationship of the Adaptive Management Program to Other Processes

- a. Real-time Operations

The adaptive management and decision-making processes described here do not directly apply to real-time operations; where individual real-time operation decisions must be made on a daily, weekly, or monthly time scale. However, real-time operational criteria may be changed over time through the adaptive management process based on new information. Such a change may require an ESA reinitiation of consultation inquiry and an ITP amendment (See Section 5, Link between AMP and Regulatory Processes).

- b. Voluntary Agreements

The Voluntary Agreements are a package of flow and non-flow measures proposed by a diverse range of interests for adoption by the SWRCB as an approach to implement the Bay-Delta Water Quality Control Plan (Bay-Delta Plan). The Voluntary Agreements would state commitments of water, funding, and other measures to implement Bay-Delta Plan water quality objectives related to protection of native fishes, including the Covered Species. The Voluntary Agreements offer a watershed-wide approach that includes new flows, habitat restoration in the Delta and Suisun Marsh as well as tributary systems, and a governance and science program that would use a structured decision-making approach to guide adaptive management. Voluntary Agreements include commitments to fund and undertake new science (monitoring and research) to address hypotheses related to the efficacy of flow and habitat restoration actions, including increases in Delta outflow in March – June to benefit Covered Species. As information is gained through the VA Science Program pertaining to actions contained in the AMP, it may be used to inform AMT discussions and recommendations and may be considered in decision-making processes of the AMSC.

The Voluntary Agreements are subject to ongoing discussion and have neither been finalized nor adopted by the State Water Resources Control Board.

c. Independent Peer Review

Independent peer review can play an important role in guiding the evaluation and response stages of the adaptive management cycle by providing unbiased, transparent reviews of the science and advice for the processes used to guide management decisions. The AMSC will oversee the use of independent peer review processes on an as-needed basis for individual adaptive management actions. The need for independent peer review may rise from a lack of consensus on the relevant science and its application to the management action, from a need for additional expertise on a specific subject matter, or when specific management actions have reached a milestone in terms of the volume of available information. In the latter situation, independent review is advisable for informing key management decisions.

Independent review may consist of letter reviews without associated formal meetings, or panel reviews in which reviewers have a public opportunity receive information from the members of the AMSC or relevant AMT in a meeting. The members of the AMSC may initiate an independent review for any adaptive management action if there is a consensus on the need for the review. The members of the AMSC can request the services of an impartial organization to facilitate the peer review process (e.g., the Delta Science Program, National Academy of Sciences, or similar organizations). In the interest of transparency, materials and recommendations from panel or letter reviews will be available publicly on agency websites. The AMSC members will encourage and support the development of peer-reviewed publications in scientific journals. Article publications, along with reports and datasets, may inform the evaluation of the adaptive management actions.

Attachments

Appendix A: Adaptive Management Program Framework and Implementation

Appendix B: Adaptive Management Actions and Programs

Adaptive management is a structured, iterative process for decision making when confronted with uncertainty. It emphasizes learning through management where knowledge is incomplete and provides a process for building knowledge through monitoring and science, reducing uncertainty, and improving management over time in a goal-oriented and structured way. Key components of adaptive management are establishing clear and measurable objectives, identifying action goals, and determining management options for best achieving those desired goals.

Decision support tools can be used within the adaptive management framework to identify the uncertainties that are most influential in a decision-making process (management), which in turn can guide the scientific approaches deployed to reduce those uncertainties and allow better informed subsequent decisions. When correctly designed and executed, adaptive management provides a means to develop and evaluate the expected outcomes of proposed management actions, to compare actual outcomes of actions to those expectations, and to make evidence-based adjustments to future actions to improve their effectiveness if warranted. The adaptive management approach can provide a transparent and documented scientific basis for continuing, modifying, or implementing an alternative action.

The Department of Water Resources (DWR), the Department of Fish and Wildlife (CDFW), Bureau of Reclamation (Reclamation), U.S. Fish and Wildlife Service (USFWS), and National Marine Fisheries Service (NMFS) (collectively, “the Implementing Entities”) intend to utilize adaptive management to inform the long-term operations of the State Water Project (SWP) and the Central Valley Project (CVP) and related activities described herein. The Implementing Entities will approach adaptive management in an open, participatory framework. The Implementing Entities will establish the Adaptive Management Steering Committee (AMSC) to coordinate through individual Adaptive Management Teams (AMT) responsible for evaluating each Adaptive Management Action, utilizing decision support tools such as structured decision making.

Working through the collaborative process outlined in this document, the Implementing Entities commit to reach consensus within the AMSC to the maximum extent possible, while still retaining individual agency discretion to make decisions (as appropriate). To that end, the Implementing Entities seek to use the potential flexibility provided by an adaptive management approach in a way that balances gaining knowledge to improve future management decisions while taking actions in the face of uncertainty to improve the operation of the CVP and SWP for their project purposes.

The Adaptive Management Program is described in Attachment A and B of the document. Appendix A to the AMP describes the steps required to implement the adaptive management process and explains how the process links to the operations of the SWP and CVP. Appendix B to the AMP includes a list of actions and programs in the Proposed Action (listed below), and additional details regarding the timeframe of evaluation of each action and the AMT responsible for implementing them:

- Winter-run Chinook Salmon OMR Management
- Spring-run Chinook Salmon OMR Management
- Summer-Fall Habitat Action for Delta Smelt
- Tidal Habitat Restoration Effectiveness for Smelt Fishes
- Tributary Habitat Restoration Effectiveness for Salmonid Fishes
- Shasta Spring Pulse Flow Studies
- Winter-run Chinook Salmon Through Delta Survival Targets
- Longfin Smelt Science Plan Actions

- Delta Smelt Supplementation
- Steelhead JPE
- Alternative Salmonid Loss Estimation Pilot Study
- Shasta Cold Water Pool Management
- Georgiana Slough Migratory Barrier Effectiveness for Salmonid Fishes
- Spring Outflow
- Clear Creek

Appendix A: Adaptive Management Program Framework and Implementation

1 Overview

In the broadest sense, the set of decisions that collectively answer the question what is the ‘best’ way to operate the Central Valley Project (CVP) and State Water Project (SWP) (hereafter, Projects) is a complex series of recurring decisions based on an ever-changing knowledge base and set of socio-ecological circumstances. The decisions about how best to operate the Projects have increased in complexity over time due to a growing number of constraints on the decision space (Figure A.1). The accumulation of constraints is one ‘certainty’ in ‘wicked problems’, which are problems that morph over time and change in response to intervention (Rittel and Webber 1973; Luoma et al. 2015).

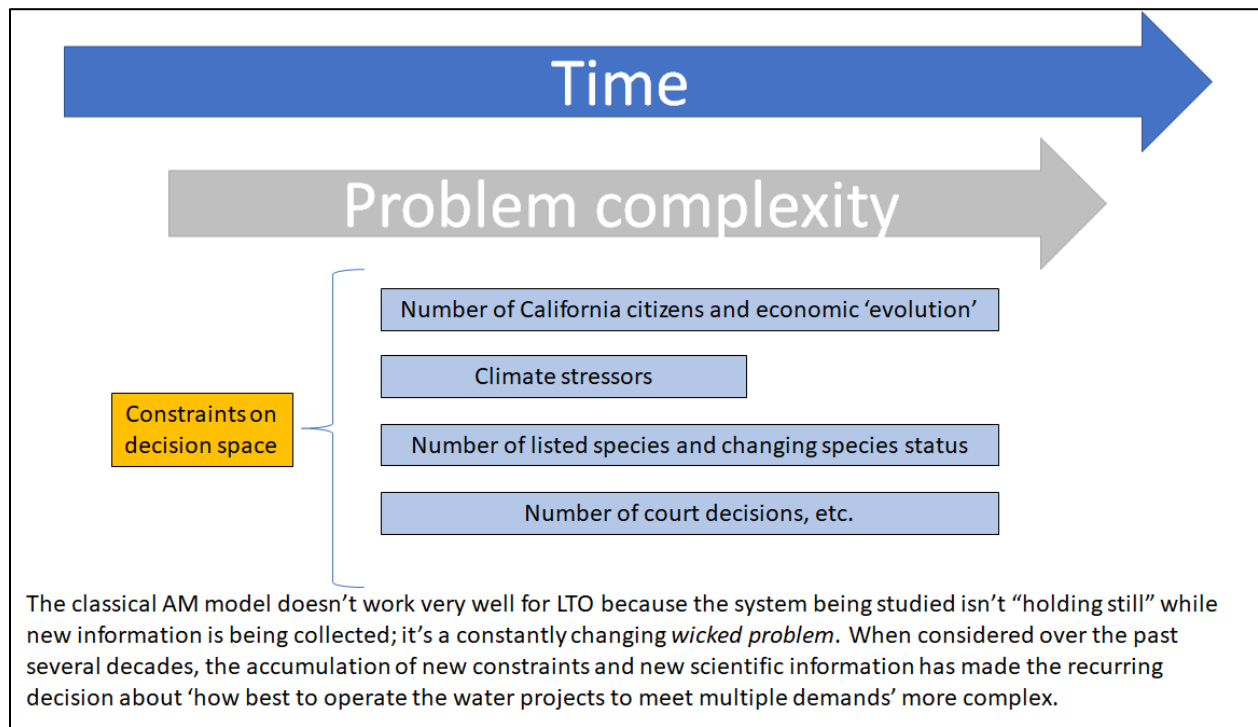


Figure A.1. Conceptual diagram of the increasing complexity of water operations consultations over time as constraints on decision space have increased.

The classical adaptive management (AM) model posed by Walters and Hilborn (1978) suggests that applying the scientific method to complex natural resource management problems is an objective way to navigate complex problems, and as such, AM has frequently been suggested as a best management practice for Project operations. However, AM as originally described does not work well in the management of systems experiencing constant change, i.e., systems that are of themselves wicked problems (DeFries and Nagendra 2017). Rather, wicked problems require a more nuanced version of ‘adaptive management’ that is better integrated in decision theory or structured decision-making (SDM; Figure B.2).

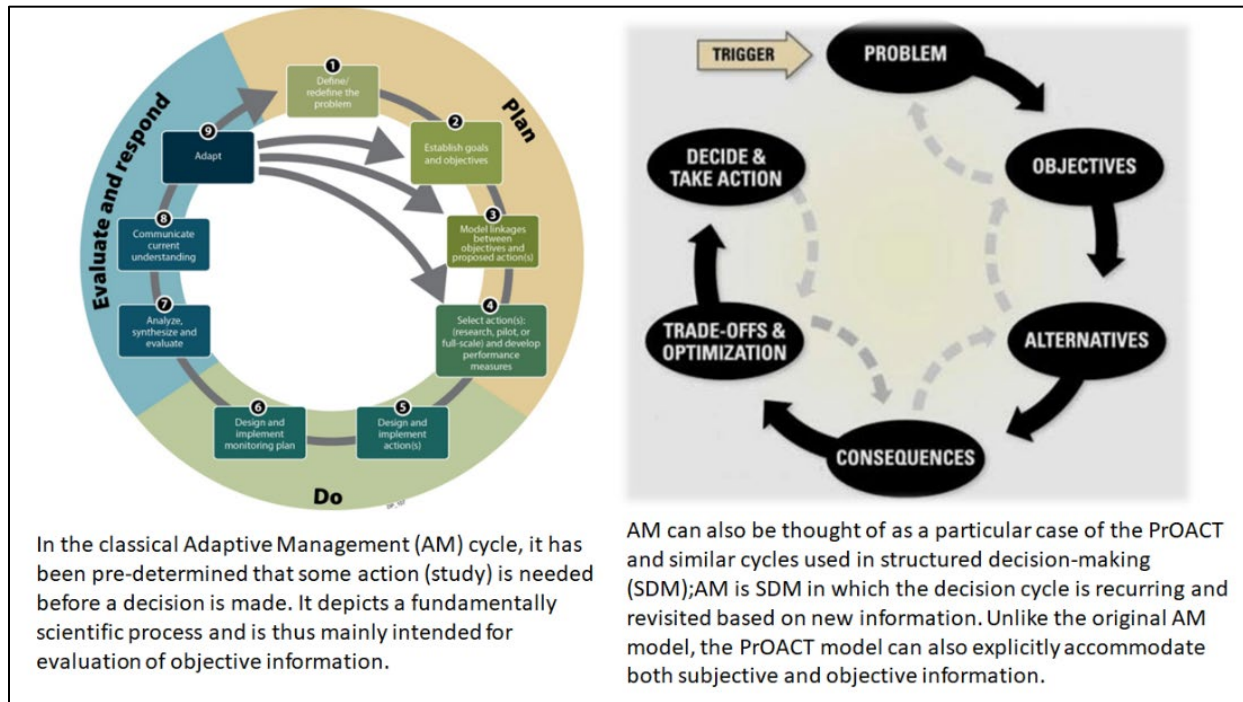


Figure A.2. Comparison of adaptive management as described by DSP (2013; derived from Walters and Hilborn (1978) and the ProACT cycle, a variant of the general approach to structured decision-making.

The reason that SDM is needed for wicked problems is that they often do not “hold still” long enough to robustly apply scientific methods. Further, wicked problems involve subjective values dimensions that cannot be ignored. The “values” can be things like different agency perspectives on the relative importance of the objectives, or socio-political constraints on decision space (Figure A.1). SDM is a set of tools that has been developed to transparently combine objective and subjective information to make the best decision that can be made with the information available at the time. The repeated use of SDM applied to a wicked problem does not stop the problem from changing over time, but it can allow necessary adaptation as the problem develops new dimensions.

Endangered species consultations on the operation of the Projects involve navigation of an evolving social-ecological system with multiple, often competing objectives. Consultations under both ESA and CESA have been a facet of Project operations since the 1990s and are one of the drivers increasing decision complexity (Figure A.1). A conceptual model of CVP and SWP ESA/CESA consultations as a recurring decision is shown in Figure A.3. The conceptual model is superimposed on the ProACT cycle, which is a predominant SDM framework. This is not done to imply that historical consultations have proceeded using decision analysis techniques, but rather to show how the process still has to move through the steps of a decision-analytic cycle. Here we use the word ‘cycle’ to describe each time a major new consultation has occurred. Several things have acted as drivers of a new consultation cycle; these are shown in yellow. In the broadest sense, the problem and the objectives do not change from cycle to cycle, but they do imply a decision involving multiple competing objectives. The Biological Assessment prepared by the US Bureau of Reclamation (Reclamation) and the incidental take permit (ITP) application prepared by the Department of Water Resources (DWR) constitute a negotiated alternative (collectively, proposed action); these documents and the resulting biological opinions issued

by the US Fish and Wildlife Service and National Marine Fisheries Service (BiOps) and ITP issued by CDFW (LTO ITP) provide the analysis of the alternative; the decision is the new BiOps and LTO ITP.

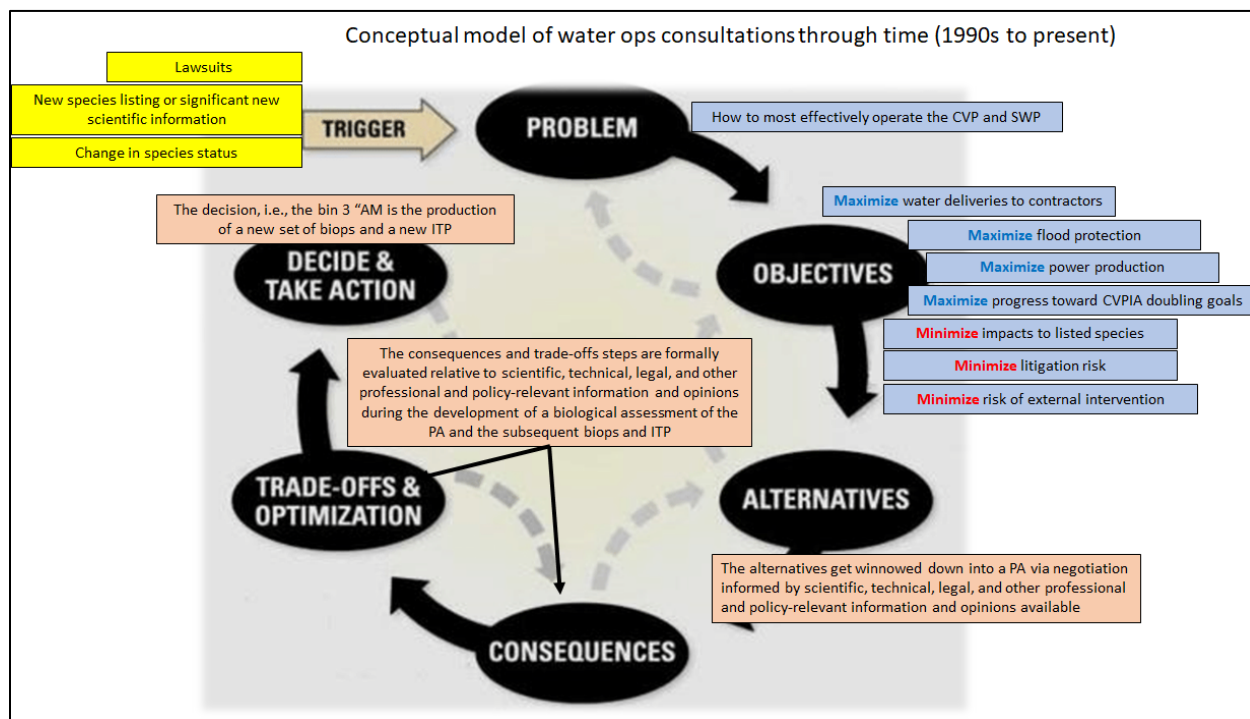


Figure A.3. Conceptual model of ESA/CESA water operations consultations as a recurring decision.

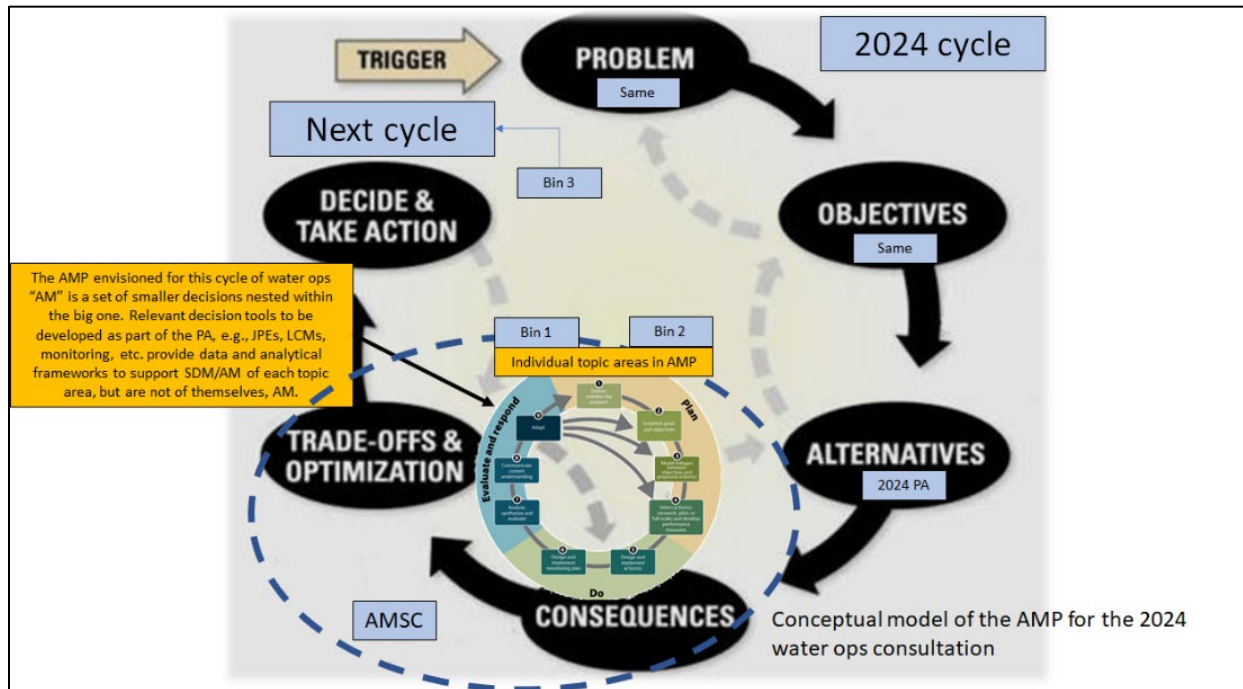


Figure A.4. Conceptual model of the Adaptive Management Program described in this appendix within the current consultation cycle. Refer to Figure A.3 for additional details.

The adaptive management framework envisioned for this cycle of water project consultations involves ongoing scientific re-evaluation of multiple topic areas that sit within the 'consequences' and 'trade-offs/optimization' steps of the current PA decision cycle (Figure A.4). The framework or 'Adaptive Management Program' (AMP) will be used for two major purposes. The first is to provide a potential path to modify water operations rules without a full new cycle (e.g. new full reinitiation of consultation or ITP development) if the existing and proposed studies, tools, and monitoring are developed and their use supports a change. The evaluation of changes that could be conducted within the current cycle are called Bin 1 and Bin 2 pathways and they are differentiated depending on their implementation timeline (see Appendix B). Bin 1 pathways may result in modifications within 3 years of issuance, while Bin 2 pathways may result in modifications but are not expected in fewer than 3 years of issuance. Bin 3 pathways are longer-term, and considerations are not expected to be complete within a single consultation cycle because they involve either or both long data evaluation timelines or substantial changes to authorized levels of listed species take. Topics in the Bin 3 category are included because they require continued data collection and analysis to inform their evaluation in the next consultation cycle.

2 AMP Framework and Implementation

The AMP will be used to evaluate and adapt the operations, actions, and related activities identified in Section 3a of the AMP and Appendix B. This evaluation will include addressing areas of known uncertainty, improving scientific understanding by filling data gaps, and weighing whether new information should be incorporated into the relevant ESA and CESA authorizations. To do so, an Adaptive Management Steering Committee (AMSC) will oversee efforts to monitor and evaluate existing

operations and related activities through existing technical teams (to the maximum extent practicable), make decisions at that level, and suggest to the Directors whether modifications or alternative actions may be warranted. The AMSC will utilize a structured decision-making process to assess the relative benefits or impacts of proposed operational changes and activities for listed species compared to what is being implemented at the time. Any proposed changes to project operations or related activities through adaptive management should provide equivalent or increased conservation benefits to the listed species.

Adaptive management typically utilizes a multi-step process. The following adaptive management framework includes elements from the Delta Plan (DSP 2013) and recommendations from the Delta Independent Science Board (2016). This framework is made up of three broad phases that are part of any scientific endeavor: (1) Plan; (2) Do; (3) Evaluate and respond. Within the phases are nine steps as represented in Figure A.2.

2.1 Phase 1: Plan

The first phase of an adaptive management process is to plan. The suite of tools to be developed and general adaptive management topics are described in Appendix B. As approved by the AMSC, Adaptive Management Teams (AMTs) will develop their own plan for each activity identified in Appendix B. Annual Presentations prepared by each AMT, as described in Section 2.3.1, will include the compilation of the individual actions covered under that AMT.

The planning process begins by clearly defining the problem or question to be addressed (*Step 1*), identifying goals and objectives (*Step 2*), and identifying the model linkages between the goals, objectives, and proposed actions (*Step 3*). Models can be conceptual, statistical, physical, decision support, or simulation. The AMSC and its facilitator(s) will oversee steps 1 and 2, then the AMTs will take a lead role in step 3.

The proposed action, LTO ITP, and BiOps outline the problems to be addressed, the goals and objectives, and in some cases describe the conceptual linkage between the actions and the objectives. However, these steps should be formally evaluated by the AMSC and its facilitator(s) once the group is established. A list of the proposed tools to be developed as part of the AMP and the general topic areas addressed by this AMP are the subject of Appendix B; more detail about the goals, objectives, and rationale is in the text below and in the associated effects analyses of the proposed action, BiOps, and LTO ITP.

The first part of *Step 4* in the Adaptive Management cycle is to decide whether a change in an existing action(s) will be recommended based on the modeling results. The proposed action, BiOps, and LTO ITP are the starting point for AM actions. Future assessments may support keeping an action as is, or modifying it in some way. A key part of the AMP (coordinated through the AMSC) will be the development of performance metrics (response variables for each tool, study, monitoring program etc. associated with each adaptive management action) to guide the program (*Step 4*). Performance metrics would be measured utilizing a suite of activities including monitoring (long-term surveys; new measurements), experimental methods (e.g. fish enclosures), and modeling (e.g. 3-D modeling, life cycle modeling). Each operation and activity, and each adaptive management change must be accompanied

by a set of criteria that the implementing entities can use to determine whether the action is having the anticipated effects.

2.1.1 Structured Decision Making

The AMSC, and associated AMTs, will utilize decision-analytic tools or a structured decision-making process to define relevant uncertainty, develop action alternatives, estimate consequences and evaluate trade-offs and preferences when making choices between alternative courses of action (e.g., *Steps 1- 4* above). Structured decision-making processes can include consideration of value-based objectives and priorities as well as science-based objectives. These processes also document the basis for decisions in a transparent, organized and repeatable framework. Below provides more detailed information on examples of structured decision-making processes currently being used by technical teams and CSAMP.

Structured decision making (SDM) is a collection of practices rooted in decision theory that provides a rational, organized framework for evaluating alternatives against consistent and explicit quantifiable objectives, encourages clear articulation of anticipated effects, and transparent consideration of trade-offs and uncertainty (Figure A.5). SDM can take many forms, depending on which of the six typical steps receive greater relative emphasis. SDM can be used to help build consensus if the SDM process includes deliberation about trade-offs and this deliberation informs the development of new alternatives that better address the range of interests represented.

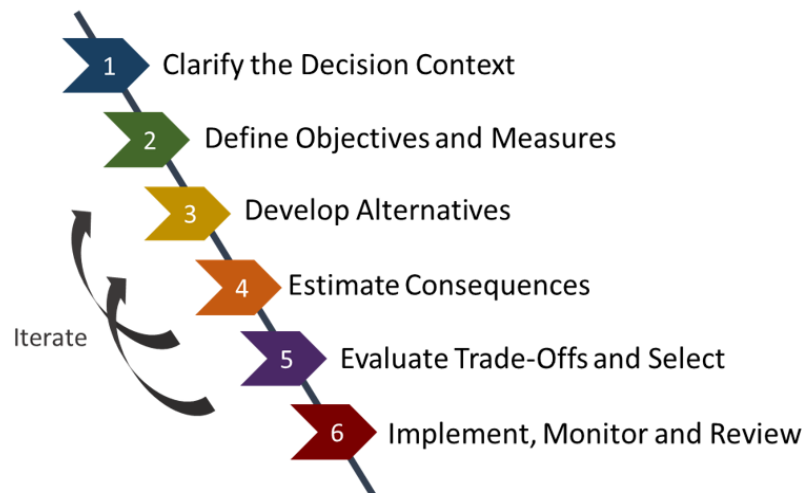


Figure A.5. Six steps of a typical SDM process (Gregory et. al. 2012).

1. Clarify the Context – The first step is to clearly establish the planning and decision-making context through answering questions such as: What decision needs to be made and who will make it? Who else needs to be involved or consulted? What is the scope and bounds of the process and the decision (e.g., what’s in and what’s out)? The initial structuring step lays out a road map for both the deliberations and the analysis that will follow.
2. Define Objectives and Measures – Objectives define the interests and values about the decision at hand. Measures define exactly what is meant by an objective and are used to estimate and report the predicted consequences of different alternatives for making a choice.

3. Develop Alternatives – Alternatives are the various actions or strategies that are under consideration. This step involves iteratively developing, comparing, and refining alternatives in the search for one(s) that offers the best balance across objectives.
4. Estimate Consequences – Consequences of the alternatives against each objective are estimated or characterized, including identifying uncertainties. Results are typically presented in a consequence table, which is a concise summary matrix illustrating the performance of each alternative with respect to each objective, as reported by the measures.
5. Evaluate Trade-offs and Preferences – Explicit choices must be made for preferred alternatives, based gains and losses for each objective. Each decision-maker is asked to make choices based on their own values and their understanding about the values of others. A variety of methods from the decision sciences are used to facilitate constructive deliberations about values and trade-offs and to ensure that tradeoff judgments are informed, thoughtful and transparent.
6. Decide, Monitor, and Learn – The focus at this stage of the process is on how to implement the decision in a way that reduces uncertainty, improves the quality of information for future decisions, and provides opportunities to revise and adapt based on what is learned. The SDM process should end with a formal transition into adaptive management and monitoring, and produce recommendations for the governance and oversight of monitoring programs, as well as triggers and mechanisms for review and amendment.

Example Applications of SDM

SDM is being utilized by the Delta Coordination Group (DCG) for the Summer-Fall Action. During 2022, Reclamation and DWR developed an SDM approach for informing decisions regarding the Delta Smelt summer-fall habitat actions. This modeling approach utilized existing and new modeling, data, and expert opinion on the impacts of the summer-fall habitat actions to provide information on the physical and biological consequences associated with implementing the various actions compared to a baseline of these outcomes without the summer-fall habitat actions. Through this SDM process, Reclamation and DWR also developed a multiyear monitoring and science plan that includes additional science that might be helpful to further investigate the spatial and temporal distribution of abiotic and biotic factors known to influence Delta Smelt habitat, including its food supply and access to those prey, Delta Smelt abundance, survival, and viability during the summer-fall time period.

2.2 Phase 2: Do

The 'Do' phase of adaptive management includes two steps that occur in parallel. The design and implementation of studies, monitoring, or modeling of actions as they are implemented with the explicit goal of improving the understanding of how strongly the action is affecting the vital rate or performance metric (*Step 5 and 6*).

Monitoring plans associated with each relevant operational or management action will include data management plans that describe the process for organizing and clearly documenting observations, including how data are collected; the methods, quality assurance, and calculations used; the temporal and spatial scales of the variables; and accurate site locations and characteristics. Monitoring must provide the data necessary to determine whether the performance metrics are responding to the management action(s). Monitoring plans may also include targeted research to better understand

observed results and further resolve key uncertainties. Results of monitoring and research must be clearly communicated so that the information gathered, and current understanding, is broadly understood.

2.2.1 Work Plan and Budget

2.2.1.1 AMSC Annual Work Plan and Budget

The planning and doing outlined in phases 1 and 2 will be described in an Annual Work Plan and Annual Budget prepared by the AMSC for the upcoming year. The Annual Work Plan will describe the proposed activities of the AMP. This plan will include 1) monitoring and research that are part of the proposed action or are otherwise required by the SWP ITP, BiOps, 2) needed facilitation services to coordinate and support implementation of the AMP, and 3) any additional monitoring and research that is planned, including any relevant monitoring and research that is part of the IEP annual work plan, as approved by the AMSC. The Annual Budget will set out projected expenditures and identify the sources of funding for those expenditures. If the Annual Work Plan describes activities that span multiple years, the budget for those activities will cover the entire period they will be implemented. The AMSC will ensure the Annual Budget accurately sets forth and makes adequate provision for the implementation of the BiOps and LTO ITP terms under which the CVP and SWP operate.

At a minimum, the Annual Work Plan and Annual Budget will contain the following information:

- A. A description of the planned actions under the AMP including their goals, objectives, and performance metrics.
- B. A description of the planned monitoring activities and the entities that will implement those activities.
- C. A description of the anticipated research to be undertaken and the entities that will conduct the studies.
- D. A budget reflecting the costs of implementing the planned actions.
- E. A description of the sources of funds that will be used to support the budget.

The AMSC will develop and approve the Annual Work Plan and Annual Budget with support from independent facilitators. The first Annual Work Plan and Annual Budget will be completed within the first year the AMSC begins convening, and annually thereafter. Upon approval, the Annual Work Plan will be posted on a public website.

2.2.1.2 Individual AMT Work Plans

Within twelve months of their initial meeting, each AMT will develop a work plan that describes the timeline needed to gather and/or synthesize the needed information for its purpose, all reasonable hypotheses addressed for that action, and the timeline for incorporating information into individual SDM processes. The AMSC will review the work plans for each AMT, provide direction or edits as needed, and approve the final plan when they are satisfied with it. Thereafter, each AMT will provide a presentation to the AMSC at least annually to document progress toward addressing the relevant

hypotheses (see Section 2.3.1 below). The work of individual AMTs and associated annual presentations can cease if a team has achieved what it was tasked to do.

2.3 Phase 3: Evaluate and Respond

The ‘evaluate and respond’ phase of adaptive management includes three key steps. Analysis, synthesis, and evaluation of the action(s) (*Step 7*) are critical for improving current understanding. Analysis and synthesis will incorporate information on how conditions have changed, expectedly and unexpectedly, as a result of implementing the action(s). Because measurable improvement in conditions for covered species might not occur on short timescales, evaluations will also examine whether actions taken prevented deterioration of conditions that may have occurred if no actions were taken or if the action is resulting in species responses trending in the desired direction. The evaluation will examine whether performance metrics indicate that one or more of the objectives have been met as a result of the implemented action(s). If an objective is not met, the potential reasons why it was not met will be identified. As each year’s data become available, recognizing that specific actions may not be required in that particular year or sequence of years, analyses should assess whether the probability of the desired outcome has changed and, if so, how this affects decisions about the action. Within the AMP it is anticipated that the AMTs will be primarily responsible for the “evaluation” step, while the AMSC will be primarily responsible for the “response” step.

Communication (*Step 8*) of current understanding gained through analysis, synthesis, and evaluation of implemented actions and monitoring will occur through a variety of channels including: 1) regular back and forth communication between the AMSC and AMTs via the floating facilitators, and when relevant, between the AMSC and the Directors, 2) annual presentations from each AMT to the AMSC, and 3) with interested parties external to the AMP by posting meeting notes on websites, giving presentations, preparing white paper reports, ensuring transparency of independent peer review materials and recommendations, and publication in peer reviewed scientific journals.

2.3.1 Annual Presentations by AMTs

During each implementation year, each AMT will provide at least one presentation (Annual Presentation) to the AMSC. The Annual Presentation will provide an overview of the AMT activities carried out during the previous implementation year.

Each AMT Annual Presentation will include, among other things, the following types of information:

1. An assessment of the implementation and efficacy of studies, monitoring, and modeling of actions during the prior reporting period, including new information gained.
2. Identification of tasks that have not been implemented on schedule and an explanation for the deviation from schedule. For actions that are behind schedule, a suggested schedule or process for completing them will also be included.
3. Adaptive management changes to actions resulting from the SDM process and proposed by an AMT for consideration by the AMSC, including the scientific rationale for the action.

2.3.2 Adapt

When it is informed and equipped with new results and better understanding, the AMSC will re-examine the actions it has been evaluating (e.g., see Appendix B). It is possible that revisions may be suggested when current information suggests doing so (*Step 9*). Possible adaptations could include anything from staying the course, to making a minor modification that can be made without formal changes to the existing LTO ITP and BiOps, to considering reinitiation or an LTO ITP amendment as mechanisms to enable a new management action or paradigm to be implemented.

Decisions to adapt are anticipated to be needed at various time intervals depending on the action or environmental conditions which may delay implementation of certain actions in any particular year or series of years. Appendix B contains a description of the planned timeframe for each action that estimates when decisions regarding AMP actions may be ready to evaluate for potential changes. In general, one year's results, however anomalous, are seldom enough to demonstrate that an action should be subject to change as a part of the adaptive management process. Furthermore, when the analysis, synthesis, and evaluation of information learned from implementing an action over time indicates that no benefit accrues, resources should no longer be spent on that action no matter how popular the action might be.

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recommendations from the Delta Independent Science Board (2016)

Appendix B: Adaptive Management Actions and Programs

A. Timeframe of implementation and evaluation of individual Adaptive Management Actions

Bin 1: Evaluation occurs annually - biannually by technical teams.

Actions for which agencies evaluate recent data to determine how to proceed before the action is conducted again. Refinement of the approach is expected to occur regularly based on prior data and targeted research. There is an expectation that Bin 1 Adaptive Management Actions or Programs (collectively AMAs) have defined objectives and performance metrics with associated monitoring occurring during the implementation of the action. Consultation and incidental take permit (ITP) amendment inquiries will be conducted, but reinitiation of consultation or an ITP amendment is not expected to be required to refine the approach to implementation after each evaluation.

Bin 1 AMAs will require components of a Structured Decision Making (SDM) process to maintain an organized approach for agency collaboration and to ensure transparency in determinations. However, Bin 1 AMAs will be managed adaptively based on present conditions, such as hydrology or annual species status, and will require quick decision-making relative to full SDM. It is not anticipated that Bin 1 AMAs will require long-term action objectives or performance measures to be determined prior to implementation nor will they require identification or evaluation of long-term alternatives. Decision support tools such as utilization of an independent facilitator and Adaptive Management Technical Team (AMT) evaluation of near-term implementation alternatives and tradeoffs will guide the Adaptive Management Steering Committee (AMSC) annual or biannual implementation action decision.

Bin 2: Evaluation and potential refinement occurs within the timeframe of the Biological Opinions and ITP.

Actions for which agencies evaluate data from multiple years of implementation. There is an expectation that coordinated science and monitoring is occurring during implementation of these actions. The evaluation may trigger re-initiation of consultation or an ITP amendment for the actions, or not, depending on scope and scale of recommended change.

Bin 2 will apply to those AMAs that are iterated or linked over time whereby actions taken early on may result in learning that improves management within the next 3-8 years. It is anticipated that Bin 2 AMAs have existing AMTs and/or have some understanding of action objectives and performance measures and have already undergone some evaluation of alternatives and trade-offs. However, it is acknowledged that Bin 2 AMAs may need refinement once implementation has occurred to minimize uncertainties associated with known data gaps. Independent facilitators and AMTs will utilize decision support tools to assess monitoring data obtained, evaluate updated knowledge base against action objectives and performance measures, develop and evaluate new alternatives if warranted, and present action implementation trade-offs to the AMSC for consideration.

Bin 3: Evaluation and potential refinement occurs in a longer timeframe on the order of 10 – 15 years and may inform the next section 7 consultation and development of a new ITP.

Actions for which agencies evaluate data over longer periods of implementation, on the order of 10-15 years. There is no expectation of an ongoing evaluation to occur during the time period of the ITP or Biological Opinions (BiOps) for long-term operations of the State Water Project (SWP) and Central Valley Project (CVP). However, there is an expectation that science and monitoring is occurring during the timeframe of the ITP and BiOps to support evaluation and refinement during the development of a new ITP and BiOps.

Bin 3 AMAs may have complex objectives, unknown alternatives, significant uncertainty in outcomes, and or large data gaps. These AMAs require a full SDM process whereby qualified and independent facilitators will guide the AMSC and associated AMTs and utilize decision-analytic tools or a structured decision-making process to define relevant uncertainty, develop action alternatives, estimate expected consequences of the alternatives, and evaluate trade-offs and preferences when making choices between alternative courses of action. It is anticipated that Bin 3 AMAs will require substantial time to plan, evaluate, and implement to facilitate learning opportunities for future action management.

Some AMAs may have components that fall in different Bins. For example, some AMAs in Bins 1 and 2 may yield the development of a decision support tool for use in an AMA in Bin 3 during future consultation. Therefore, it is important all AMAs use components of structured decision-making and apply a consistent and coordinated approach to monitoring performance metrics identified so that results from various AMAs can be comprehensively evaluated when related.

B. Adaptive Management Actions

1) Winter-run Old and Middle River Flows Management

- a) *Brief Description:* Onramping and offramping Old and Middle River Flows (OMR) management for winter-run Chinook Salmon is currently informed by the Salmon Monitoring Team (SaMT). The SaMT is a technical advisory team made up of technical staff from the US Bureau of Reclamation (Reclamation), the Department of Water Resources (DWR), the National Marine Fisheries Service (NMFS), the California Department of Fish and Wildlife (CDFW), and the State Water Resources Control Board (SWRCB) that synthesizes recent field monitoring data and historical long-term monitoring data, along with expert opinion to inform the Water Operation Management Team (WOMT). Specifically, the SaMT will evaluate real-time data, including the Salmonid Distribution Table, and the weekly loss threshold table, which classifies the winter-run Chinook salmon population as the percent in the Delta. This information is used to implement the winter-run weekly loss thresholds and to minimize the effects of water operations on winter-run Chinook Salmon.

Proposed Action (PA) Sections 3.7.4.1 and 3.7.4.5.3 describe the use of winter-run Chinook Salmon weekly and annual loss thresholds to trigger actions aimed to minimize entrainment and loss of juvenile out-migrants. However, it is anticipated that the criteria associated with the Winter-Run Chinook Salmon Machine Learning Model will need to be reassessed using the genetics-based run-identification loss dataset currently available (Section 3.7.4.1) and a larger effort to develop a real-time assessment tool for the SaMT to recommend OMR management actions to minimize entrainment into the south Delta well before salvage events occur.

b) Assigned AM Bin: Bin 2

- i. The development of a model explicitly predicting daily winter-run Chinook Salmon migration timing using historical long-term monitoring data and environmental variables is necessary to reduce uncertainty in the weekly Salmonid Distribution Table and the estimated percent of winter-run present in the Delta. This model needs to be made readily available as a transparent prediction tool that leverages recent biotic and abiotic

data to predict current and near-future migration timing and provided to the SaMT to inform their discussions prior to WOMT. This effort should be completed and implemented no later than 2026.

- ii. The explicit rate of winter-run Chinook Salmon juvenile out-migrant entrainment into the South Delta, the fate of individuals entrained due to OMR management, and the effects of the State Water Project (SWP) and Central Valley Project (CVP) south Delta water operations is a topic area in OMR management that has been studied in the past and merits further investigation. Loss associated with salvage events at the SWP and CVP facilities is currently used to trigger OMR management actions, but these detections in salvage occur days or even weeks after individuals were initially entrained into the South Delta and account for only a proportion of entrained individuals lost to the population. A new modeling framework is necessary for more effective real-time OMR management actions to be used to minimize winter-run Chinook Salmon entrainment into the South Delta. Specifically, the modeling framework should integrate a winter-run Chinook Salmon distribution model (e.g., Bin 2 item *i* above) with particle tracking model outcomes (potentially the individual-based ECO-PTM model developed by USGS and DWR) to estimate the proportion of the out-migrant population vulnerable to entrainment into the South Delta per day, the probability of entrainment into the South Delta given current hydrologic conditions, and the travel time to the water export facilities. Such a modeling framework should be converted into a real-time assessment tool for the SaMT to recommend OMR management actions to minimize entrainment into the South Delta well before salvage events occur.

- c) *Adaptive Management Technical Team:* The existing Winter-run Chinook Machine Learning Interagency Team will lead analysis and development of all winter-run Chinook salmon OMR management sub-actions in coordination with other interested agencies and stakeholders. Specific work pertaining to this action should be conducted by the current Winter-run Chinook Machine Learning Interagency Team. The team has welcomed input from a diverse array of agency and stakeholder representatives since its inception to provide critical guidance throughout model development and interpretation. This role would continue with the addition of SDM processes as needed.

- d) *Tools:* Winter-Run Chinook Salmon Machine Learning Model

2) Spring-run OMR Management

- 1) *Brief description:* Spring-run OMR Management, Science, and Monitoring: Section 3.9.2 of the Proposed Action describes an approach to minimize impacts of SWP and CVP operations in the South Delta on Sacramento River origin spring-run Chinook Salmon that relies on detection of hatchery-origin Chinook Salmon (spring-, fall-, and late fall-run) in salvage at the SWP and CVP facilities as surrogates for entrainment of natural-origin spring-run in the Central and South Delta. While implementing the Spring-run Hatchery Surrogate measure a parallel effort is ongoing to develop an annual Spring-run Juvenile Production Estimate (JPE) (PA Section 3.9.2). PA Section 3.9.2 describes the timeline for initial program development (interim monitoring, special studies, and development of the JPE database and model) and the intention to utilize independent peer reviews. The Spring-run JPE Core Team is also responsible for evaluating the

existing Spring-run Hatchery Surrogate measure (PA Section XX). Recommendations from these reviews will inform considerations for future reinitiation of consultation and ITP amendments with NMFS and CDFW. A subsequent independent peer review will be considered to continue to evaluate monitoring and special study data available through implementation of the Spring-run JPE as well as the initial Spring-run Lifecycle Model.

2) *Assigned AM Bin: Bin 2*

Development of an interim Spring-run JPE is ongoing and independent peer reviews of the Spring-run JPE program will be considered in the near-term. Additionally, the Spring-run JPE Core Team is tasked with reviewing the Spring-run Hatchery Surrogate measure (see Special Studies Section) in early 2025.

3) *Adaptive Management Technical Team:* The Spring-run JPE Core Team is responsible for implementing the Spring-run JPE program, and collaborating with the AMSC to charter independent peer review panels when initiated, and evaluating the Spring-run Hatchery Surrogate measure. After these reviews DWR and Reclamation will continue to convene the Spring-run JPE Core Team and subteams in coordination with CDFW, NMFS, and the US Fish and Wildlife Service (USFWS), and support implementation of the Spring-run JPE Science Plan, the Spring-run JPE Monitoring Plan, the Spring-run JPE Race ID Program Development Plan, the Spring-run JPE Data Management Strategy, and updates to those plans.

4) *Tools:* The Spring-run JPE and the Spring-run Lifecycle Model are key tools needed to reduce uncertainty regarding the timing and abundance of young-of-year and yearling life stages entering the Delta from the Sacramento River and assess impacts of a variety of stressors on spring-run Chinook Salmon.

3) **Larval and Juvenile Delta Smelt OMR Management**

- a. *Brief Description:* The Larval and Juvenile Delta Smelt Protection Action in Chapter 3 of the ITP Application describes an approach to minimize the impacts of the SWP and CVP operations in the south Delta on larval and juvenile Delta Smelt that relies on the collection of Secchi depth data by field surveys. While this metric of water clarity is based upon the best available science, it is anticipated that an evaluation of turbidity data from telemetered water quality stations across the south and central Delta could yield a trigger that would be more responsive to real-time conditions and would eliminate the need for field crews to conduct additional Secchi depth surveys when data is needed more frequently than biweekly. The turbidity-based trigger level will be as close as is feasible to matching the existing Secchi depth trigger of 1 meter, including using multiple turbidity stations to match the geographic scope of the 12 stations used for the Secchi depth trigger.

- b. *Assigned Adaptive Management Bin: Bin 2*

Development of a turbidity-based trigger to replace the Secchi depth trigger will be considered in the near term.

- c. *Adaptive Management Technical Team:* A team of technical staff from CDFW, USFWS, DWR, and Reclamation will convene to discuss analytical approaches to developing a turbidity-based trigger that provides the same level of minimization as the Secchi depth trigger.
- d. *Tools:* The Delta Smelt Life Cycle Model informed the development of the Secchi depth trigger and may be used to evaluate a turbidity-based trigger.

4) Larval and Juvenile Longfin Smelt OMR Management

- a. *Brief Description:* The Larval and Juvenile Longfin Smelt Protection Action in Chapter 3 of the ITP Application describes an approach to minimize the impacts of the SWP and CVP operations in the south Delta on larval and juvenile Longfin Smelt that relies on paired real-time hydrologic and monitoring triggers. While these OMR management triggers are designed to provide entrainment minimization for larval and juvenile Longfin Smelt, the inclusion of new monitoring data and quantitative tools could provide further evaluation of environmental and monitoring data that could potentially yield an action that would be more responsive to real-time conditions and be more effective at minimizing entrainment.

- b. *Assigned Adaptive Management Bin:* **Bin 2**

Development of a new OMR management trigger will be considered in the near term.

- c. *Adaptive Management Technical Team:* A team of technical staff from CDFW, USFWS, DWR, and Reclamation will convene to discuss analytical approaches to analyzing water quality, hydrologic, and distribution data to inform the creation of a new trigger framework initiating OMR management.
- d. *Tools:* Available water quality, hydrologic, and fish monitoring datasets will be analyzed, as well as relevant flow and particle tracking models, as appropriate. New Longfin Smelt life cycle model tools will be utilized, as available.

5) Summer-Fall Habitat Action for Delta Smelt

To study habitat effects on Delta Smelt survival and evaluate effectiveness of mitigation actions in improving habitat and food availability, DWR and Reclamation have proposed the Summer Fall-Habitat Action (SFHA). The SFHA includes, but is not limited to, the actions described below. The Delta Coordination Group (DCG) will a) develop a multi-year science and monitoring plan for the Summer-Fall Habitat Action including focused studies and b) conduct reviews of action plans and seasonal action results to inform future summer-fall actions or improvements to science and monitoring to inform uncertainties in evaluation. The DCG will utilize project-specific and technical teams for coordination on the adaptive management framework as described in the AMP. Specific adaptive management plans for the Summer-Fall Habitat Actions will be reviewed by the AMT (where applicable), and coordination with the AMT may differ for actions based on assignment of AM bins.

Fall X2

- a) *Brief Description:* To increase the amount of low-salinity zone habitat for Delta Smelt in wet and above normal hydrologic year types, DWR and Reclamation will maintain a 30-day average X2 $\leq$ 80 km from September 1 through October 31.

In 2012, USFWS initiated the development of several life cycle modeling efforts to better understand the factors that affect Delta Smelt population growth rates. These efforts led to two published life cycle models. The results of these life cycle model variations support the hypothesis that Delta outflow in the summer has a stronger effect on Delta Smelt survival than Delta outflow in the fall. The best information currently available suggests that high summer flows help align habitat needs of Delta Smelt in the Suisun Marsh and Suisun Bay region, including turbidity and water temperature, while also increasing food subsidies, supporting Delta Smelt growth and survival. The same outcome is expected if flows are high enough in the fall, but the response of Delta Smelt is expected to be less, because ambient air temperatures cool into more appropriate ranges and the prey subsidy is reduced as prey populations seasonally senesce. These changes in fall habitat conditions are expected to occur part way through the September – November time period considered in the Delta Smelt lifecycle models. This newer information merits a robust synthesis effort to bring together available modeling tools, including the Delta Smelt lifecycle model, and monitoring data.

b) Assigned AM Bin: Bin 1

While science and monitoring in the summer and fall will occur each year (during implementation and non-implementation years), evaluation of the Fall X2 action will occur on a shorter timeframe, after multiple years of implementation since its inception in 2008. The AMT will work with described technical teams to develop a comprehensive synthesis of summer-fall habitat conditions to inform the development of an adaptive management plan. The AMT may recommend an independent workshop or review of the Fall X2 action following sufficient a robust evaluation and synthesis effort. The AMSC may also request that the AMT develop alternative X2 actions to implement during the summer-fall time period that provide equal or better benefits to Delta Smelt as the Fall X2 action originally developed in 2008.

- c) *Adaptive Management Technical Team:* The Delta Coordination Group (DCG), in collaboration with DCG technical teams (Science and Monitoring Workgroup and Hydrology and Operations Workgroup) will be responsible for developing adaptive management plans specific to the Fall X2 including describing AM objectives, hypotheses, and performance metrics for evaluation.

Suisun Marsh Salinity Control Gate

- a) *Brief Description:* To improve Delta Smelt habitat in Suisun Marsh and Grizzly Bay during summer-fall, Suisun Marsh Salinity Control Gates (SMSCG) will be operated as described in PA Section XX to maximize the number of days at Belden's Landing where the 3-day average of salinity is equal or less than 4 psu during Above Normal and Below Normal years and 6 psu in Dry years with the goal of maximizing the amount of suitable habitat available to Delta Smelt in Suisun Marsh and Grizzly Bay.

b) Assigned AM Bin: Bin 3

While science and monitoring will occur each year (during implementation and non-implementation years), evaluation of SMSCG operation efficacy will occur on a longer timeframe

after multiple years of implementation across a range of hydrologic conditions, within 10-15 years. The AMT will work with described technical teams to review monitoring plans and focused research as needed within the larger SDM process. They may recommend an independent workshop or review of the action following sufficient implementation and monitoring for a robust evaluation.

- c) *Adaptive Management Technical Team:* The Delta Coordination Group (DCG), in collaboration with DCG technical teams (Science and Monitoring Workgroup and Hydrology and Operations Workgroup) will be responsible for developing adaptive management plans specific to the SMSCG action including describing AM objectives, hypotheses, and performance metrics for evaluation.

Experimental Food Enhancement Actions

- a) *Brief Description:* Each year food subsidy measures to augment the SFHA will be considered. Food actions may include a number of implementation alternatives (e.g., water source, timing, intensity, etc.) which have been evaluated by the Delta Coordination Group (DCG) to inform future implementation plans. Food subsidy actions are hypothesized to increase localized prey availability for Delta Smelt in the North Delta and Suisun Marsh, resulting in opportunities for higher growth and survival of juvenile and sub-adult life stages. Food actions include North Delta Food Subsidy Action, Managed Wetland reoperation in Suisun Marsh, and Sacramento Deepwater Ship Channel Food Subsidy Action.
- b) *Assigned AM Bin: **Bin 2***
Following multiple years of implementation, data collection, and results, the DCG may suggest convening an independent workshop or review panel within the timeframe of the consultation and ITP. Results will be included in seasonal reporting and adaptive management reviews to evaluate the science and monitoring, efficacy of actions, hypothetical alternative strategies and/or actions, and potential inclusion of food subsidy actions as potential permanent action elements of the SFHA, or if appropriate, termination of actions deemed ineffective by the AMSC.
- c) *Adaptive Management Technical Team:* Food subsidy action plans, monitoring plans, focused research and reports will be developed by the DCG, in collaboration with DCG technical teams (Science and Monitoring Workgroup and Hydrology and Operations Workgroup). Together, teams will be responsible for developing adaptive management plans specific to food actions including describing objectives, hypotheses, performance metrics for evaluation, and timeline.

6) Tidal Habitat Restoration Effectiveness for Smelt Fishes

- a) *Brief Description:* DWR and Reclamation propose to carry forward habitat restoration acre targets identified from the 2008 and 2019 FWS Biological Opinions (8,000 acres) and the 2020 ITP (396.3 acres) to complete mitigation requirements for Delta Smelt and Longfin Smelt (per the 2020 ITP). DWR and Reclamation propose to meet the total acreage requirement (8,396.3 acres) through completion of habitat restoration projects. The projects identified in the PA are

in different phases of completion: 1) constructed (3,584 acres), 2), in construction (3,490 acres) or 3) planned (1,662 acres). All identified restoration projects are located in the northern arc of the upper estuary and are designed to enhance food production and rearing habitat for Delta Smelt and Longfin Smelt (per the 2020 ITP). DWR and Reclamation will complete its 8,396.3 acre restoration requirements by 2026.

b) Assigned AM Bin: Bins 1 and 3

Bin 1: Some actions involving treatment or clearing of invasive vegetation, use or presence of livestock, or other land management actions will be evaluated on an annual or biannual basis. These evaluations may inform revisions to site-specific Long-term Management Plans, which are required of DWR and Reclamation as part of the mitigation.

Bin 3: To understand the effectiveness of tidal wetland restoration for providing a food subsidy for pelagic areas to benefit Delta Smelt as well as juvenile rearing habitat for Chinook Salmon, monitoring occurring as part of the DWR-CDFW Fish Restoration Program will continue throughout the permitted period. Monitoring will allow assessment of the biotic and abiotic capacity of restored tidal wetlands to support listed fish species, the opportunity for fish to access wetland-derived resources, and actual use of those resources. Reference wetlands will continue to be monitored concurrently to account for dynamic regional conditions that also impact restored habitats. Following multiple years of monitoring and targeted studies to address specific uncertainties regarding effectiveness of tidal wetland restoration, such as the ability of restoration locations to provide food resources to Delta Smelt at critical times of the year, observations of Delta Smelt or juvenile Chinook Salmon occupying restoration sites or utilizing restored resources, and retrospective evaluation of the tidal marsh restoration site quality and or effectiveness relative to targets identified, the AMSC will provide guidance to the AMT in prioritizing data and information for synthesis work. Syntheses for understanding efficacy of tidal wetland restoration may regard food subsidy, effects of restoration on water quality, prevalence of invasive aquatic vegetation, utilization of restored habitat by Delta Smelt and listed salmonids, as well as evaluations of site design and local geomorphology on tidal wetland function as a food web subsidy. Based on the data resources and information available, the AMT may recommend that an independent workshop or peer review panel be convened to assist with evaluation and collecting lessons learned. Information gathered through syntheses, workshops, and/or independent review panels will be used to inform future tidal wetland restoration designs and future reinitiation of consultation for the SWP and CVP with USFWS and NMFS and ITP amendments for the SWP with CDFW.

c) Adaptive Management Technical Teams:

- i.* DWR and CDFW will lead evaluations of land management actions to inform and develop changes to site specific Long-term Management Plans based on information gained through evaluation of specific management practices and will coordinate accordingly with Reclamation, USFWS and NMFS on plan revisions.
- ii.* An inter-agency technical team composed of scientists from DWR, Reclamation, CDFW, USFWS, and state and federal water contracting entities, as well as any consultants contracted for focused research on specific uncertainties regarding tidal wetland restoration will be responsible for data analyses and synthesis work. This team will work with the AMSC to prioritize data analyses that are responsive to specific hypotheses

regarding tidal wetland restoration effectiveness as a food subsidy and juvenile salmon rearing habitat. At milestones for analysis and reporting of special studies or multi-year syntheses, the inter-agency technical team will present its findings to the Interagency Ecological Program's Tidal Wetland Project Work Team, which is an open and collaborative venue for exchange of scientific ideas and information.

7) Tributary Habitat Restoration Effectiveness for Salmonid Fishes

a) *Brief Description:* The Upper Sacramento River Anadromous Fish Habitat Restoration Project Monitoring Plan and Protocols (2017) are designed to determine the effectiveness of the Upper Sacramento River Anadromous Fish Habitat Restoration Project (referred to Project henceforth) in meeting identified objectives and to validate the linkage between restoration actions and the biologic response to those actions. This monitoring plan follows the framework for detecting biological responses to flow management described by Souchon et al. (2008). Monitoring methods structured as field protocols are described in the Plan and Protocols including control site selection, longitudinal profile and cross sections, juvenile habitat mapping protocols, snorkel survey protocols, seining, enclosure studies, invertebrate drift sampling, redd surveys, and stream temperatures.

b) *Assigned AM Bins: **Bin 1 and 3***

Bin 1: Some actions involving annual land management practices will be evaluated on an annual or biannual basis. These evaluations may inform revisions to site-specific Long-term Management Plans, which are required of DWR and Reclamation as part of the mitigation.

Bin 3: Monitoring and targeted studies to address specific uncertainties regarding effectiveness of tributary habitat restoration inform the Science Integration Team's decision support models. The AMT will review recommendations from decision support models to assess critical uncertainties to understand the effectiveness of tributary habitat restoration in providing spawning and refuge habitat to benefit Chinook Salmon, monitoring occurring as part of the Anadromous Fish Habitat Restoration Program throughout the permitted period.

c) *Adaptive Management Technical Team:* The existing CVPIA Upper Sacramento River Habitat Restoration Technical Team includes Reclamation, USFWS, NMFS, CDFW, consultants (e.g., Chico State University, PSMFC), and recipients of competitive funding for habitat restoration will be utilized as the AMT for this action.

8) Shasta Spring Pulse Studies

a) *Brief Description:* Reclamation will release up to 150 thousand acre feet (TAF) in pulse flow(s) each water year to benefit Chinook Salmon in the Sacramento River watershed. In 2021, a multi-year Upper Sacramento River Spring Pulse Flow Study Plan was developed by Reclamation in coordination with CDFW, USFWS, NMFS, SWRCB, UCSC, and SRSC. The timing, magnitude, duration, and frequency of the pulse flows will be evaluated and refined by the Sacramento River Group (SRG) on an annual basis and with the intent of maximizing multi-species benefits,

which may include coordinating timing of pulse flows with natural flow events and/or pulse flows in tributaries. The pulse flow schedule will be planned by the agencies and stakeholders in the SRG and implemented annually by Reclamation. Reclamation will reduce the volume of a pulse flow, not release a pulse flow, or apply the water to another purpose only if CDFW, NMFS, or USFWS determines that these alternatives will be more beneficial to fish species. CDFW or NMFS would consider reducing the volume of a pulse flow or not releasing a pulse flow if, for example:

- i. the releases would increase the forecasted winter-run Chinook Salmon mean annual temperature dependent mortality (TDM) by 10% or more, or
- ii. the 150 TAF pulse flow volume (regardless of when it is released) would decrease the forecasted end of April Shasta storage to below 2.2 MAF using the February 90% exceedance forecast.

b) Assigned AM Bin: Bins 2 and 3

Bin 2: Hindcast evaluation of action effectiveness that includes technical review of the functional elements of the pulse flow (i.e., timing, magnitude, duration, and frequency) as well as an evaluation of criteria used to support beneficial use decisions.

Bin 3: If Bin 2 evaluations indicate a set of triggers and or the timing and magnitude of spring pulse flows are beyond what was considered in the Proposed Action or review of conditions, triggers, and effects after multiple years of implementation across a range of hydrologic conditions determines there is new understanding and/or information that is significantly different from what was applied to the effects analysis at the time of ESA consultation initiation. Reviews will also provide an opportunity to consider refined understanding and potential applications to other tributaries, divisions, or systems.

c) Adaptive Management Technical Team:

Bin 2 responsibilities would be assigned to the SRG.

Bin 3 responsibilities would be assigned to the SRG, SHOT, and the AMSC.

9) Winter-run Chinook Salmon Through-Delta Survival and Salvage Thresholds

- a) Brief Description:* There is considerable uncertainty surrounding the implications of facility loss of juvenile Sacramento River winter-run Chinook Salmon at CVP and SWP facilities for through-Delta survival in the Central Valley Bay-Delta. Juvenile salmon through-Delta survival, as measured at Chipps Island (Delta exit), accounts for route-specific survival and migration routing through different migratory pathways. Field and modeling studies will address these uncertainties by conducting the following analyses: 1) an acoustic receiver network and associated real-time modeling of the data, 2) targeted acoustic telemetry studies (i.e., tag fish and release them in the Delta, 3) retrospective analyses of data to evaluate through-Delta survival due to LTO operations, 4) incorporation and consideration of any additional routing and survival data obtained, 5) evaluation of the sensitivity of winter-run Chinook Salmon population dynamics, relative to recovery and viability criteria, to through-Delta survival using lifecycle modeling, and 6) analyses of the relationship between loss at facilities and broader Delta

conditions using a combination of particle tracking models. Several lifecycle models, including simplified simulation-based approaches, the CVPIA SIT DSM, and the SWFSC Winter-run Chinook Salmon Lifecycle Model, may be considered to evaluate winter-run Chinook Salmon population responses to varying Delta conditions and identify a target Delta survival. We propose using multiple particle tracking models (e.g., PTM, ecoPTM, ePTM), with competing tradeoffs related to ease of implementation and assumptions about particle movement and mortality, to assess relationships between loss at facilities and Delta survival.

b) *Assigned AM Bin: Bin 2*

Studies will be completed to address uncertainties in the estimation of through-Delta survival. These newly generated modeling results will be used to propose and update decision support tools for juvenile Chinook Salmon related to outmigration survival and entrainment risk and may change the triggers for export reductions. This work may be of interest to independent review panels. New information and its application may inform future reinitiation of consultation and ITP amendments.

c) *Adaptive Management Technical Team:* This work has been of interest to the Science Integration Team (SIT), which has identified these studies as critical for reducing uncertainty in entrainment risk management. Field coordination and implementation of these studies has occurred through the Interagency Telemetry Advisory Group (ITAG) since 2018. Technical review may occur through the SIT and/or ITAG.

10) Longfin Smelt Science Plan Actions

a) *Brief Description:* The Special Studies Section of the Proposed Action describes the continued implementation of the Longfin Smelt Science Program and updating its science plan. The science plan is a roadmap for addressing substantial gaps in our understanding of the biology and ecology of Longfin Smelt, which include management activities needed to prevent further decline of the species within the San Francisco Estuary. To accomplish this, the Longfin Smelt Technical Team (LFSTT) will continue to develop and support the ongoing activities of the Longfin Smelt Science Program. These activities will address one or more of the seven Priority Areas of the science plan and are expected to produce valuable information for resource managers. These Priority Areas are: 1) continued development of the Longfin Smelt lifecycle model, 2) providing input and guidance for the Longfin Smelt culture program, 3) improved distribution monitoring, 4) improved larval entrainment monitoring, 5) improved understanding of spawning and rearing habitat, 6) understanding migration and movement behaviors, and 7) factors which affect abundance, growth, and survival. Findings from the scientific activities conducted within the program will inform considerations for future consultations and ITPs. However, if new information pertinent to real-time operations for Longfin Smelt entrainment or if LFSTT provides other information relevant to management actions for Longfin Smelt during the term of the BiOp or ITP, trigger re-initiation of consultation or an ITP amendment for the actions.

b) *Assigned AM Bin: Bin 2*

A Longfin Smelt Science Plan has been developed and implementation of high priority individual science actions has begun. Actions already underway include development of a Longfin Smelt

lifecycle model, establishing Longfin Smelt in culture, and improved distribution monitoring. The LFSTT has prioritized science actions to allow for sequenced implementation and completion over the course of the next eight years. As a result, actions will be ready for evaluation and be available to inform development of a subsequent permit/consultation.

- c) *Adaptive Management Technical Team:* The Longfin Smelt Technical Team (LFSTT) would be assigned all responsibilities for guiding implementation of each Longfin Smelt Science Action identified in the Longfin Smelt Science Plan. The LFSTT is co-lead by DWR and CDFW and includes representatives from USFWS, Reclamation, and the State/Federal Water Contractors.

11) Delta Smelt Supplementation

- a) *Brief Description:* DWR and Reclamation propose to support continued experimental releases and the development of a program to conduct supplementation of the wild Delta Smelt population with propagated fish consistent with USFWS' Supplementation Strategy (USFWS 2020). Reclamation and DWR will ensure production ramps up to a minimum of 125,000 fish by water year 2024, a minimum of 150,000 fish by water year 2025 and a minimum of 200,000 fish by water year 2026 that are at least 200 days post-hatch (dph) or equivalent as informed by CDFW and USFWS. USFWS and CDFW, in coordination with Reclamation and DWR, will update the Supplementation Strategy to incorporate new findings from the program and update performance metrics used to guide production targets and methods development.

- b) *Assigned AM Bin:* **Bins 1 and 2**

Bin 1: A process to evaluate production targets to support supplementation will be developed and implemented no less than annually via the existing Culture and Supplementation of Smelt (CASS) Steering Committee. Outcomes of the review may include but are not limited to revisions of production numbers, timeline, release methods, monitoring, and genetic management strategies. These findings will be incorporated into the Supplementation Strategy and will serve as guidance for the program.

Bin 2: Additionally, an independent peer review of the program may be conducted on a 5-year basis at the discretion of the AMSC.

- c) *Adaptive Management Technical Team:* The CASS group was created in 2019 and is comprised of participants from Reclamation, DWR, CDFW, and USFWS. This body provides oversight in advancing science-based management activities to secure and stabilize the Delta Smelt population through a coordinated propagation and supplementation program. The CASS Steering Committee shall continue to provide guidance to its three working groups: 1) Captive Propagation Working Group, 2) Research Working Group, and 3) Regulatory Working Group. The CASS Steering Committee may be integrated into the AMSC following formation of the AMSC.

12) Steelhead JPE

- a) *Brief description:* Reclamation proposes to develop a steelhead JPE for tributaries with CVP facilities that will focus on the annual production of outmigrating juvenile steelhead. Data used in the JPE will inform the status and trends of Sacramento and San Joaquin basin steelhead and

may also help inform actions that will increase steelhead abundance and improve steelhead survival through the Delta.

b) Assigned AM Bin: Bin 2

Reclamation and DWR propose to conduct the first four-year independent panel review (2024) from data generated from the Stanislaus River steelhead life-cycle monitoring program. Beginning Fall 2025 and based upon incorporated 2024 review panel feedback and recommendations, Reclamation and DWR will work with the technical team to consider implementing an expanded JPE framework to the San Joaquin and Sacramento basins. By Summer 2026, Reclamation and DWR will decide to address deficiencies in the JPE framework and/or expand the JPE framework to remaining CVP or SWP tributaries. Reclamation and DWR propose to conduct the second four-year independent panel review (2028) from data generated from the San Joaquin and Sacramento basins JPE.

c) Adaptive Management Technical Team: Reclamation and DWR, in coordination with USFWS, NMFS, CDFW, and interested stakeholders will create or use an existing technical team should one be later identified to develop the steelhead JPE framework and incorporate feedback from the 2024 and 2028 panel reviews.

13) Alternative Salmonid Loss Estimation Pilot Study

a) Brief description: DWR, in coordination with Reclamation, has completed a draft updated Alternative Loss Equation (ALE-22) software tool for estimating winter-run and spring-run Chinook Salmon and Central Valley steelhead losses at the SWP and CVP export facilities. DWR, in coordination with Reclamation and the Alternative Loss Equation Technical Team (ALE-TT), a proposed new sub-team of the Central Valley Fish Facilities Review Team (CVFFRT), will further refine the parameters of this tool by developing an Alternative Loss Pilot Study Implementation Plan (ALPS-IP) to implement this tool in parallel with current loss estimation methods and incorporate SDM to prioritize the implementation of loss component studies and performance evaluation studies. The goal of this pilot study is to provide a more accurate estimates of salmonid loss, and loss parameters, at the SWP and CVP export facilities while understanding the utility of the new alternative method relative to the existing method.

b) Assigned AM Bin: Bin 2

Within the first year of the effective date of the ROD or ITP, DWR, in collaboration with Reclamation, will convene the ALE-TT and conduct a knowledge transfer and methods workshop for the ALE-22 tool and prepare a draft ALPS-IP for ALE-TT review. Within the second year of the effective date of the ROD or ITP, DWR will submit the final draft ALPS-IP for both the ALE-TT and AMSC review. DWR will finalize the ALPS-IP once approved by the AMSC and establish priorities for implementation (e.g., loss parameter studies) using SDM within the ALE-TT. The ALE-TT may utilize an independent science panel review to further enhance the SDM prioritization process. In the third year of the effective date of the ROD or ITP, DWR will submit prioritized ALPS-IP recommendations, informed by the ALE-TT SDM process, to the AMSC for approval. The permittee shall then update the loss equation with refinement to the loss equation components as approved by CDFW.

c) *Adaptive Management Technical Team:*

- i. Knowledge transfer and methods workshop: DWR and Reclamation will convene the ALE-TT, with membership comprised of DWR, Reclamation, CDFW, USFWS, NMFS, and State/Federal Water Contractors representatives, as well as other interested stakeholders.
- ii. Review of the initial draft ALPS-IP: ALE-TT
- iii. Review of the final draft ALPS-IP: ALE-TT, AMSC, as well as input from the CVFFRT and Salmonid Monitoring Team (SaMT)
- iv. SDM Prioritization of ALPS-IP: ALE-TT, with support from an independent review panel if requested.

14) Shasta Cold Water Pool Management

a) *Brief Description:* Reclamation will operate Shasta Reservoir to build a cold-water pool and use the Temperature Control Device (TCD) on Shasta Dam to blend water from different reservoir strata to protect downstream winter-run Chinook Salmon returning adults and incubating eggs from temperature stressors. An annual operation of the Shasta TCD and the development of the temperature management plan will be developed as part of real-time operations. Shasta Reservoir cold water pool management will rely on an objectives-based management framework adapted from the multi-year drought sequence experienced in Victoria, Australia (Mount et al. 2016) that considers the available hydrology to “Protect,” “Maintain,” “Recover,” and “Enhance,” protected species, habitats, and water deliveries. An initial set of objectives and metrics will be further refined according to increased understanding of species needs, interannual hydrologic conditions (e.g., drought) and operational limitations.

b) *Assigned AM Bin: Bin 2*

Hindcast evaluation of action effectiveness that includes a review of the objectives and metrics used to guide annual temperature planning. Objective-based storage targets and temperature dependent mortality will be considered with regards to their ability to support species viability and water delivery performance.

c) *Adaptive Management Technical Team:* Evaluation of action effectiveness and objective-based criteria would be assigned to the SRG.

15) Georgiana Slough Salmonid Migratory Barrier Effectiveness for salmonid fishes

a) *Brief Description:* DWR in coordination with Reclamation will continue to seasonally install and operate a salmonid migratory barrier at Georgiana Slough each year to reduce entrainment into the Central and South Delta of emigrating juvenile salmonids. Operation of the salmonid migratory barrier should improve the seasonally averaged through-Delta survival probability to Chipps Island compared with survival probability if the salmonid barrier were not in operation. Barrier operations and monitoring details are defined in the Georgiana Slough Salmonid Migratory Barrier (GSSMB) Operations and Monitoring Plans developed by the GSSMB Coordination Group. To further maximize seasonal survival benefits to migrating salmonids, DWR and Reclamation will continue leading the GSSMB Coordination Group, with membership comprised of DWR, Reclamation, CDFW, USFWS, NMFS, and State/Federal Water Contractors representatives. DWR and Reclamation, working with the GSSMB Coordination Group, will

provide at least a triennial report and review and update, as necessary, the GSSMB Operations and Monitoring Plans.

b) *Assigned AM Bin: Bin 2*

Triennial report of GSSMB operations and monitoring that can be used to inform necessary changes/updates to the Operations and Monitoring Plans.

c) *Adaptive Management Technical Team:* Triennial report and updating the GSSMB Operations and Management Plan would be assigned to the GSSMB Coordination Group.

16) Spring Outflow

a) *Brief Description:* Reclamation and DWR will supplement Delta outflow during spring months per the terms of the Voluntary Agreements (VAs) as described in the March 2022 Voluntary Agreement Term Sheet, revised in November 2022. Actions that will support the additional Delta outflow include Reclamation and DWR south of Delta export modifications, Reclamation reoperating upstream reservoirs to advance and allow for scheduling of water made available by contractors in CVP watersheds and passing Delta inflow from water made available by VA Parties. In the latter case, spring flow pulses on VA tributary systems (Sacramento, American, Feather, Mokelumne, Yuba, and Tuolumne rivers and Putah Creek) are intended to benefit juvenile Chinook Salmon growth and survival in the tributaries while also contributing to increased Delta outflows. The increased Delta outflows are intended to benefit Chinook Salmon outmigration survival in the Delta and enhance habitat for native estuarine fishes, including Delta Smelt and Longfin Smelt. The amount of supplemental Delta outflows will vary by water year type, with 750 – 825 TAF provided in Dry, Below Normal, and Above Normal years, and approximately 150 TAF provided in Critical and Wet years. The supplemental flows will occur during the months of March through May and prioritized during the period of April 1 – May 31. The details of flow amounts by source and water year type are provided in Section XX the PA and in the November 2022 revision of the March 2022 Voluntary Agreement Term Sheet. Supplemental spring Delta outflows are proposed as part of a path of implementation for an updated SWRCB Bay-Delta Water Quality Control Plan. In advance of the SWRCB's decision regarding the VA proposal, the supplemental Delta outflows will occur as an early implementation action and continue if and when the SWRCB incorporates the VA actions into an updated Water Quality Control Plan. During implementation, supplemental spring flows will be managed by real-time operation groups to determine the source, schedule, and amount of water to ensure consistency with proposed flow levels as described in the Voluntary Agreement Term Sheet.

b) *Assigned AM Bin: Bin 3*

For a synthetic, multi-year evaluation of the performance of increased spring Delta outflows to inform the next reinitiation of consultation for long-term operations of the SWP and CVP and development of a California Endangered Species Act ITP.

c) *Adaptive Management Technical Team:* The Voluntary Agreement Science Committee (VASC) is facilitated by an independent third party and is comprised of scientists and science managers from DWR, Reclamation, CDFW, NMFS, USFWS, and the Public Water Agency organizations of the VA Parties, with staff from the SWRCB participating in an advisory capacity. The Voluntary Agreement Term Sheet includes provisions for a VA Science Program to support adaptive

management of VA actions, including increased spring flows on tributaries and Delta outflow. The VASC intends to use quantitative decision-support tools (e.g., lifecycle models for Chinook Salmon) and SDM processes to provide recommendations to the VA Program's decision-making body, the Systemwide Governance Committee. To support the VA program's adaptive management process, the VASC has developed a draft VA Science Plan, which contains hypotheses, metrics, and baselines for evaluating increased spring Delta outflows and pulse flows on tributaries. The draft VA Science Plan thus provides a framework for a multi-year evaluation of whether supplemental spring flows are performing according to expectations and will inform the SWRCB evaluation of the VA Program in Years 6 – 8 of the program, including how and whether the VA Program should continue after Year 8. The VASC will support adaptive management of spring outflows for the Biological Opinion by providing the multi-year, synthetic evaluation developed for the VA Program to the AMSC to inform future major reinitiation of consultation and ITP amendments.

17) Clear Creek

a) Brief Description: A draft proposal from Reclamation for long term Clear Creek/Whiskeytown Reservoir operations includes a novel approach to exerting desirable intra-annual flow variability. A draft new flow regime would implement variable flows over the course of a year that would range from flow releases as low as 100 cfs in late summer, adapting flow needs during spring-run Chinook Salmon spawning/the onset of fall-run spawning in September/October, and (ultimately) slowly ramping up to 300 cfs in the winter when fry could benefit from seasonally inundated surfaces, then ramping back down to 100 cfs the following summer to start again. This flow variability will create a more natural seasonally variable hydrograph and is expected to provide opportunity for gravel augmentation or other restoration to target surface elevations and channel form for seasonal inundation to benefit salmon rearing. There are expected benefits and potential consequences from these changes. Continuation of existing, and some proposed, monitoring efforts including but not limited to RBFWO maintained temperature loggers, Potential Spawning Area Mapping (PSAM), Spawn Area Mapping (SAM), rotary screw trapping, spawning surveys, snorkel surveys, video weir, redd mapping, and proposed habitat monitoring will be important for evaluation of these management actions.

*b) Assigned AM Bin: **Bin 2***

An adaptive management and monitoring approach to the new flow regime and/or temperature criteria will be useful for determining if the flow variability indeed provides viable opportunity to contribute to restoring channel form and floodplain elevations to targeting rearing habitat and improved growth and survival for juvenile salmon, and for guiding adjustments to flow and temperature criteria if necessary. It is anticipated that adaptive management refinements would occur at approximately three-year intervals, although more frequent refinements may be necessary in the first few years of implementing the new flow regime.

c) Adaptive Management Technical Team: Field coordination and implementation of monitoring studies would occur through the existing Clear Creek Technical Team (CCTT) work team. The CCTT, with representatives from Reclamation, USFWS, NMFS, DWR, CDFW and others, provides Central Valley Operations with an annual pulse flow and temperature management proposal. This proposal details the CCTT's request for pulse flow releases from Whiskeytown Dam (e.g., flow schedule, ramping rates, peak flow) and water temperature management, as well as

background information on fish monitoring and proposal rationale. It is anticipated that the CCTT will continue to provide annual proposals and that they will include details on how best to implement the variable flow regime and meet water temperature criteria. Additionally, the CCTT is anticipated to review outcomes of the flow regime and make suggestions to improve future management actions for the benefit of fish and wildlife on Clear Creek. Additionally, the CCTT provides Reclamation with an annual summary of management activities on Clear Creek. These reports highlight the past water year's conditions, management actions and results, habitat restoration projects, fisheries monitoring data, and the CCTT's meeting discussions. It is anticipated that these annual summaries will continue to provide evaluations and potential refinements for future year's implementation of flow and temperature management.

Attachment 3 – Adopted Mitigation Monitoring and Enforcement

Record of Decision

**Long-Term Operation of the Central Valley Project and
State Water Project**

Attachment 3. Adopted Mitigation Monitoring and Enforcement

Table 3-1. CVP and SWP Wide Adopted Mitigation Monitoring and Enforcement

Additional Mitigation Adopted	Impact Addressed by Mitigation Measure	Responsible Party	Verification	Timing
Mitigation Measure BIO-4: Flow Criteria and Real-time Group Considerations for Bank Swallow: Develop flow criteria that avoid impacts of high water flows by limiting frequency and duration of peak flows over 14,000 cfs (Sacramento River) or rapid draw-downs to nesting bank swallow habitat during the breeding season (April 1 through August 31); this measure takes into consideration including downstream tributary flows when timing water releases (Bank Swallow Technical Advisory Committee 2013).	Changes in flows compared with the No Action Alternative are expected to result in very minor effects on plants and wildlife along stream and reservoir banks but could result in adverse impacts on bank swallow colonies.	Reclamation	Seasonal and Annual Reports	Annually/ Seasonally One-Time
Mitigation Measure WS-1: Coordination with Byron Bethany Irrigation District: DWR will coordinate with Byron Bethany Irrigation District prior to herbicide treatments.	Potential impacts to water supply from herbicide treatments	DWR	Annual Report	Prior to herbicide application
Mitigation Measure WS-2: Coordination with Contra Costa Water District: Reclamation will coordinate with Contra Costa Water District (CCWD) to avoid creating new or additional restrictions on CCWD's ability to fill Los Vaqueros Reservoir, beyond the restrictions that are imposed under the then current CCWD Biological Opinions and Incidental Take Permits, so that with implementation of the selected alternative, CCWD will have opportunities to fill Los Vaqueros Reservoir that are at least comparable to the current opportunities.	Potential small reductions to water supply	Reclamation	Annual Report	Ongoing
Mitigation Measure AQUA-4: Fall-run Chinook Salmon Brood Year Assessment: To assess the condition of fall-run Chinook salmon populations on CVP tributaries, a fall-run Chinook salmon brood year assessment for the previous year's cohort and the cohort of returning adults that hatched three	Impacts to fall-run Chinook salmon from proposed operations.	Reclamation	Annual Report	Annually

Additional Mitigation Adopted	Impact Addressed by Mitigation Measure	Responsible Party	Verification	Timing
years prior will be completed. The brood year assessment will be based on the best available science each year and teams may consider using indicators similar to the <i>Annual Winter-run Chinook Brood Year Assessment</i> that is part of Alternative 2. Information will be reviewed by technical teams coordinating specific divisions or watersheds and attached to the Long-Term Operations Annual Report by Reclamation.				

Attachment 4 – Avoidance and Minimization Measures Included in Action 5

Record of Decision

**Long-Term Operation of the Central Valley Project and
State Water Project**

Attachment 4. Avoidance and Minimization Measures Included in Action 5

Appendix D in the EIS includes a detailed description of mitigation measures identified for fish and aquatic resources. This Attachment summarizes the avoidance and minimization measures that are built in as part of Action 5. Mitigation measures in the Action 5 may be modified through adaptive management.

Sacramento River Division

Table 4-1. Avoidance Measures in the Sacramento River Division

Avoidance Measure	Impact Category	Responsible Party	Verification	Timing
Fall and Winter Base Flows for Shasta Refill and Redd Maintenance: More storage required for Shasta Reservoir from December through February for higher release. Predictable storage management for Shasta Reservoir	Water Supply, Fish and Aquatics	Reclamation	Seasonal and Annual Report	Annually
Adult Migration and Holding Water Temperature Objectives: Under a circumstance where conditions may cause water temperatures to rise to concerning levels prior to the final TMP, Reclamation will begin water temperature management as early as March 1 to target water temperatures of 58.0° F daily average at the Sacramento River above the Clear Creek Gage (CCR).	Water Quality, Fish and Aquatics	Reclamation	Seasonal and Annual Report	Annually
Limitations in Sacramento River Settlement (SRS) Contractors Water Available Under Contract – Water temperature related impacts: Sacramento River flows may decrease in the spring, summer, and fall of dry years as one approach to conserving storage in Shasta Reservoir.	Water Supply, Water Quality, Fish and Aquatics	Reclamation	Annual Report	Annually
Refuge Coordination for Instream Flow, Lake Levels, and Refuge Needs for salmonids and sturgeon: Shasta Reservoir releases to refuges in the summer and fall may decrease during the driest of years to increase Shasta Reservoir storage.	Water Supply, Fish and Aquatics, Terrestrial	Reclamation	Annual Report	Annually

Avoidance Measure	Impact Category	Responsible Party	Verification	Timing
Annual Winter-Run Chinook Salmon Brood Year Assessment: Based on the outcome of the broodyear assessment prepared by the Winter-run JPE sub-team, Reclamation, NMFS, USFWS and CDFW will convene appropriate technical staff to make recommendations if it is necessary to increase the production of winter-run Chinook salmon associated with the Integrated-Recovery Supplementation Program or take other actions to protect production of winter-run Chinook salmon at the Livingston Stone National Fish Hatchery.	Fish and Aquatics	Reclamation	Annual Report	Annually
Adult Migration & Holding Water Temperature Objectives – Managing water temperatures: Under a circumstance where low flows combined with warm air temperatures and/or an intentional warmwater power bypass cause water temperatures to rise to concerning levels prior to the final Temperature Management Plan, Reclamation will begin temperature management as early as March 1st through May to target water temperatures of 58°F daily average at CCR.	Fish and Aquatics	Reclamation	Annual Report	Annually
SRS Contractors – Delaying or Shifting Spring Diversions, Shifting Timing of Delivery of Transfer Water, Rice Decomposition Smoothing: Reclamation may request that the SRSC shift timing of delivery of transfer water to increase the amount of water in Shasta Reservoir through the water temperature management season	Fish and Aquatics and Water quality	Reclamation and SRS Contractors	Annual Report	Annually
Minimum Instream Flows – Increased holding capacity for Shasta Reservoir storage: In response to major storm events, Reclamation, after coordination through the SRG and SHOT, and also through adaptive management, may determine that lower flows achieve the same biological effects as the minimum flow of 3,250 cfs at Keswick Dam.	Fish and Aquatics, Water Quality and Water Supply	Reclamation	Annual Report	Annually
Flow and Non-Flow Measures from the Voluntary Agreements – Increased flow from increased spring releases for Sacramento salmonids: Flow and non-flow measures may increase flows in the spring prior to the water temperature management season	Fish and Aquatics and Water Quality	Reclamation	Annual Report	Annually
Wilkins Slough Minimum Flow Criteria Relief – Summer flows for salmonids and sturgeon: Minimum flows are met under considerations for storage, fisheries, and water deliveries.	Fish and Aquatics, Water Supply and Water Quality	Reclamation	Annual Report	Annually

Avoidance Measure	Impact Category	Responsible Party	Verification	Timing
Rebalancing between other CVP Reservoirs – Conserving Shasta Reservoir storage for salmonids and sturgeon: Rebalancing between reservoirs can be used to conserve Shasta Reservoir storage and operate the Temperature Control Device TCD to temperature targets.	Fish and Aquatics, Water Quality	Reclamation	Annual Report	Annually
Limitations on CVP Allocations for End of September Storage – Water supply reductions in dry water years for salmonids and sturgeon: The goal of reductions is to increase end of September storage for Shasta Reservoir.	Fish and Aquatics and Water Quality	Reclamation	Annual Report	Annually
Modifications to Water Transfers – Shifting timing during typical irrigation season for salmonids and sturgeon: Modifications to water transfers involve shifting the timing of delivery of transfer water during the typical irrigation season.	Fish and Aquatics	Reclamation	Annual Report	Annually
Situation-Specific Adjustments to Delta Water Quality Standards – Water temperature related impacts for salmonids and sturgeon: Sacramento River flows may decrease in dry years as one approach to conserving storage in Shasta Reservoir. Relaxation of Delta outflow and salinity requirements historically occur in the winter, spring, and summer.	Fish and Aquatics	Reclamation	Annual Report	Annually
Egg Incubation and Emergence Water Temperature Objectives – Withdrawing and blending water within Shasta Reservoir for salmonids and sturgeon: Water temperature management would target 53.5°F through operation of the Temperature Control Device on Shasta Dam, selectively withdrawing and blending water from different elevations within Shasta Reservoir	Fish and Aquatics	Reclamation	Annual Report	Annually
Drought Operations Priority Framework – Winter-run Chinook salmon spawning water temperatures for salmonids and sturgeon: Reclamation will develop a Drought Emergency Plan that establishes system priorities and seeks to provide Winter-run Chinook salmon spawning water temperatures.	Fish and Aquatics	Reclamation	Annual Report	Annually
Ramping Rates – Limiting how quickly releases are reduced for salmonids and sturgeon: Changes in river elevation from reservoir releases can strand fishes.	Fish and Aquatics	Reclamation	Annual Report	Annually

Avoidance Measure	Impact Category	Responsible Party	Verification	Timing
Minimum Instream Flows – Temporary reductions in Reservoir releases for salmonids and sturgeon: Minimum instream flows are temporary reductions in reservoir releases to preserve water storage.	Fish and Aquatics	Reclamation	Annual Report	Annually
Pulse Flows – Releases of water from Reservoirs for salmonids and sturgeon: Pulse flows are spatiotemporally coordinated releases to benefit migration of fish.	Fish and Aquatics	Reclamation	Annual Report	Annually

Clear Creek

Table 4-2. Avoidance Measures in Clear Creek

Avoidance Measure	Impact	Responsible Party	Verification	Timing
Clear Creek Water Temperature Management – Whiskeytown Dam releases: In dry, critical, or transfer curtailment years, Reclamation may not be able to meet water temperatures and will operate Whiskeytown Dam as close to these water temperatures as practical.	Fish and Aquatics	Reclamation	Seasonal Report	Annually
Pulse Flows – Clear Creek water quality and dilution capability: Except in years with significant uncontrolled spill, Reclamation will release up to 10,000 acre-feet from Whiskeytown Dam for channel maintenance, spring attraction flows, and to meet other physical and biological objectives.	Water Quality and Fish and Aquatics	Reclamation	Seasonal Report	Annually
Ramping Rates – Limiting how quickly releases are reduced for salmonids: Changes in river elevation from reservoir releases can strand fishes.	Fish and Aquatics	Reclamation	Seasonal Report	Annually
Minimum Instream Flows – Temporary reductions in Reservoir releases for salmonids: Minimum instream flows are temporary reductions in reservoir releases to preserve water storage.	Fish and Aquatics	Reclamation	Seasonal Report	Annually
Pulse Flows – Releases of water from reservoirs for salmonids: Pulse flows are spatiotemporally coordinated releases to benefit migration of fish.	Fish and Aquatics	Reclamation	Seasonal Report	Annually

American River

Table 4-3. Avoidance Measures in the American River

Avoidance Measure	Impact	Responsible Party	Verification	Timing
Redd Dewatering Protective Adjustment – Hydrology and potential dewatering impacts to fall-run Chinook salmon redds: The measure may decrease stranding and dewatering by softening changes in the minimum release requirements.	Fish and Aquatics	Reclamation	Seasonal Report	Annually
Folsom Reservoir Flow and Temperature Management: Reclamation will implement the Automated Temperature Selection Procedure, which was developed in consultation with representatives of state and federal agencies and prioritizes water temperatures during the summer to support steelhead rearing over water temperatures in the fall to support fall-run Chinook salmon spawning.	Fish and Aquatics	Reclamation	Seasonal Report	Annually
Ramping Rates – Limiting how quickly releases are reduced for salmonids and sturgeon: Changes in river elevation from reservoir releases can strand fishes.	Fish and Aquatics	Reclamation	Seasonal Report	Annually
Minimum Instream Flows – Temporary reductions in Reservoir releases for salmonids and sturgeon: Minimum instream flows are temporary reductions in reservoir releases to preserve water storage.	Fish and Aquatics	Reclamation	Seasonal Report	Annually
Pulse Flows – Releases of water from reservoirs for salmonids and sturgeon: Pulse flows are spatiotemporally coordinated releases to benefit migration of fish.	Fish and Aquatics	Reclamation	Seasonal Report	Annually

Stanislaus River

Table 4-4. Avoidance Measures in the Stanislaus River

Avoidance Measure	Impact	Responsible Party	Verification	Timing
Water Instability Flows – Water temperatures and rearing habitat: The measure may decrease water temperatures and provide more rearing habitat in the winter at the consequence of reducing reservoir storage and potentially increasing water temperatures in subsequent months.	Fish and Aquatics	Reclamation	Seasonal Report	Annually
Ramping Rates – Limiting how quickly releases are reduced for salmonids: Changes in river elevation from reservoir releases can strand fishes.	Fish and Aquatics	Reclamation	Seasonal Report	Annually

Delta

Table 4-5 Avoidance Measures in the Delta

Avoidance Measures	Impact	Responsible Party	Verification	Timing
Delta Control Gates Closures – Potential decrease of entrainment risk: The measure may decrease entrainment risk by potentially aquatic species from being diverted into the interior Delta.	Fish and Aquatics	Reclamation and DWR	Annual Report	Annually
Baker Slough Pumping Plant – Delta and longfin smelt entrainment risk reduction: The measure may benefit Delta smelt and longfin smelt through reduced entrainment risk.	Fish and Aquatics	Reclamation and DWR	Annual Report	Annually
Tracy Fish Collection Facility and Skinner Delta Fish Protective Facility – Fish screening from Jones Pumping Plant: The measure may decrease entrainment risk by potentially preventing aquatic species from being entrained at the export facility.	Fish and Aquatics	Reclamation and DWR	Annual Report	Annually
Old and Middle River Flow Management Start – The measure may decrease entrainment risk by potentially preventing aquatic species from being entrained at the export facility.	Fish and Aquatics	Reclamation and DWR	Annual Report	Annually

Avoidance Measures	Impact	Responsible Party	Verification	Timing
Old and Middle River Management Real Time Operation – Manage diversion rates: The measure may decrease entrainment risk by potentially preventing aquatic species from being entrained at the export facility.	Fish and Aquatics	Reclamation and DWR	Annual Report	Annually
Spring Delta Outflow – Supplement Delta outflow: Reclamation and DWR will take actions intended to supplement Delta outflow per the terms of the Vas approved by the SWRCB and executed agreements by VA parties.	Fish and Aquatics	Reclamation and DWR	Annual and Seasonal Reports	Annually
Delta Smelt Supplementation – Collaborate Governance: The measure is expected to be generally beneficial to the Delta smelt population due to the increased releases into the Delta.	Fish and Aquatics	Reclamation and DWR	Annual and Seasonal Reports	Annually
Modifications to Water Transfers – Shifting timing during typical irrigation season for salmonids, sturgeon, and smelt: Modifications to water transfers involve shifting the timing of delivery of transfer water during the typical irrigation season.	Fish and Aquatics	Reclamation	Annual Report	Annually
Delta Smelt Adult Entrainment Protection Action (Turbidity Bridge) – Continuous bridge of turbidity: If after a “First Flush” Action If JPF is < 0 cfs, daily average turbidity is ≥ 12 Formazin Nephelometric Units (FNU) in the OMR corridor, and average water temperatures at Jersey Point or Rio Vista have not exceeded 53.6°F (12°C) consecutively for 3 days,, Reclamation and DWR will make a one-time action to reduce reducing CVP and SWP exports to maintain an average OMR Index no more negative than -3,500 cfs for at least 7 days.	Fish and Aquatics	Reclamation and DWR	Annual Report	Annually

Attachment 5 – Mitigation Measures Not Adopted

Record of Decision

**Long-Term Operation of the Central Valley Project and
State Water Project**

Attachment 5. Mitigation Measures Not Adopted

Table 5-1. Mitigation Measures not Adopted

Mitigation/Avoidance Measure	Impact	Rationale
AG-1: Diversify Water Portfolios – Water agencies diversifying their water portfolios: Diversification could include the sustainable conjunctive use of groundwater and surface water, water transfers, water conservation and efficiency upgrades, and increased use of recycled water or water produced through desalination where available.	Agricultural Lands	We received input from the public and interested parties that this measure is not widely feasible and may not be effective. Moreover, this measure is outside of Reclamation's control.
VIS-2: Develop a Visual Resource Monitoring and Mitigation Program for San Luis Reservoir: A program will be developed and implemented to reduce, minimize, or eliminate adverse changes in visual resources along San Luis Reservoir, such as substantial exposure of typically inundated substrate.	Visual Resources	Limited agency resources are to be used in a different capacity.
WQ-1: Develop a Water Quality Mitigation and Monitoring: A program shall be developed and implemented to reduce, minimize, or eliminate increases in water quality constituents.	Water Quality	Reclamation meets its water quality requirements through D-1641.
Mitigation Measure BIO-3: Real-time Group Considerations for Foothill Yellow-legged Frog: Reclamation will develop and implement field evaluations to inform real-time groups to minimize impacts to foothill yellow-legged frog and their aquatic habitat. Reclamation will coordinate with other monitoring efforts, as relevant, to reduce the data gap regarding known occupied and predicted occupied habitat of foothill yellow-legged frog in the action area and to identify comprehensive and consistent measures to improve the potential for conservation of these species and associated aquatic habitats. Field evaluations for foothill yellow-legged frog for all flow operations will inform real-time groups to minimize impacts to terrestrial biological resources for operational decisions and will be conducted in coordination with the various technical teams and the program will be developed in coordination with USFWS and CDFW. The monitoring approach includes the following principles which would be incorporated into any future changes to monitoring programs addressed in a subsequent consultation:	Terrestrial Species	Foothill Yellow legged frog were not identified to be adversely affected in the 2024 ESA Section 7 consultation with USFWS.

Mitigation/Avoidance Measure	Impact	Rationale
- Chapter 3: Incorporate an aquatic habitat and ecosystem monitoring enterprise for the long-term operations of the CVP and SWP to effectively measure physical conditions, water quality, and species abundance and distribution. - Chapter 4: Provide robust synthesis of data to incorporate results and lessons learned. Species-specific conservation actions to assess the condition of foothill yellow-legged frog and viability of aquatic habitat in the action area are described below. Protocols for documenting occurrences of all life-stages of foothill yellow-legged frog (including monitoring intervals) and assessing their habitat will be developed by Reclamation, in conjunction with the USFWS and CDFW, based on the best available protocol for this species (e.g., Seldenrich and Pool 2002). This information will be used to document baseline levels for population monitoring. Surveys will include the following, as needed, to generate a robust synthesis of results for the monitoring program: - Chapter 5: Stream reaches occupied by adult foothill yellow-legged frog and stream reaches used for breeding (e.g., based on presence of egg masses or tadpoles). - Chapter 6: Unoccupied breeding habitat with the potential to support breeding populations (typically upstream or downstream of occupied habitat). - Chapter 7: An assessment of riparian vegetation and stream substrate along occupied and unoccupied stream reaches. - Chapter 8: Presence of non-native bullfrogs, crayfish, and non-native, predatory fish species. - Chapter 9: Presence of other factors that could potentially affect breeding success.		
Mitigation Measure BIO-2: Northwestern Pond Turtle – Real-Time Group Considerations: Reclamation will develop and implement field evaluations to inform real-time groups to minimize impacts to northwestern pond turtle and their aquatic habitat. Reclamation will coordinate with other monitoring efforts, as relevant, to reduce the data gap regarding known occupied and predicted occupied habitat of northwestern pond turtle in the action area and to identify comprehensive and consistent measures to improve the potential for conservation of these species and associated aquatic habitats. Field evaluations for northwestern pond turtle for flow operations will inform real-time groups to minimize impacts to terrestrial biological resources for operational decisions and will be conducted in coordination with the various technical teams (e.g. SHOT) and the program will be developed in coordination with USFWS and CDFW.	Terrestrial Species	Not specifically related to the operations of the CVP and SWP.

Mitigation/Avoidance Measure	Impact	Rationale
The monitoring approach includes the following principles which would be incorporated into any future changes to monitoring programs addressed in a subsequent consultation: • Incorporate an aquatic habitat and ecosystem monitoring enterprise for the long-term operations of the CVP and SWP to effectively measure physical conditions, water quality, and species abundance and distribution. • Provide robust synthesis of data to incorporate results and lessons learned. • Protocols for monitoring northwestern pond turtle (including monitoring intervals) and assessing their habitat will be developed by Reclamation, in conjunction with the USFWS and CDFW, based on the best available scientific methods for this species (e.g., Bury et al. 2001; Oregon Department of Fish and Wildlife 2020). This information will be used to document baseline levels for population monitoring. Surveys will include the following, as needed, to generate a robust synthesis of results for the monitoring program: • Assess the quality of occupied and unoccupied (typically adjacent to occupied habitat) western pond turtle habitat in stream reaches. • Document the presence of basking sites that could be monitored repeatedly. • Assess the relative quality of adjacent upland nesting and overwintering habitat, particularly in areas where nesting has been documented in the past. • Evaluate the presence of factors that could affect breeding success (e.g., adjacent land use). • Document whether young turtles are present (as an indication of whether successful reproduction is occurring).		
Mitigation Measure REC-1: Update Public Information on Changing Recreation Conditions: Reclamation will facilitate updates to widely available information (websites or other sources) to inform the public when adverse changes in average water elevation, river flows, or seasonal fluctuations occur to recreation resources, depending on different factors such as the type of recreation and intensity of the activity (e.g., advanced whitewater rafting versus less-advanced rafting)	Recreation	May already be occurring
Mitigation Measure AQUA-2: Delta Smelt Monitoring: Reclamation will continue to monitor Delta smelt.	Aquatic	Addressed by Proposed Action
Mitigation Measure AQUA-3: Longfin Smelt Monitoring: Reclamation will continue to monitor Longfin smelt.	Aquatic	Addressed by Proposed Action

Mitigation/Avoidance Measure	Impact	Rationale
Mitigation Measure EJ-1: Increasing Participation with Tribal, Minority, and Low-Income Populations: During any ongoing coordination regarding long-term operations of the CVP, Reclamation will, consistent with the Bipartisan Permitting Reform Implementation Rule, 89 Fed. Reg. 35,442 (May 1, 2024); U.S. Department of Interior Equity Action Plan (April 14, 2022); and Reclamation’s Manual, Directives and Standard on Public Involvement in Bureau of Reclamation Activities (updated July 28, 2023): • Treat Indigenous Knowledge as high-quality information. • Consider the ability of affected persons and agencies to access electronic media and the primary language of affected persons when conducting research. • Support priority actions in the DOE Equity Action Plan, Action 4, related to increasing opportunities to access public lands and prioritizing access to recreation areas and services in urban communities. Strive to reach and involve minority, low-income, reluctant or unknown publics who may be affected, using minority or special media, translated materials, or other means, as appropriate. Reclamation will identify opportunities to gather Tribal Indigenous Knowledge for consideration in future Reclamation projects. Additionally, Reclamation will identify opportunities to include tribal interests and low-income/minority advocacy groups in affected communities to review and provide input on compliance documentation. For projects occurring in areas with a high proportion of Spanish speaking residents, Reclamation will continue to provide materials and resources in Spanish for a higher likelihood of participation from the affected population.	Environmental Justice	Executive Orders 12898 (Feb. 11, 1994) and 14096 (Apr. 21, 2023) have been repealed.
Mitigation Measure EJ-2: Reduce Effects of Employment Loss: To assist in offsetting job losses in the agricultural sector, Reclamation will develop internship program(s) and advertise in affected communities near the Reclamation offices.	Environmental Justice	Executive Orders 12898 (Feb. 11, 1994) and 14096 (Apr. 21, 2023) have been repealed.
Mitigation Measure EJ-3: Increasing Participation with Trinity River Parties: Reclamation will hold a public meeting in Trinity County to hear from local interests on Trinity River specific alternatives and potential impacts.	Environmental Justice	Executive Orders 12898 (Feb. 11, 1994) and 14096 (Apr. 21, 2023) have been repealed. However, Reclamation is currently undertaking a concurrent effort on Trinity River Division operations that may impact water supply, aquatics, recreation, and economics. Reclamation will consider the inclusion of this measure in the Trinity River specific process.

Attachment 6 – Comment Letters Received on Final EIS

Record of Decision

**Long-Term Operation of the Central Valley Project and
State Water Project**

Warner, Timothy J

From: Gordon, Stephanie (Skophammer) <GORDON.STEPHANIES@EPA.GOV>
Sent: Monday, December 16, 2024 1:58 PM
To: Warner, Timothy J
Cc: Riddle, Diane@Waterboards
Subject: [EXTERNAL] FEIS Comments Long Term Operations
Attachments: 2024-12-13_EPA Comments_Long Term Operations FEIS-signed.pdf

This email has been received from outside of DOI - Use caution before clicking on links, opening attachments, or responding.

Hello Tim Warner,
Please find attached EPA's comments on the Final EIS for the Long Term Operations. EPA is submitting these comments because Section 309 of the Clean Air Act requires EPA to review and comment on the environmental impact of any proposed federal action subject to NEPA's environmental impact statement requirements. Thank you for your response to our comments on the Draft EIS.

Thank you,
Stephanie

Stephanie Skophammer Gordon
U.S. Environmental Protection Agency, Region 9
Environmental Review Branch
75 Hawthorne St.
San Francisco, CA 94105
(415) 972-3098
Pronouns: she/her
gordon.stephanieS@epa.gov
Please do not mail me any hard copies.



REGION 9

SAN FRANCISCO, CA 94105

December 13, 2024

Tim Warner
U.S. Bureau of Reclamation
Attention: Bay-Delta-Office
801 I Street, Suite 140
Sacramento, California 95814

Subject: EPA Comments on the Final Environmental Impact Statement for Long-Term Operations of the Central Valley Project and State Water Project, California (EIS No. 20240211)

Dear Tim Warner:

The U.S. Environmental Protection Agency has reviewed the Bureau of Reclamation's above-referenced document pursuant to the National Environmental Policy Act and our NEPA review authority under Section 309 of the Clean Air Act. The CAA Section 309 role is unique to EPA. It requires EPA to review and comment on the environmental impact of any proposed federal action subject to NEPA's environmental impact statement requirements and to make its comments public.

Reclamation has selected Alternative 2 Multi-Agency Consensus as the preferred alternative. It includes actions developed with California Department of Fish and Wildlife, Department of Water Resources, National Marine Fisheries Service, and US Fish and Wildlife Service to harmonize operational requirements of the Central Valley Project with California Endangered Species Act requirements for the State Water Project. Alternative 2 is analyzed in phases to accommodate voluntary flow contributions and State Water Resources Control Board decisions, including 1) operations with a Temporary Urgency Change Petition; 2) the full Voluntary Agreement alternative to the Bay-Delta Plan update; 3) early implementation of Delta export reductions; and 4) no additional winter and spring Delta outflow. NMFS, USFWS, and CDFW have all finalized their Endangered Species Act decision documents.

The EPA recognizes the need for improved water management in California and has been a cooperating agency on this project to ensure that federal decision making concerning new water operations appropriately considers environmental impacts, including cumulative impacts

associated with other proposed and planned water infrastructure projects and water quality control plans. In our comments on the Draft EIS, we identified several topics or resource areas that would benefit from additional information or analysis in the Final EIS, including project operations, scope of analysis, climate impacts, and surface water quality. We appreciate Reclamation's response to our comments provided in the Final EIS.

As noted in the Executive Summary, Preferred Alternative 2 accommodates operations with Temporary Urgency Change Petitions (TUCP). However, details regarding TUCPs (under what conditions they would occur, what criteria they would apply to, and what locations would be affected) are not described in the detailed descriptions of Alternative 2 within Chapter 3 or, as mentioned in the Response to Comments, Appendix G. EPA remains concerned that including TUCPs in planned operations is not appropriate given the infrequent and exceptional circumstances which are they are requested and approved. We recommend more transparent consideration be given to when and how TUCPs will be utilized by Reclamation in their Long-Term Operations of the CVP.

The EPA appreciates the opportunity to provide comments on this Final EIS. If you have any questions, please contact me at donez.francisco@epa.gov or Stephanie Gordon at gordon.stephanies@epa.gov.

Sincerely,

**FRANCISCO
DONEZ**

Digitally signed by
FRANCISCO DONEZ
Date: 2024.12.13 15:11:07
-08'00'

Francisco Dóñez
Manager
Environmental Review Section 2

Cc: Diane Riddle, State Water Resources Control Board

Warner, Timothy J

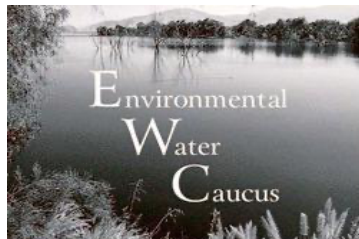
From: John Buse <jbuse@biologicaldiversity.org>
Sent: Monday, December 16, 2024 5:31 PM
To: BDO Comments, BOR MPR
Subject: [EXTERNAL] Comments on Final EIS for Long-Term Operations of CVP and SWP
Attachments: 2024.12.16 FEIS Comments.pdf

This email has been received from outside of DOI - Use caution before clicking on links, opening attachments, or responding.

Please see the attached comments on the subject Final EIS:

John Buse
Senior Counsel
Center for Biological Diversity
Phone: (323) 533-4416

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December 16, 2024
U.S. Bureau of Reclamation California Great Basin Region
Via email: sha-mpr-bdo@usbr.gov

Re: Comments on Bureau of Reclamation FEIS (EIS No. 20240211) on Long-Term Operations of the CVP and SWP

Dear U.S. Bureau of Reclamation:

By this letter, our public interest organizations comment, pursuant to the National Environmental Policy Act (NEPA), on the U.S. Bureau of Reclamation (Reclamation) Final Environmental Impact Statement (Final EIS) on Long-Term Operations (LTO) of the Central Valley Project (CVP) and State Water Project (SWP). The Final EIS was issued for public review on November 15, 2024. These comments are submitted by Sierra Club California, AquAlliance, Center for Biological Diversity, California Water Impact Network, Environmental Water Caucus, and Planning and Conservation League.

The Final EIS and Response to Comments (RTC) failed to address several specific comments from Sierra Club, et al.'s September 6, 2024 letter regarding the Draft EIS and inadequately responded to others. The Final EIS still contains myriad inadequacies, including the omission of relevant information regarding impacts on endangered and threatened species,

failure to include environmentally protective alternatives, and inadequate assessment of several reasonably foreseeable impacts. We urge Reclamation to revise or supplement the Final EIS to comply with NEPA.

I. Information in the Staff Report Pertains to the EIS Because the Bay-Delta Plan Affects Long-Term Operation of the SWP and CVP.

The Final EIS still omits critical information on impacts to endangered and threatened species and the environment from the State Water Resources Control Board (Water Board)’s Draft, *Staff Report/Substitute Environmental Document in Support of Potential Updates to the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary for the Sacramento River and its Tributaries, Delta Eastside Tributaries, and Delta* (Staff Report), despite numerous comments urging Reclamation to include this information. Reclamation largely responds to this glaring omission by insisting that information on impacts in the Staff Report does not “pertain” to the Final EIS here. (*See e.g.* RTC at 224.) This is incorrect for several reasons.

First, as Reclamation is aware, the Long-Term Operation of the Projects and the Staff Report’s proposed amendments to the Bay-Delta Water Quality Control Plan (Bay-Delta Plan) are inextricably intertwined: The Long-Term Operation affects the Delta, and proposed Bay-Delta Plan amendments may very well constrain the Long-Term Operation of the Projects. This is because the State Water Board’s Decision 1641 (or D-1641) places responsibility for the Plan’s implementation on Reclamation and the California Department of Water Quality Resources (DWR):¹ The Bay-Delta Plan requires the SWP and CVP to meet certain water quality and flow objectives in the Delta to maintain desired salinity levels for in-Delta diversions (*e.g.*, water quality levels for in-Delta water supplies) and fish and wildlife, among other things. (*See* Cal. Water Code §13160.) The Bay-Delta Plan’s restrictions, as a result, frequently affect the

¹ California Environmental Protection Agency, State Water Resources Control Board, “Revised Water Right Decision 1641,” March 15, 2000, at https://www.waterboards.ca.gov/waterrights/board_decisions/adopted_orders/decisions/d1600_d1649/wrd1641_1999dec29.pdf.

amount and timing of water available for pumping and export from the Delta, sometimes reducing Delta exports to CVP and SWP water users south of the Delta.²

In light of their intertwined nature, it is inconceivable that the Staff Report's information supporting the proposed Bay-Delta Plan amendments and information regarding impacts from the Voluntary Agreements would not "pertain" to the Long-Term Operation of the CVP and SWP, as Reclamation suggests. (*E.g.*, RTC at 224, 232, 234-35.) The Staff Report includes, for example, critical information on the Projects' impacts on the Delta, indicating that "[n]ative species in the Bay-Delta ecosystem are experiencing an ecological crisis" (Staff Report, Ch. 7.12, Hydrology and Water Quality, 7.12.1 Surface Water, p. 7.12.1-1) largely due to reductions in flow, diversions, and exports. And it proposed the proposed Plan amendments as an alternative, while also assessing the very alternative Reclamation assesses in its Final EIS Alternative 2: the Voluntary Agreements. Thus, considering the Projects' impacts on the Delta and its species, as described in the Staff Report, Reclamation needed to disclose and assess the Staff Report's information in its Final EIS for Long-Term Operation of the Projects.

Second, another theme from Reclamation's responses centers on its theory that it need not assess possible conflicts with its proposed Plan amendments in the Final EIS because the Water Board has not yet adopted the proposed Plan amendments. (RTC at 254-55.) But the CEQ NEPA regulations state otherwise: an EIS "shall include an analysis of . . . *possible* conflicts between the proposed action and the objectives of Federal, regional, State, Tribal, and local plans, policies, and controls for the area concerned[.]" (40 C.F.R. § 1502.16(a)(4) (emphases added).) While not yet adopted, the Staff Report undoubtedly describes "possible" conflicts between the proposed Plan amendments and the preferred alternative Reclamation chose here, as the Staff Report goes so far as to state: "Failing to take actions proposed by the proposed Plan amendments could result in the loss of Delta function beyond restoration of its original function and, therefore, *would result in a significant irreversible environmental change.*" (Staff Report, Ch. 7.23, Cumulative Impact Analysis, Growth-Inducing Impacts, and Significant Irreversible Environmental Changes, p. 7.23-69) (Emphasis added.) This needed further assessment in Reclamation's Final EIS.

² See U.S. Department of the Interior (DOI), Bureau of Reclamation, Mid-Pacific Region, Long-Term Central Valley Project Operations Criteria and Plan, Sacramento, CA, May 22, 2008, pp. 2-6.

However, even without this explicit conflict, the fact that the Water Board has not yet adopted the proposed Plan amendments does not mean the Staff Report information supporting that amendment is irrelevant to Long-Term Operation of the Projects. NEPA requires an evaluation of “any reasonably foreseeable adverse environmental effects” of the proposed action “to the fullest extent possible.” (42 U.S.C. § 4332(2)(C).)³ And the information in the Staff Report describes reasonably foreseeable impacts on species and habitat in the Delta from diversions, exports, and insufficient flow: all impacts partially resulting from the Projects’ operation, and which may continue to result should the Water Board not adopt the proposed Plan amendments.

Finally, Reclamation’s omission of information in the Staff Report in the Final EIS contradicts NEPA’s strong policy in favor of disclosure. NEPA requires disclosure “to the fullest extent possible.” (42 U.S.C. § 4332.) “One of the purposes of an EIS is to ensure full disclosure of the environmental consequences of a project.” *Columbia Basin Land Protection v. Schlesinger*, 643 F.2d 585, 594 (9th Cir. 1981.) The Supreme Court agreed with this sentiment in *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 350 (1989), stating “The sweeping policy goals announced in § 101 of NEPA are thus realized through a set of ‘action-forcing’ procedures that require that agencies take a “‘hard look’ at environmental consequences,” [citation omitted], and that provide for broad dissemination of relevant environmental information.” (Emphasis added.) Thus, in omitting critical information in a readily available Staff Report, Reclamation unlawfully failed to adequately disclose relevant information in its Final EIS.

In sum, the public is entitled to a full and fair discussion of significant effects of diversions of freshwater for CVP and SWP operations on endangered and threatened fish species. Reclamation must prepare a supplemental Draft EIS that discloses and discusses the information provided by expert agencies and the new information in Staff Report. In particular, it is critical for a supplemental Draft EIS to also disclose and discuss the expert agencies’

³ The Long-Term Operation of the Projects and the proposed Plan amendment supported by the Staff Report may also be viewed as “connected actions” because the preferred alternative for the Projects’ Long-Term Operation cannot proceed if the Water Board adopts the proposed Plan amendments. (40 C.F.R. § 1501.3 (b)(2) (defining connected actions as those that “[c]annot or will not proceed unless other actions are taken previously or simultaneously.”).) Thus, the Staff Report’s assessment supporting the foreseeable proposed Plan amendment adoption should have been taken into account here.

information indicating that the Voluntary Agreements will not sufficiently protect the endangered and threatened fish species.

II. Reclamation Failed to Disclose Expert Agency Disagreement Regarding the Voluntary Agreements in the Final EIS.

The Final EIS fails to disclose relevant information, including disagreements among expert agencies regarding the Voluntary Agreements' effectiveness, included in Alternative 2. This violates NEPA regulations, which mandate that "[a]t appropriate points in the draft statement, the agency *shall* discuss *all major points of view* on the environmental effects of the alternatives, including the proposed action." (40 C.F.R. § 1502.9(b)) (Emphasis added.) Courts have made plain this includes disagreements: Agencies must not only recite dissenting opinions; they must "analyze," "respond to," and "discuss" them. *Ctr. for Biological Diversity v. U.S. Forest Serv.*, 349 F.3d 1157, 1168 (9th Cir. 2003); *Seattle Audubon Soc'y v. Espy*, 998 F.2d 699, 704 (9th Cir. 1993) (finding that the Forest Service was required to address in the final environmental impact statement scientific criticisms opposing evidence upon which the final statement's management strategy rested); *Sierra Club v. Bosworth*, 199 F. Supp. 2d 971, 981 (N.D. Cal. 2002) (concluding that a reasoned discussion of major scientific objections must be disclosed in the final impact statement); *W. Watersheds Project v. Zinke*, 441 F. Supp. 3d 1042, 1087 (9th Cir. 2020) (NEPA's requirement that responsible opposing viewpoints are included in the final impact statement "reflects the paramount Congressional desire to internalize opposing viewpoints into the decision-making process to ensure that an agency is cognizant of all the environmental trade-offs that are implicit in a decision.") (citing *California v. Block*, 690 F.2d 753, 770-71 (9th Cir. 1982).) None of that was done here.

Specifically, Reclamation failed to respond to comments that it omitted information provided by EPA and the National Marine Fisheries Service (NMFS) describing the Voluntary Agreements' inadequacies and omitted these disagreements from assessment of Alternative 2 in the Final EIS. Sierra Club, et al.'s previous comments noted EPA's Staff Report, explaining that the Voluntary Agreements "do not provide flow to ensure year-round protection or protection in critical dry years" and that substantial funding has not been secured. (EPA Comment on Staff Report, pp. 6-7.) And commenters referenced NMFS's similarly expressed concern that (1) Voluntary Agreements' flow assets would not be deployed during critical water years when ESA-listed species are at highest risk of extinction; (2) the flow commitments in the Voluntary

Agreement Term Sheet are nonbinding and “would not provide a significant difference in average flow relative to the baseline (Alt1)”; and (3) the total flows that would be expected under the proposed Voluntary Agreements is much less (range of 1-43 percent, depending on location/source and water year type) than what would occur under the Proposed Plan Amendments alternative. (NMFS Comment, p. 5.)

Nevertheless, the Final EIS ignores these expert comments and instead supports the Voluntary Agreements option. In leaving out EPA and NMFS’s disagreements from its discussion of Alternative 2 (which includes the Voluntary Agreement alternative to the Bay-Delta Plan update), Reclamation’s Final EIS hides from the public that Reclamation plans to do the opposite of the Water Board and other expert agencies recommend, in violation of NEPA’s requirement for full disclosure.

This omission and inadequate assessment requires a supplemental Draft EIS. The public is entitled to a full and fair discussion of significant effects of diversions of freshwater for CVP and SWP operations on endangered and threatened fish species under Alternative 2. Reclamation must prepare a supplemental Draft EIS that discloses and discusses the information provided by expert agencies, specifically the information that the Voluntary Agreements will not protect the endangered and threatened fish species.

III. The Final EIS Still Fails to Disclose CDFW’s Comments on the Staff Report.

The Final EIS also claims it did not need to include the California Department of Fish and Wildlife (CDFW) and NMFS’s Staff Report comments because the agencies did not explain *how* to consider their Staff Report comments in the context of the EIS for this project. (RTC at 234-35.) This too contorts Reclamation’s responsibilities under NEPA, which imparts a duty on Reclamation to disclose relevant information “to the fullest extent possible.” (42 U.S.C. § 4332.)

Undoubtedly the information NMFS and CDFW provided is relevant here, as it describes conditions in the Delta required to support endangered and threatened species. NMFS specifically noted, for example, “the important relationship between flow and the survival of juvenile Chinook salmon during their outmigration through the Sacramento River and Delta” and encouraged “unimpaired hydrologic flow regime to support all anadromous salmonid and sturgeon life history stages and the ecological function of critical and essential fish habitat” (NMFS Comment, p. 2): two critical factors Reclamation needed to consider in selecting its

preferred alternative for Long-Term Operation impacting the Delta. And CDFW explained that “[i]n recent years, the poor water quality conditions in the Sacramento River watershed and Bay-Delta, exacerbated by drought, have brought fish species listed under the protection of state and federal Endangered Species Acts to levels near extinction or extirpation.” (CDFW Comment, pp. 2-3.) These comments were relevant and critical to disclose, whether the agencies instructed Reclamation on how to consider them or not.

IV. The Final EIS Unlawfully Excludes Analysis of Possible Conflicts Between LTO of the Projects and the Objectives of State and Federal Plans, Policies, and Controls for the Area Concerned.

The Final EIS also lacks the required analysis of possible conflicts between the agency action and the objectives of state plans, policies, and controls. First, Reclamation failed to adequately respond to comments that it failed to analyze the California Endangered Species Act (CESA) for potential conflicts in the EIS. Instead, it merely pointed to Standard Response 2, which states only that DWR intends to seek a new Incidental Take Permit (ITP) from CDFW, which would provide CESA authorization for SWP operations regardless of whether there are changes to federal law during the term of the ITP. (RTC at 28.) But nowhere does the Final EIS assess consistency with CESA’s policy “favoring protection of a listed species over projects that might jeopardize them or their habitats,” (Fish & G. Code, § 2053); *Mountain Lion Foundation v. Fish and Game Com.* (1997) 16 Cal.4th 105, 125, nor Fish & Game Code section 2053, which declares it “the policy of the state that public agencies should not approve projects as proposed which would jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat essential to the continued existence of those species, if there are reasonable and prudent alternatives available consistent with conserving the species or its habitat which would prevent jeopardy.” (Fish & G. Code, § 2053.) The Final EIS fails to even disclose, let alone analyze, the possible conflicts between the proposed action and CESA’s policies and controls.

Second, regarding Reclamation’s failure to assess the Project’s consistency with the Delta Reform Act, nowhere does the Response to Comments address this issue. Instead, Reclamation points to Chapters 4–22 regarding its general analysis of “potential environmental effects *related* to the Delta Reform Act.” (RTC at 257.) But what remains missing in the Final EIS is any assessment of *consistency* and potential conflict with the Delta Reform Act’s objectives,

including the established State policy “to reduce reliance on the Delta in meeting California’s future water supply needs through a statewide strategy of investing in improved water supplies, conservation, and water use efficiency,” (Water Code § 85021); the Act’s policy to “[r]estore the Delta ecosystem, including its fisheries and wildlife, as the heart of a healthy estuary and wetland ecosystem,” (Water Code § 85020(c); and the Act’s “coequal goals” of “providing a more reliable water supply for California and protecting, restoring, and enhancing the Delta ecosystem” in a manner that “protects *and enhances* the unique cultural, recreational, natural resource, and agricultural values of the Delta as an evolving place.” (Water Code § 85054) (Emphasis added.)

Third, the Final EIS lacks analysis of potential conflicts with the objectives of the Public Trust Doctrine, with Reclamation instead pointing to its general assessment of impacts on public trust resources. (RTC at 258.) This is inadequate. As the Delta Reform Act mandates, the Public Trust Doctrine remains “the foundation of state water management policy and are particularly important and applicable to the Delta.” (Water Code § 85023.) It encapsulates the state’s “affirmative duty to take the public trust into account in the planning and allocation of water resources, and to *protect public trust uses whenever feasible.*” *National Audubon Society v. Superior Court* (1983) 33 Cal.3d 419, 446 (Emphasis added.)

Reclamation further responds that “[a]nalyzing past allocation decisions is not within the scope of this EIS.” (RTC at 258.) But that is the duty the Public Trust Doctrine requires: “a duty of continuing supervision over the taking and use of the appropriated water. In exercising its sovereign power to allocate water resources in the public interest, *the state is not confined by past allocation decisions which may be incorrect in light of current knowledge or inconsistent with current needs.*” *National Audubon*, 33 Cal.3d 419, 447 (Emphasis added.) The Final EIS failed to even mention, let alone analyze, whether past water allocation decisions may be inconsistent with current needs and the duty to protect public trust resources. Consequently, the Final EIS failed again to analyze possible conflicts between the proposed action and California’s public trust doctrine.

Fourth, the Final EIS also fails to assess possible conflicts with the objectives of California’s reasonable use doctrine. Reclamation again insists it did not need to assess the reasonable use doctrine for potential conflicts because analyzing past allocation decisions is not within the scope of the Final EIS. (RTC at 260.) But again, NEPA regulations require assessment

of possible conflicts between state and federal objectives. Considering that the reasonable use doctrine is enshrined in the California Constitution and ubiquitous throughout the state water code, the EIR, at the very least, needed to disclose and analyze possible conflicts as a result of unreasonable use or unreasonable method of use of CVP and SWP exports.

And finally, Reclamation failed to disclose or assess consistency between the objectives of the Central Valley Project Improvement Act (CVPIA) and the Long-Term Operation of the Projects in the Final EIS, instead pointing to a sparse discussion of the CVPIA in Appendix C. (RTC at 261-62.) While Appendix C does mention the CVPIA and its objectives, nowhere does Reclamation disclose or discuss potential conflicts between the Project and the CVPIA's objectives, nor does Reclamation point to any such discussion in its Response to Comments.

V. The Final EIS Unlawfully Omits Disclosure and Analysis of Water Transfers.

Per USBR's own NEPA regulations, an EIS must include a description of the proposed action. 43 C.F.R. § 46.415(a)(2); *see also* 40 C.F.R. § 1502.14(b) [an EIS must "[d]evote substantial treatment to each alternative considered in detail including the proposed action . . ."]. The EIS's project description is deficient because it describes water transfers both as part, and as independent from, the proposed action. Specifically, the EIS at 3-15 states, "The actions taken by contractors to make water available for these water transfers (i.e., reducing consumptive use by crop idling and shifting, reservoir storage releases, or groundwater substitution) have separate environmental compliance and are not a component of this EIS. However, the specific timing and operations associated with the conveyance of the water to be transferred is a component to all alternatives analyzed in this EIS." (See also, EIS at 3-46, 3-67, 12-58.) Because the timing and operations associated with the conveyance of the transfer *is* admittedly part of this proposed action, the whole of the underlying water transfer projects must be considered as part of the whole of the current proposed action, since the timing and operation are essentially inextricable from the water transfer itself. CEQ regulations section 1502.4(a) states that "[p]roposals or parts of proposals which are related to each other closely enough to be, in effect, a single course of action shall be evaluated in a single impact statement." CEQ regulations section 1508.25(a)(1), meanwhile, directs agencies to study "connected actions" in "the same impact statement," and sets forth criteria for determining whether actions are "connected." Thus, the EIS also impermissibly piecemeals individual components of the water transfers it provides for. Nowhere

in its “Groundwater,” “Fish and Aquatic Resources,” or “Terrestrial Biological Resources” section does the EIS quantify or analyze the effects of these groundwater substitution water transfers, or crop idling water transfers. However, the effects of these projects are well known to the Bureau, and should be included in this EIR.⁴ A lead agency violates NEPA by “failing to provide the public with ‘sufficient information to . . . generate meaningful comment’” (*Sierra Club v. Flowers*, 423 F.Supp.2d 1273, 1329 (S.D. Fla. 2006) quoting 33 C.F.R. § 325.3(a); 40 C.F.R. §§ 15001.(b), 1500.2, 1506.6.)

VI. The Final EIS Fails to Include the Required Range of Reasonable Alternatives.

As explained in prior comments, despite state law objectives focused on reduced reliance on the Delta and conservation, the Final EIS again includes no alternative focused on reducing reliance on the Delta, no alternative focused on restoring the Delta ecosystem including its fisheries and wildlife, and no alternative requiring water conservation, recycling, and greater water use efficiency to reduce the claimed need for exports. This violates NEPA’s plain text, which *requires* federal agencies to “study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources.” (42 U.S.C. § 4332(2)(E); *see also Native Ecosystems Council v. U.S. Forest Serv.*, 428 F.3d 1233, 1245 (9th Cir. 2005) (“Any proposed federal action involving unresolved conflicts as to the proper use of resources triggers NEPA’s consideration of alternatives requirement, whether or not an EIS is also required.”))

NEPA requires an EIS to include a range of reasonable alternatives that meet the purpose and need of the proposed action. (42 U.S.C. § 4332[C][iii].) Courts have repeatedly held that “[t]he existence of a viable but unexamined alternative renders an [EA] inadequate.” *Western Watersheds Project v. Abbey*, 719 F.3d 1035, 1050 (9th Cir. 2013.) And in rejecting any alternatives, the agency must at the very least “briefly discuss the reasons” why alternatives “were eliminated from detailed study.” (40 C.F.R. § 1502.14); *Native Ecosystems Council*, 428 F.3d at 1245 (9th Cir. 2005) (applying § 1502.14 to EA analysis.)

Here, as described *supra* and in our previous comments, conflicts between state and federal objectives and plans do exist, and alternatives are available, yet Reclamation *still* failed to include the proposed Plan amendments as an alternative or the “high flow” alternative in its Final

⁴ See https://www.usbr.gov/mp/nepa/nepa_project_details.php?Project_ID=18361.

EIS. In refusing, Reclamation repeats the same refrain: “The SWRCB process is a separate process not suitable for inclusion as an alternative to operate the CVP.” (RTC at 247.) However, nowhere does the Final EIS explain why the proposed Plan amendments or high flow alternative from the Staff Report would not meet the agency action’s purpose. And Reclamation had no excuse: the Water Board identified the proposed Plan amendments set forth in section 7.1 of the Staff Report/SED (Staff Report, pp. 7.1-1 to 7.1-52) in September 2023—*10 months* before Reclamation issued the Draft EIS. There is no doubt Reclamation was aware of these alternatives, considering Reclamation submitted a January 19, 2024 comment letter on the Staff Report, disagreeing with the proposed Plan amendments.

The absence of the required range of reasonable alternatives in the Draft EIS also requires Reclamation to prepare and publish a supplemental Draft EIS. An alternative proposed by the expert Water Board and supported by the expert EPA, NNMFS, and CDFW calls for careful consideration and, at the very least, disclosure to the public. By failing to include or even *reference* the Water Board’s proposed Plan amendment alternative, Reclamation’s Final EIS again fails to “sharply define the issues for the decision maker and the public and provide a clear basis for choice among options” contrary to NEPA Regulation § 1502.14.

VII. The Final EIS Again Fails to Comply with NEPA in Analyzing Impacts on Endangered and Threatened Fish Species.

The Response to Comments and Final EIS still dodge commenters’ core concern as to whether the diversions, including the Projects’ operations, may cause or contribute to the extinction of one or more of the endangered and threatened fish species. Tellingly, Reclamation does not even attempt to point to a specific section of its 18,000+ page analysis on this potential impact, instead referring to a generic description of mandatory EIS components, as well as all chapters 4-22 that evaluate impacts. None of this includes the critical, relevant assessment of impacts of diversions laid out in the Staff Report.

As described in prior comments, the Staff Report states the following regarding impacts of diversions on species:

- “Based on available information regarding several proposed water diversion and conveyance projects and pending water right applications that propose surface water diversions during the wet season, it is assumed that streamflows may be

reduced during the winter and spring under the no project alternative, which could result in potentially significant impacts on aquatic and terrestrial species and habitats in the Sacramento/Delta watershed.” (Ch. 7.24, Alternatives Analysis, p. 7.24-9); and

- Water exports and upstream diversions have combined to reduce the average annual Delta net outflow 33% from 1948 to 1968 and 48% from 1986 to 2005 compared with unimpaired conditions. (Ch. 2, p. 2-106.) Moreover, “Since the 1990s, there also has been a significant decline in spring outflow and a reduction in the variability of Delta outflow throughout the year (see Figure 2. 4-71 Chapter 2, Hydrology and Water Supply) due in part to water diversions as well as hydrology.” (Ch. 5, p. 5-27.)

These are impacts that Long-Term Operation of the Projects *will have*, and Reclamation’s comments on the Staff Report reveal that it knew of these impacts six months before preparing its Draft EIS. Yet the Final EIS once again fails to incorporate an adequate discussion of these important impacts.

California’s native inland fishes (including anadromous species) are experiencing rapid declines, and if present trends continue, many species are likely to go extinct within the next century (Moyle et al., 2011.) The Bay-Delta ecosystem and its inhabitants are particularly vulnerable. As stated in the Staff Report and discussed in previous comments, “Native species in the Bay-Delta ecosystem *are experiencing an ecological crisis*.” (Staff Report, Ch. 7.12, Hydrology and Water Quality, 7.12.1 Surface Water, p. 7.12.1-1.) Many threatened and endangered native fish species rely on adequate flows throughout the Sacramento River and the entire Delta watershed, including but not limited to Sacramento River winter-run Chinook salmon (federally and state endangered), Central Valley spring-run Chinook salmon (federally and state threatened), Central Valley steelhead (federally threatened), Delta smelt (federally threatened and state endangered), Bay-Delta longfin smelt (federally endangered), green sturgeon (federally threatened and a state species of special concern). It is not only possible, but *likely* that Project operations will push these sensitive species even closer to extinction. The impacts to threatened and endangered species must be thoroughly analyzed with the best available science, which the Final EIS entirely fails to accomplish.

Reclamation must prepare a supplemental Draft EIS to discuss the significance of adverse effects on endangered and threatened for species and the degree to which the diversions for the Projects' operations may adversely affect those species. Otherwise, Reclamation will remain in violation of NEPA.

VIII. The Final EIS Again Omits Discussion of Irreversible and Irretrievable Commitments of Federal Resources Involved in the Proposed Action.

The Final EIS again fails to include “any irreversible and irretrievable commitments of Federal resources which would be involved in the proposed agency action should it be implemented.” (42 U.S.C. §4332(v).) As explained in prior comments, the Water Board concluded in its Staff Report that “[f]ailing to take actions proposed by the proposed Plan amendments could result in the loss of Delta function beyond restoration of its original function and, therefore, would result in a significant irreversible environmental change.” (Staff Report, Ch. 7.23, p. 7.23-69.) But Reclamation dismissed this conclusion as irrelevant because the Water Board made it “pursuant to CEQA for the Draft WQCP amendment not on modifications to the long term operations of the CVP and SWP.” (RTC at 267.)

This response defies logic. As described *supra*, Reclamation and DWR implement the Bay-Delta Plan and are required to meet certain water quality and flow objectives, which often affect the amount and timing of water available to be pumped or exported from the Delta for the Projects. The proposed Bay-Delta Plan amendments thus affect Reclamation's operations, and Reclamation's operations affect the Delta. If the proposed Plan amendment is not adopted, the ongoing Project operations themselves could contribute to this “significant irreversible environmental change.” Reclamation needed to, at the very least, disclose and discuss this in the Final EIS.

IX. The Final EIS Again Omits Assessment of Impacts on Public Health in Environmental Justice Communities.

The Final EIS fails to adequately assess public health impacts and impacts on environmental justice communities that may result from cyanobacteria harmful algal blooms (CHABs). In its response to comments, Reclamation points to four cursory paragraphs in Chapter 21, Section 21.2.3. (RTC at 267-68.) But nowhere does that section discuss health impacts; rather, it only discusses the likelihood of CHABs.

Reclamation further responds by excusing itself from assessment by deeming a public health analysis too “speculative” since 1) it is unknown where the CHABs may occur, 2) several factors influence the potential for illness, and 3) there is a lack of comprehensive, routine monitoring for CHABs in the Delta. (RTC at 268.) None of these provide adequate excuses, as the “effects [of a proposed action] may be difficult to measure and may be determined ultimately to be too imprecise to influence the [action], but this is precisely the type of determination that only can be intelligently made after the preparation of at least an EA.” *Cal. Wilderness Coal. v. U.S. Dep’t of Energy*, 631 F.3d 1072, 1103 (9th Cir. 2011.) When an agency is uncertain about the possible environmental effects of a proposed action, the proper course is to complete assessment to the best of the agency’s ability, not to avoid environmental analysis altogether. At least some degree of “speculation . . . is implicit in NEPA,” but agencies may not “shirk their responsibilities under NEPA by labeling any and all discussion of future environmental effects as crystal ball inquiry.” *Selkirk Conservation All. v. Forsgren*, 336 F.3d 944, 962 (9th Cir. 2003); *Sierra Club v. FERC*, 867 F.3d 1357, 1374 (D.C. Cir. 2017) (“NEPA analysis necessarily involves some ‘reasonable forecasting,’ and . . . agencies may sometimes need to make educated assumptions about an uncertain future.”)

Here, some information was even readily available to Reclamation, as DWR’s Draft EIR on SWP Long-Term Operations, issued on May 29, 2024, admitted “CHABs . . . have the potential to harm human health or aquatic biota. CHABs are a widespread problem in water bodies worldwide.” (Draft EIR, Ch. 5, Surface Water Quality, p. 5-9.) And according to the Staff Report, “Harmful algal blooms (HABs) have become a regular occurrence in the Delta since 1999,” (Lehman et al. 2005, 2013; Kurobe et al. 2013), and “Delta communities have expressed significant ongoing concerns regarding proliferation of HABs in the Delta and requested that the Water Boards take actions to address these concerns. HABs are a component of the phytoplankton community with potentially severe impacts on fish and wildlife, as well as on human and pet health and safety.” (Staff Report, Ch. 5, Proposed Changes to the Bay-Delta Plan for the Sacramento/Delta, p. 5-60) (Emphasis added.) EPA also expressed concern in its comment letter. (EPA Comments, pp. 1-2.) Reclamation thus had no excuse for failing to provide any information to the public on potential public health impacts on environmental justice communities from CHABs, as NEPA regulations require. (40 C.F.R. § 1501.3(d)(vii).)

X. The Final EIS Analysis of the Delta Conveyance Project Operation Remains Inadequate.

The Final EIS still fails to include the requisite analysis of the Delta Conveyance Project. Reclamation's response to comments essentially admits it failed to assess the cumulative impacts of the Delta Conveyance Project along with preferred alternative 2B on threatened and endangered species. (RTC at 271-72.) And then it goes on to promise environmental analysis in the future: "Potential refinements, as well as environmental or regulatory changes that may occur during the planning and construction period prior to initial Delta Conveyance Project operations, will be considered in future project-level permitting consistent with NEPA and ESA"; "additional assessments relative to LTO of the CVP may be necessary"; and "the combined effect of modified ongoing operations of the SWP and the operation of the Delta Conveyance Project will need to be determined." (RTC at 271-72.)

NEPA requires more *at this stage*, not only in the future. (40 C.F.R. § 1502.15.) The Delta Conveyance Project is an approved project with reasonably foreseeable impacts and cumulative impacts on endangered and threatened species, public health, and environmental justice communities. It must be assessed in a revised or supplemental Draft EIS, specifically considering changes in the operation of existing SWP facilities as a result of implementation of Alternative 2B, not just Alternative 2 as Appendix Z currently does.

XI. The Final EIS Continues to Exclude Numerous Terrestrial Biological Resources Without Explanation.

The Final EIS still omits several special-status terrestrial species from full assessment without explanation. However, Reclamation responds it *did* assess impacts to all special-status terrestrial species listed in Appendix P, Terrestrial Biological Resources Technical Appendix, Section P.1.8; it just assessed some off the record: "While suitable habitat for these species have the potential to overlap with the project area and/or is present in some areas proposed for operational changes, the operational changes proposed under the alternatives were found not to have the potential for adverse effects on these species; therefore, no further evaluation was completed." (RTC at 275.) Then after making this off-the-record assessment, "[i]n circumstances where effects on the habitat would not differ from effects under the No Action Alternative, it was determined that there would be no potential effect on the species," and complete assessment was not included in the EIS (Final EIS, App. AD, p. 53.)

However, the numerous species included in Appendix P that were not fully assessed have diverse ecologies and habitat requirements. The Final EIS states that habitat information was provided in Appendix P, however this information includes only brief descriptions of habitat types and regions that are occupied by the included species. It does not provide any systematic geographic information on where these habitats occur, let alone any analysis determining whether and how different habitat types would be impacted by the Project, the No Project Alternative, or any other alternatives. The information provided is entirely insufficient to support the claims that so many terrestrial species would not be impacted by the Project.

This is impermissible under NEPA, which requires a “convincing statement of reasons to explain why [a] project’s impacts are insignificant.” *Bark v. United States Forest Serv.*, 958 F.3d 865, 869 (9th Cir. 2020.) This statement of reasons must be in the document itself, as “[a]n agency must defend its actions based on the reasons it gave when it acted. *Dep’t of Homeland Sec. v. Regents of the Univ. of Cal.*, 591 U.S. 1, 24 (2020.) In other words, the Final EIS needed an explanation for Reclamation’s failure to assess impacts to these terrestrial species, yet the Final EIS still fails to articulate one beyond these conclusory sentences in the Response to Comments.

Further, the Final EIS still excludes any consideration of impacts on species present in CVPIA refuges from its analysis of terrestrial biological resources. And Reclamation does not disagree. Its response to comments simply repeats its statement from the DEIS admitting that for the Sacramento River, “Potential reductions in water deliveries to CVPIA wildlife refuges in the Sacramento River watershed under the alternatives could also have impacts on the availability of aquatic habitat, however, Reclamation does not control the distribution of water to CVPIA wildlife refuges beyond initial water year allocations. Therefore, the changes or impacts described for terrestrial resources associated with CVPIA refuges are outside the scope of this alternatives analysis.” (Final EIS, App. AD, p. 54).

Again, NEPA requires more. Agencies must assess all reasonably foreseeable direct and indirect impacts, even *including* non-jurisdictional impacts, in an EIS. *Save Our Sonoran, Inc. v. Flowers*, 408 F.3d 1113, 1122 (9th Cir. 2005) (Defendants must consider impacts of entire subdivision before granting permit to fill waterways running through subdivision even if “permitting authority is limited” to some aspects only); *Ocean Advocs. v. U.S. Army Corps of Eng’rs*, 402 F.3d 846, 867-68 (9th Cir. 2005) (Corps must evaluate oil spill impacts, even when

it lacks authority to regulate the underlying activity or spills); *Standing Rock Sioux Tribe v. U.S. Army Corps of Eng'rs*, 985 F.3d 1032, 1049 (D.C. Cir. 2021) (same.) Throughout Reclamation's assessment, it admits, "The last remaining reproductive population of the giant garter snake in the San Joaquin Valley exists in CVPIA refuges. Reduced water deliveries to CVPIA wildlife refuges in the San Joaquin River under Alternative 3 would have impacts on the availability of aquatic habitat for giant garter snake and northwestern pond turtle." (Final EIS, App. P, p. 13-10). The Final EIS does include impacts of water allocations, which will necessarily affect distribution to CVPIA refuges. The Final EIS therefore needed to include the impacts to terrestrial biological resources in CVPIA refuges including giant garter snakes in its analysis of all alternatives and in all relevant watersheds.

Relatedly, beyond failing to adequately assess impacts on terrestrial species in its Final EIS, Reclamation again fails to include any alternative more protective of terrestrial species. Instead, Reclamation's response to comments points to its Standard Response 4, which also mentions no alternative more protective of terrestrial species. This is inadequate: The Final EIS should have considered at least one alternative that prioritizes the minimization of impacts to terrestrial biological resources.

XII. The Proposed Mitigation for Impacts to Terrestrial Biological Resources Remains Inadequate in the Final EIS.

And furthermore, despite no alternatives offering additional protection for terrestrial species, the Final EIS still fails to include mitigation for all the species that will experience impacts. Rather, the Final EIS still proposes mitigation for only three species—bank swallow, foothill yellow-legged frog, and northwestern pond turtle—excluding numerous others. And the mitigation remains as inadequate as in the Draft EIS: The Final EIS continues to rely on vague and deferred plans to monitor the species with little detail.

Reclamation offered the generic excuse that "NEPA is a procedural requirement and does not require compensatory mitigation for potential impacts." (RTC at 278.) However, while NEPA does not *require* compensatory mitigation, it does require 1) an explanation supporting why Reclamation found only some terrestrial species would be impacted, and 2) a discussion of mitigation measures to offset those impacts, with "sufficient detail to ensure that environmental consequences have been fairly evaluated." *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 352 (1989); (*Okanogan Highlands Alliance v. Williams*, 236 F.3d 468,

477 (9th Cir. 2000) (upholding an EIS where “[e]ach mitigating process was evaluated separately and given an effectiveness rating.”) Reclamation’s final EIS failed to include this mandatory information.

XIII. Conclusion

In sum, Reclamation has failed to adequately respond to comments and produce a legally sufficient Final EIS. To comply with NEPA, Reclamation must promptly revise its EIS or prepare a supplemental Draft EIS and recirculate it for public review and comment.

Sincerely,



*E. Robert Wright, Counsel
Sierra Club California*

*/s/ Caty Wagner
Water Campaign Manager
Sierra Club California*



*Howard Penn, Executive Director
Planning and Conservation League*



*Conner Everts, Facilitator
Environmental Water Caucus*



*John Buse, Senior Counsel
Center for Biological Diversity*

*Carolee Krieger, Executive Director
California Water Impact Network*



*Barbara Vlamis, Executive Director
AquAlliance*

From: [Whitman, Terri](#)
To: [BDO Comments, BOR MPR](#)
Cc: [O'Hanlon, Daniel](#); [Frink, Russell](#); [Woo Nazal, Andrey](#); [Scott Petersen](#); [Rebecca Akroyd](#); [Rebecca Harms](#); [afebbo@wwd.ca.gov](#); [Jeff Payne](#)
Subject: [EXTERNAL] SLDMWA and Westlands Comments on the Final EIS for the Long-Term Operations of the Central Valley Project
Date: Monday, December 16, 2024 4:59:40 PM
Attachments: [2024-12-16 FINAL SLDMWA and Westlands Comments on EIS with Exh. A.pdf](#)

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Dear Mr. Warner:

Please find attached comments from San Luis & Delta-Mendota Water Authority (“Water Authority”) and Westlands Water District (“Westlands”) in response to the U.S. Bureau of Reclamation’s (“Reclamation”) Final Environmental Impact Statement for the Long-Term Operations of the Central Valley Project, dated November 15, 2024 (“Final EIS”). Please let us know if you have any difficulties accessing the attached file.

Terri Whitman

Assistant to Daniel J. O'Hanlon, Eric N. Robinson, Holly A. Roberson and Carson Graves

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December 16, 2024

VIA EMAIL

U.S. Bureau of Reclamation, Bay-Delta Plan Office
Attention: Tim Warner
801 I Street, Suite 140
Sacramento, CA 95814-2536
Email: sha-MPR-BDO@usbr.gov

Re: Final Environmental Impact Statement for the Long-Term Operations of the Central Valley Project

Dear Mr. Warner:

The San Luis & Delta-Mendota Water Authority ("Water Authority") and Westlands Water District ("Westlands") appreciate the opportunity to provide these comments in response to the U.S. Bureau of Reclamation's ("Reclamation") Final Environmental Impact Statement for the Long-Term Operations of the Central Valley Project, dated November 15, 2024 ("Final EIS"). As cooperating agencies, the Water Authority and Westlands have provided input throughout this National Environmental Policy Act ("NEPA") process, reflecting their roles as key stakeholders in Central Valley Project ("CVP") operations¹.

The decisions Reclamation will memorialize in its forthcoming Record of Decision are of critical importance to California's future, affecting protected fish and wildlife species, millions of residents, and millions of acres of prime farmland. The Water Authority operates key CVP infrastructure, and most of its member agencies, including Westlands, depend on the CVP as the principal source of water for users within their service areas. A list of the Water Authority's member agencies is attached as Exhibit A.

We commend Reclamation staff for their efforts in preparing the Final EIS and responding to prior comments. In particular, we want to acknowledge the adaptive management approach outlined in the Final EIS. Despite these efforts, the Water Authority and Westlands remain concerned about several aspects of the Final EIS. Over the past 30 years, the Water Authority's member agencies, including Westlands, have faced a sharp decline in CVP water supply reliability, disproportionately impacting south-of-Delta contractors and economically disadvantaged communities. The preferred alternative, Alternative 2, imposes further reductions in water supply that disproportionately affect the Water Authority's member agencies and the communities they serve. This inequity alone provides ample justification for rejecting Alternative 2.

¹ The Water Authority and Westlands provided comments on administrative versions of the Draft EIS, on October 16, 2023 and April 19, 2024. The Water Authority and Westlands also provided comments on the public Draft EIS, dated September 9, 2024. Many of these earlier comments are still applicable to the Final EIS and we hereby incorporate those comments and the attachments thereto by reference.

In summary, the Water Authority and Westlands provide the following key comments on the Final EIS: (1) the Water Authority and Westlands appreciate the analysis in the Final EIS that will enable implementation of the Healthy Rivers and Landscapes Program (“HRL Program”), but would like clarification on whether this analysis is also applicable to Alternative 1, Alternative 4, and the No Action Alternative; (2) the Fall X2 Measure should be eliminated from all alternatives because it is not supported by the best available science; (3) the potential future changes to Trinity River Division Operations should be included in the cumulative effects analysis because the impacts of changes to Long-Term Operations of the CVP cannot be fully analyzed without first accounting for potential changes to the operations of the Trinity River Division; (4) Reclamation must make clear in its Record of Decision that actions taken to harmonize CVP operations with the State Water Project (“SWP”) operations shall not reduce CVP deliveries in a manner that conflicts with contractual obligations; (5) considering the significant uncertainties in forecasting the effects of temperature changes, the discussion regarding temperature dependent mortality (“TDM”) estimates in Chapter 12 should include a more robust explanation of the inherent uncertainties associated with this modeling data; and (6) critical gaps in the Draft EIS that were identified in the Water Authority’s and Westlands’ earlier comments remain unaddressed, particularly those related to water supply, groundwater availability, economic and environmental justice impacts, and air quality – meaning that the Final EIS has not been revised to thoroughly evaluate all potential impacts in compliance with NEPA. These comments are explained in greater detail below.

1. The Healthy Rivers and Landscapes Program

Alternative 2 of the Final EIS includes the implementation of the HRL Program, previously referred to as the “Voluntary Agreements.” The Water Authority and Westlands commend Reclamation’s inclusion of this program in the Final EIS and appreciate the analysis provided under Alternative 2 to enable the HRL Program’s implementation, contingent upon approval by the State Water Resources Control Board. While the analysis of the HRL Program is presented in connection with Alternative 2, the Water Authority and Westlands seek confirmation that this analysis is also applicable to Alternative 1, Alternative 4, and the No Action Alternative. If Reclamation adopts any of these alternatives, the Water Authority and Westlands request assurance that the existing analysis is sufficient to support the HRL Program’s implementation under those alternatives as well.

2. The Fall X2 Measure Should be Eliminated From All Alternatives

Reclamation has modified Alternative 4 to remove the Fall X2 requirement in light of recent scientific findings, including the 2024 USFWS Biological Opinion, however, Reclamation’s preferred alternative, Alternative 2², still retains the Fall X2 requirement. (Final EIS, Appendix AD, Table 4-80, pp. 9-10.) As discussed in the Water Authority’s and Westlands’ September 9, 2024 comment letters, advances in scientific knowledge since the Fall X2 was first implemented in 2008 have made clear that it does not achieve its intended purpose of benefiting the delta smelt but does impose substantial water supply costs. Since 2008, the Fall X2 measure has resulted in the redirection of millions of acre-feet of water that could have been beneficially used.

NEPA requires that agencies rigorously explore and objectively evaluate all reasonable alternatives, including those that reflect the best available science. (40 C.F.R. § 1502.14(a).) Both Polansky *et al.*

² The Draft EIS identified Alternative 2B as the “preferred alternative,” however, Alternative 2B was eliminated from the Final EIS and replaced with Alternative 2. (Final EIS, Appendix AD, p. AD-30 [“The Final EIS incorporates the components of Alternative 2B into the updated modeling and analysis of Alternative 2. The Final EIS does not contain a separate Alternative 2B.”].)

(2024) and the 2024 USFWS Biological Opinion strongly support excluding the Fall X2 requirement. However, by retaining Fall X2 as part of the preferred alternative in the Final EIS, Reclamation has failed to adequately address the implications of recent scientific findings and is perpetuating reliance on outdated and unsupported habitat measures. A more-consistent approach to incorporating these new scientific understandings into the NEPA process would have been to exclude Fall X2 from all alternatives, including the preferred alternative. To that end, the Water Authority and Westlands strongly urge Reclamation to adopt Alternative 4, or – if it decides to adopt Alternative 2 – to do so without adopting the Fall X2 measures that it currently includes. By failing to fully incorporate recent scientific findings across all alternatives, let alone the preferred alternative, the Final EIS does not meet NEPA's requirements for a thorough and informed analysis.

3. Potential Future Changes to Trinity River Division Operations Should Be Included in the Cumulative Effects Analysis in the Final EIS

The Final EIS does not include the potential changes to the Trinity River Division (“TRD”) operations in its cumulative effects analysis. The Final EIS states that Reclamation intends to complete the NEPA and ESA processes for a decision on the potential for new TRD operations by the end of 2025, after conducting additional public outreach in the Trinity River watershed, and once the Trinity-specific NEPA effort is further developed. (Final EIS, Appendix AD, pp. AD-48-49.) This approach overlooks cumulative effects and systemic trade-offs, potentially leaving significant environmental and operational impacts of changes to TRD operations unaddressed.

An EIS must include an analysis of cumulative effects, defined as “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions.” (40 C.F.R. § 1508.1(g)(3).) Courts have emphasized this requirement. (See *Oregon Natural Resources Council Fund v. Goodman*, 505 F.3d 884, 892-93 (9th Cir. 2007) (EIS inadequate for failing to adequately discuss the future impacts of foreseeable projects on listed species).) Reclamation's proposed changes to TRD operations are a foreseeable project, which means that Reclamation's decision to exclude evaluation of potential TRD modifications from its cumulative effects analysis fails to comply with NEPA's requirements.

Reclamation has acknowledged that “the TRD is part of the CVP, and an analysis evaluating potential effects and tradeoffs between CVP divisions as a complete system will be necessary.” (Appendix AD, p. AD-48.) Nonetheless, Reclamation intends to complete its analysis of changes to Long-Term Operations of the CVP without also evaluating the impacts of forthcoming changes to the TRD. An integrated approach that evaluates the CVP as a complete system, including the TRD, would streamline the process and ensure a cohesive evaluation of environmental impacts and trade-offs. Conducting separate NEPA efforts for the Sacramento River/Delta operations and TRD operations risks not only redundancy but also conflicting conclusions that undermine the effectiveness and coherence of Reclamation's decision-making. Given the acknowledged interdependencies between the TRD and operations in the Sacramento River/Delta, the impacts of changes to Long-Term Operations of the CVP cannot be fully analyzed without first accounting for potential changes to the operations of the TRD.

4. The Record of Decision Must Make Clear That the CVP Will Not Be Voluntarily Operated to Satisfy CESA Standards

Reclamation's responses to the Water Authority's and Westlands' comments acknowledge that the CVP is not subject to regulation under California Endangered Species Act (“CESA”). (Final EIS, Appendix AD, Table 4-80, pg. 4.) However, the description of Alternative 2 still suggests that Reclamation will operate

the CVP to conform to the standards and requirements of CESA and the determinations of the California Department of Fish and Wildlife (“CDFW”). The Final EIS states: “Alternative 2 consists of actions developed with CDFW, DWR, NMFS, and USFWS to harmonize operational requirements of CVP with CESA requirements for the SWP. It includes actions and approaches for the CVP and SWP identified by the state and federal fish agencies, in addition to the water supply and power generation objectives of Reclamation and DWR.” (Final EIS at 3-1.)

Reclamation states that it “may consider potentially reasonable alternatives beyond its own jurisdiction and the jurisdictions of other agencies (federal and otherwise) when determining what reasonable alternatives should be considered.” (Final EIS, Appendix AD, pp. AD-29-30.) Because CESA restrictions can materially differ from restrictions under the federal Endangered Species Act (“ESA”), Reclamation must make clear in its Record of Decision that actions taken to harmonize CVP operations with the SWP operations shall not reduce deliveries in a manner that conflicts with contractual obligations. (See *San Luis & Delta-Mendota Water Authority v. U.S. Dept. of the Interior*, No. 1:11-cv-00952 LJO GSA, E.D. Cal. 2015, 2015 WL 893365 [voluntary actions that reduce exports during “excess conditions” violate federal law].)

5. Uncertainties With the TDM Models Used to Evaluate Shasta Operating Criteria Should Be Disclosed and the Final Action Should Include Flexibility to Refine Operating Criteria

The Final EIS states the Anderson and Martin TDM models were used to estimate temperature-dependent egg mortality for Sacramento River Winter run chinook salmon under different alternatives. (Final EIS, Ch. 12, pp. 12-27-12-30; Appendix F, p. F.1-3-24.) Because existing estimates of TDM are based on observations of specific subsets of total redds, there are no direct estimates of TDM that can be used in quantitative modeling. In response to comments regarding the considerable uncertainty associated with these estimates, and the approach to modeling, Reclamation revised Appendix L2 and provided additional clarification regarding these modeling methods.

Considering the significant uncertainties in forecasting the effects of minor changes in temperature changes, the discussion regarding TDM estimates in Chapter 12 should include a more robust explanation of the inherent uncertainties associated with this modeling data. Furthermore, the final action that Reclamation adopts should include the necessary flexibility to refine Shasta operating criteria as it develops a better understanding of how minor changes in temperature affect TDM for listed salmon.

6. The Final EIS Does Not Adequately Address Environmental Effects to South-of-Delta Communities and Resources

The Water Authority and Westlands appreciate the monumental effort required for Reclamation to respond to comments in preparing the Final EIS. However, critical gaps identified in the Water Authority’s and Westlands’ earlier comments remain unaddressed, particularly those related to water supply, groundwater availability, economic and environmental justice impacts, and air quality. NEPA requires a thorough and balanced evaluation of all potential impacts associated with Reclamation’s proposed action to ensure informed decision-making, and the following comments outline areas within the Final EIS that have not been revised consistent with NEPA’s requirements.

a. Groundwater Availability, SGMA Compliance, and Water Supply

The Final EIS acknowledges that the Sustainable Groundwater Management Act (“SGMA”) will result in less groundwater being available for beneficial uses than under current conditions. (Appendix AD, Table

4-80, pp. 23-25; 64-65.) However, instead of adjusting its quantitative modeling to reflect these enforceable restrictions, Reclamation asserts that “effects of implementing SGMA are not effects of the alternatives.” (*Id.*) This approach is flawed. By omitting legally enforceable limits on groundwater extraction, the Final EIS fails to fully evaluate potential impacts on several resource categories.

The responses to comments note the difficulties for including specific actions for each GSP because a single management strategy does not exist. As a result, Reclamation acknowledges that its modeling “represents effects to groundwater that may be more substantial than when GSP provisions are fully enacted.” (Appendix AD, Table 4-80, p. 34.) The reasonable approach would be to assume some level of reduced groundwater supplies, even if it is not precise, instead of assuming there will be no reduction at all. Because NEPA requires that agencies use high-quality information and ensure scientific integrity in environmental reviews (40 C.F.R. § 1502.24), Reclamation’s decision to exclude existing groundwater use restrictions undermines the reliability of the analysis and leaves critical gaps in assessing how this resource—and interconnected resource categories—will be impacted.

The failure to evaluate groundwater has the most significant impact on the water supply and land use and agricultural resources categories in the Final EIS because the modeling currently assumes that groundwater will be available to meet certain existing demands. Furthermore, reduced surface water availability reduces groundwater recharge, which will likely exacerbate the effects of groundwater restrictions. Reclamation defers evaluation of these foreseeable impacts by asserting that decisions regarding groundwater restrictions are not caused by the alternatives. (Appendix AD, Table 4-80, p. 34 [“effects of implementing SGMA are not effects of the alternatives”].) Contrary to this assertion, groundwater restrictions under SGMA are already in place and there are conservative methods available to simulate potential impacts of reduced groundwater availability.

The need to quantify potential impacts of reduced groundwater availability is underscored by Reclamation’s decision to include assumptions regarding reduced groundwater availability in the economic analysis. This selective approach to evaluating reduced groundwater availability in one section but not in others is inconsistent with NEPA’s mandate to comprehensively evaluate environmental consequences, including a “quantified assessment” of significant impacts. (42 U.S.C. § 4332(2)(C); 40 C.F.R. § 1502.1; *Great Basin Res. Watch v. Bureau of Land Mgmt.*, 844 F.3d 1095, 1104-1106 (9th Cir. 2016).)

b. Economic and Environmental Justice Impacts

As highlighted in the Water Authority’s and Westlands’ September 9, 2024 comment letters, the Final EIS does not adequately analyze the indirect economic effects of reduced CVP deliveries south of the Delta. While the Final EIS considers direct impacts, such as job losses and increased water costs, it overlooks broader economic ripple effects, particularly on businesses dependent on agricultural workers. Reclamation’s response to this comment is that: “[p]rice effect revenue results would primarily result in changes to proprietor income and are not expected to result in substantial impacts on the regional economy.” (Appendix AD, Table 4-80, p. 28.) This response does not adequately explain why the potential economic effects identified in the Water Authority’s and Westlands comments are not potentially significant. Instead, it raises further questions: why would the changes primarily affect “proprietors” and not farms and farm workers? Why do changes to proprietor income not constitute a significant impact?

The questions above illustrate why the analysis in the Final EIS does not include the requisite “hard look” at all significant impacts associated with the proposed action, including indirect effects. (42 U.S.C. § 4332(2)(C); 40 C.F.R. § 1508.1(g); *Great Basin*, *supra*, at 1104-06.)

c. Air Quality and Infrastructure Impacts

The Water Authority and Westlands also raised concerns in their September 9, 2024 comment letters about the air quality impacts of increased fallowing south of the Delta. The Final EIS acknowledges that groundwater pumping is a primary driver of emissions, and was revised to state that an increase in fallowing would result in the potential for fugitive dust emissions, however, it does not propose any new mitigation measures. (Final EIS, Chapter 9, p. 9-7.) Alternatives 2 and 3 remain likely to exacerbate air quality issues by increasing fallowing in regions where such impacts are already acute. This Final EIS's failure to evaluate mitigation for this impact is inconsistent with NEPA's requirement to assess significant environmental impacts and consider mitigation measures when such effects are identified. (40 C.F.R. §§ 1502.14(f), 1502.16(a)(9).)

Additionally, Reclamation's responses to comments on the Draft EIS failed to address the Water Authority's and Westlands' concerns regarding modeled groundwater impacts related to subsidence in the Westside Subbasin. Reclamation's response acknowledges that the modeling results demonstrate significant declines in groundwater have the potential to cause subsidence but does not attempt to further evaluate the scale of that potential impact or whether mitigation is feasible. (Appendix AD, Table 4-80, p. 34.) A NEPA-compliant response would be to recognize that the projected groundwater decline—up to 200 feet—will likely lead to subsidence in this area, posing significant negative implications for critical infrastructure. Notably, approximately 85% of groundwater use in the Westside Subbasin is sourced from an aquifer located below the Corcoran Clay, which is susceptible to subsidence. Ignoring the substantial risk of subsidence resulting from such a dramatic decline in groundwater levels is inconsistent with the thoroughness required by NEPA.

CONCLUSION

In conclusion, the Water Authority and Westlands thank Reclamation for this opportunity to review and comment on the Final EIS. The Water Authority and Westlands urge Reclamation to reject Alternative 2, as described in the Final EIS, for the reasons set forth above and to be mindful that the forthcoming Record of Decision will be of critical importance to California's future, affecting protected fish and wildlife species, millions of residents, and millions of acres of prime farmland.

Respectfully submitted,



J. Scott Petersen, P.E.
Director of Water Policy
San Luis & Delta-Mendota Water Authority



Allison Febbo, General Manager
Westlands Water District

Exhibit A
(Description of Water Authority and list of Member Agencies)

The San Luis & Delta-Mendota Water Authority (“Water Authority”) is a public agency with its principal office located in Los Banos, California. It was formed in 1992 as a joint powers authority and has twenty-seven member agencies. Twenty-five of the Water Authority’s member agencies contract with the United States for the delivery of water from the federal Central Valley Project (“CVP”). Most of the Water Authority’s member agencies depend upon the CVP as the principal source of water they provide to users within their service areas. That water supply serves approximately 1.2 million acres of agricultural lands within areas of San Joaquin, Stanislaus, Merced, Fresno, Kings, San Benito, and Santa Clara Counties, a portion of the water supply for nearly 2 million people, including in urban areas within Santa Clara County referred to as the “Silicon Valley,” and millions of waterfowl that depend upon nearly 200,000 acres of managed wetlands and other critical habitat within the largest contiguous wetland in the western United States. The operations of the CVP are therefore of vital interest and importance to the Water Authority, its member agencies, and the people, farms, businesses, communities, and wildlife refuges they serve. As a result of their functions and responsibilities, the Water Authority and its member agencies have special expertise regarding many of the environmental issues related to the Draft EIR.

The individual member agencies of the Water Authority are:

- Banta-Carbona Irrigation District
- Broadview Water District
- Byron Bethany Irrigation District
- Central California Irrigation District
 - City of Tracy
- Columbia Canal Company (a Friend)
 - Del Puerto Water District
 - Eagle Field Water District
- Firebaugh Canal Water District
- Fresno Slough Water District
 - Grassland Water District
- Henry Miller Reclamation District #2131
 - James Irrigation District
 - Laguna Water District
- Mercy Springs Water District
- Oro Loma Water District
- Pacheco Water District
- Panoche Water District
- Patterson Irrigation District
- Pleasant Valley Water District
 - Reclamation District 1606
- San Benito County Water District
 - San Luis Water District
- Santa Clara Valley Water District (Valley Water)
 - Tranquillity Irrigation District
 - Turner Island Water District
- West Stanislaus Irrigation District
- Westlands Water District

From: [Thomas Cannon](#)
To: [BDO Comments, BOR MPR](#)
Subject: [EXTERNAL] Comments on FEIS LTO - attention: Tim Warner
Date: Tuesday, December 10, 2024 10:14:39 AM
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FEIS Comments

To: Tim Warner, sha-MPR-BDO@usbr.gov

From: Thomas Cannon, 916-952-6576, tccannon@comcast.net

Executive Summary

Alternatives

The alternatives described in the EIS other than the No-Action Alternative are not real alternatives with specific operations and infrastructure elements. For example: Alt 2 prioritizes storage and cold-water pool management. Each alternative should prioritize these objectives. Alternatives should not be defined by objectives but represent a specific operational and structural scheme/regime that may approach the objectives a different way or with a different degree of implementation. One alternative or alternative type could involve an array of structural fixes and no changes to the basic flow regime. Another may simply be strictly operational regime that focuses on varying degrees of implementation – some with dramatic effects and some with less dramatic effects, with each having different degrees of benefits and effects on other beneficial uses. Another alternative may involve new infrastructure. Another may involve hatcheries, Another may involve only salmon habitat improvements. A further example may involve only different ways to deliver water from storage (e.g. with or without new infrastructure – with a new Sites Reservoir). An environmentally preferred alternative may have a mixed or variable array of actions to address objectives.

Preferred Alternative (Alt 2)

Alternative 2 prioritizes storage of water in Shasta Reservoir for water temperature management during multiple years of drought and results in reduced temperature-dependent mortality during egg incubation. Alternative 2 would reduce deliveries for CVP water service and repayment contracts and Sacramento River Settlement (SRS) Contractors under specific drought conditions to increase storage in Shasta Reservoir. This increased storage would result in higher fall and winter releases in non-drought conditions. Higher fall and winter releases would improve juvenile Chinook salmon survival during migration down the Sacramento River. In drier years, Alternative 2 reduces fall and winter releases and reduces survival during migration. Loss of

juvenile winter-run Chinook salmon at the Delta fish collection facilities is generally similar to the No Action Alternative based on similar Old and Middle River (OMR) flows. Through-Delta survival is also generally similar to the No Action Alternative, based on Delta inflow, with increases in January, March, and April of critically dry water year types. (O-18)

Comment: There are many factors regulated in Alt 2 (and all alts) with widely differing degrees of implementation. Criteria should be defined for each factor and varied based on conditions in the watershed over that year. Criteria should be developed for different scenarios. Factors should include those that affect Keswick, Red Bluff, Wilkins Slough, Freeport, Rio Vista, and Chipps Island flows, stages, and water temperatures. Objectives should be specified for each of these locations. Comparisons among scenarios and effects of factor range should be shown between actual (historical), no-action, and alternative scenarios/examples to show benefits/effects of differing criteria/objectives. The decision process for selecting preferred scenarios should be documented. The effects of scenarios on benefits/effects of beneficial uses and target natural resources should be compared. Differences among and within factor criteria are often insignificant and higher ranges should be considered.

Alternative 3 prioritizes release of water for Delta outflow and reduces diversions to store water in Shasta Reservoir, which would generally decrease temperature-dependent mortality and improve juvenile Chinook salmon survival during migration down the Sacramento River. Delta inflow would generally increase and operations at the Delta fish collection facilities would generally decrease loss.

Comment: There are many types of diversions if changed would have different responses in terms of Shasta and other system reservoir storage. Changes in demands on Shasta storage is a complex factor with widely varying effects on storage. Also, demands can be met in different ways. This is a complex process requiring a high degree of complex analyses and interpretation. Furthermore, Delta outflow is controlled by many factors involving different infrastructure. Criteria for outflow can be met in many different ways, some involving Shasta storage and some not. Loss of fish in the Delta is also a complex process with many factors involved.

Real-time management under Alternative 4 aims to store more water in Shasta Reservoir to decrease temperature-dependent mortality during egg incubation. Increased fall flows due to real-time storage management would result in higher releases that would improve juvenile

Chinook salmon survival during migration down the Sacramento River. Through-Delta survival is generally similar to the No Action Alternative with similar Delta inflows, and operations at the Delta fish collection facilities increase loss.

Comment: There are many ways to store more water in Shasta Reservoir and many more to alter the volume and need for the cold-water pool supply. How the multi-factor management would be accomplished is beyond comprehension – for example how would the choice among factors employed and degree of employment would be made in real time has not been described. Criteria/objectives for temperatures in spawning reach can be met with the array of factors used in each alternative. The “best” way to meet criteria should be defined in each alternative. Letting criteria vary among and within alternatives is not the way to evaluate alternatives. For example – TDM in Figure 0-19 can be minimized in every alternative, but in different ways with different costs/benefits or changes in infrastructure/operations.

0.4.4.2 Spring-run Chinook Salmon

Under the No Action Alternative, Reclamation operates the Temperature Control Device (TCD) on Shasta Reservoir to manage water temperatures on the Sacramento River downstream of Keswick Reservoir to achieve fisheries objectives, including objectives for winter-run Chinook salmon, and suitable temperatures for spring-run Chinook salmon. Storage of water in Shasta Reservoir during the winter and spring reduces instream flows during the juvenile spring-run Chinook salmon migration period. Spring pulse flows help spring-run Chinook salmon juvenile outmigration, including spring-run Chinook salmon from non-project streams. Whiskeytown Reservoir summer and fall operations may adversely or beneficially impact spring-run Chinook salmon; potential adverse impacts include low flows and elevated water temperatures in Clear Creek, while potential beneficial impacts include coldwater releases to reduce thermal stress during holding, spawning, and egg incubation. Pulse flows in Clear Creek during the spring could attract spring-run Chinook salmon holding in the Sacramento mainstem, encouraging movement toward spawning habitat. In the Delta, export restrictions minimize the loss of juvenile salmon at the Delta fish collection facilities. Increased spring Delta inflow may improve survival for outmigrating salmonids. (O-22)

Comment: These factors are among the many affecting spring run salmon. All alternatives address the effects or needs of the salmon. An infrastructure alternative should include upgrades/maintenance of the TCD to fix/improve its effectiveness. Winter pulse flows also improve the emigration of fry to the lower river floodplains and Bay/Delta nurseries. Whiskeytown releases to

Clear Creek are also too warm in summer for holding spring run adults – should be addressed with operations/infrastructure improvements. Spring pulse flow to Clear Creek should be part of spring pulse flow to attract spring run spawners. Winter and spring pulse and base flows (river and Delta inflow/outflow) would benefit emigration of fry and subyearlings, respectively. Delta exports should be restricted during pulse flows. Winter-Spring flows are important for spring run migrants. Spring, summer, and fall conditions (flows and temperatures) are important in spring and winter run spawning reaches.

0.4.4.4 Delta Smelt

Alternative 3 may result in minor increases and minor decreases in suitable habitat depending on water year type and the application of a temperature threshold and would likely have minor beneficial to minor adverse impacts on juvenile Delta smelt summer and fall habitat. Under Alternative 3, depending on the water year type, there would be a substantially higher population growth rate when compared with the No Action Alternative. (O-26)

Comment: None of the alternatives addresses recovery of the species from its present state of virtual extinction. A specific alternative should address this need: maintaining outflow to allow the LSZ to remain in Suisun Bay yearround and for water temperatures to be less than 72°F in the LSZ yearround. Given their one-year life cycle, these conditions are necessary at a minimum in all water year types.

0.4.4.6 Green Sturgeon

Alternative 2 prioritizes storage of water in Shasta Reservoir for water temperature management during multiple years of drought and would reduce deliveries for CVP water service and repayment contracts and Sacramento River Settlement Contractors under specific drought conditions to increase storage in Shasta Reservoir. This increased storage would result in higher fall and winter releases in non-drought conditions. Alternative 2 relative to the No Action Alternative is expected to have negligible impacts and possible beneficial impacts on spawning habitat, minor adverse impacts on rearing and emigration, and beneficial impacts and adverse impacts on upstream migration and holding habitats dependent upon location, month, and/or water year type due to differences in flow. Alternative 2 relative to the No Action Alternative is expected to have beneficial impacts and minor adverse impacts on spawning and egg incubation, beneficial and adverse impacts on rearing and emigration, and negligible and adverse impacts on upstream migration and holding dependent upon location, month, and water year type due to differences in water temperature. Alternative 2 is expected to have negligible impacts on the loss of juveniles at facilities. (O-28)

Comment: None of the alternatives addresses recovery of the species from its present state of near extinction. A specific alternative should address this need: maintaining outflow and water temperatures in the lower Sacramento River from spring through fall in wetter years - to allow the lower Sacramento River to sustain early spring water temperatures at 60F, late spring water temperatures at 65F, and summer-fall water temperatures at 68F.

0.4.4.7 Fall-run Chinook Salmon

Adult fall-run Chinook salmon use the Sacramento River as a migration corridor and as spawning grounds between September and June. Release reductions from Shasta Reservoir early in the fall under the No Action Alternative may adversely impact the fall-run Chinook salmon population from low flows and elevated water temperatures leading to unsuccessful outmigration and redd dewatering. Similarly, in Clear Creek, low flows and elevated water temperatures may negatively impact fall-run Chinook salmon, and coldwater releases may be beneficial. In the lower American River, operations would ramp down to the revised minimum flows from Folsom Reservoir as soon as possible in the fall and maintain these flows through fall-run Chinook salmon spawning and egg emergence, where possible, to minimize redd dewatering and juvenile stranding. In the Stanislaus River, pulse flows may benefit migrating juveniles in the spring and adults in the fall. In the Delta, OMR management season may cause adverse or beneficial impacts for fall-run Chinook salmon in the Delta dependent on fish presence, distribution, and flows. (O-29)

Comment: None of the alternatives address recovery of the fall-run salmon from its present state of near extinction in the wild. A specific alternative should address this need: maintaining outflow and water temperatures in the lower Sacramento River from spring through fall in wetter years - to allow the upper Sacramento River to sustain summer-fall water temperatures below 56F, late spring water temperatures at 65F, and summer-fall water temperatures at 68F. Fall X2 and Rio Vista flows are prescribed to attract fall run from the Bay to and through the Delta and lower rivers to the spawning rivers in the Sacramento and San Joaquin valleys.

**Attachment 7 – Comment Letters
Received on the Environmental
Compliance Sufficiency Memorandum
for the Central Valley Project and State
Water Project Long-Term Operation,
Operations Plan – Action 5**

Record of Decision

**Long-Term Operation of the Central Valley Project and
State Water Project**



State of California – Natural Resources Agency
DEPARTMENT OF FISH AND WILDLIFE
Ecosystem Conservation Division
P.O. Box 944209
Sacramento, CA 94244-2090
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GAVIN NEWSOM, Governor
CHARLTON H. BONHAM, Director



November 10, 2025

Adam Nickels
Acting Regional Director
California-Great Basin
United States Bureau of Reclamation
2800 Cottage Way
Sacramento, CA 95825

Re: Environmental Compliance Sufficiency Review for the Central Valley Project and State Water Project Long-Term Operations Plan – Action 5

Dear Mr. Nickels:

The California Department of Fish and Wildlife (CDFW), along with the California Department of Water Resources (DWR), U.S. Fish and Wildlife Service (USFWS), and National Marine Fisheries Service (NMFS), collaborated closely with the U.S. Bureau of Reclamation (Reclamation) over a four-year period in the development of the 2024 Proposed Action (PA) for the Long-term Operations of the Central Valley Project (CVP) and State Water Project (SWP) and the subsequent Biological Opinions (BiOp) issued by NMFS and USFWS. CDFW has reviewed the Action 5 Operation Plan (Action 5) for the CVP and SWP and associated Environmental Compliance Sufficiency Review and appreciates the opportunity to provide comments.

Overall, Action 5 provides less protection for species than the 2019 and 2024 BiOps for the Long-term Operations of the CVP and SWP, issued by the USFWS and NMFS. Many of the protective measures in Action 5 are vague and some are not implementable because they rely on models or metrics that do not exist, or are not based in best available science. Measures related to Old and Middle River (OMR) management contain requirements for triggering that are subjective and potentially set a bar for implementation that is arbitrary and less protective than requirements established in the 2024 PA. Taken together, this renders many of the actions not reasonably certain to occur. In addition, CDFW is concerned that the analysis and assumptions reflected in the Environmental Compliance Sufficiency Review and its supporting documents in many cases do not support the conclusions regarding the impacts to species from Action 5. Below we offer more specific comments on aspects of Action 5.

Winter- and Spring-run Chinook Salmon Protections

Real-Time Assessment Thresholds – Winter-Run Chinook Salmon Juveniles: Action 5 includes annual loss thresholds that are substantially greater than the thresholds used

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in the 2024 PA and analyzed in the BiOps. Specifically, thresholds have doubled for natural-origin Sacramento River Winter-run Chinook Salmon (Winter-run) and increased 8-fold for hatchery-origin Winter-run. Action 5 also removes early season protections in November and December and weekly distributed loss thresholds from January through June for Winter-run. Additionally, the 2024 PA included protective measures intended to minimize loss when 50% and 75% of the annual loss threshold is exceeded that were not included in Action 5. CDFW's Effects Analysis, State Water Project Effects on Winter-run and Spring-run Chinook Salmon (Salmon Effects Analysis), prepared for the 2024 SWP Incidental Take Permit (ITP), determined the annual loss threshold used in the 2024 PA, in combination with weekly loss thresholds, would reduce entrainment and protect Winter-run juveniles during periods of peak loss, particularly in years with low juvenile production and high salvage. Action 5 would eliminate the 50%, 75% and weekly loss protections in the 2024 PA, increasing impacts to Winter-run if they are present in the Delta.

Real-Time Assessment Thresholds – Spring-run Chinook Salmon Juveniles: Action 5 states: "If an assessment indicates annual salvage loss is on a trajectory to exceed 1% of the JPE entering the Delta and a reduction in export pumping would materially increase through-Delta survival, Reclamation and DWR will reduce CVP and SWP exports to maintain an average OMR no more negative than -3,500 cfs for 7 days and prepare a subsequent assessment." The loss threshold in Action 5 for Central Valley Spring-run Chinook Salmon (Spring-run) is 4 times greater than the hatchery surrogate loss threshold used in the 2024 PA and analyzed in the BiOps. Additionally, a JPE for Spring-run does not currently exist and it is unclear how this measure would be implemented. Unlike the 2024 PA, Action 5 does not require the development of a Spring-run JPE or life cycle model that could support implementation of the measure at some point in the future. Furthermore, it is not clear how a "material increase in through-Delta survival" would be defined, creating substantial uncertainty in understanding how this measure would be implemented in real time.

The Spring-run measure in Action 5 also states that "The annual salvage loss as a proportion of the spring-run Chinook salmon JPE shall be tracked by surrogates." Action 5 points to Late-fall Chinook production releases as surrogates for yearling life stages and Feather River Hatchery Spring-run production releases as surrogates for young-of-year life stages. However, no information is provided to explain how hatchery production would be used to develop a total estimate of Spring-run juvenile production (Spring-run JPE), including natural origin fish. To our knowledge, this has not been done and there is currently no published, peer-reviewed scientific literature to support this approach.

Start of Entrainment Management and First Flush Conditions: The benefits of minimizing impacts to Winter-run juveniles and Spring-run yearlings during a "First Flush" event have long been recognized. A First Flush Action (COA 8.3.1 in the 2024 SWP ITP), was originally developed as a part of the 2008 USFWS Reasonable and Prudent Alternative (RPA) with a focus on Delta Smelt, but was subsequently included

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in the NMFS 2009 BiOp as part of its RPA to reduce the level of mortality for NMFS-trust resources. The 2020 ITP for long-term operations of the State Water Project and the 2019 NMFS BiOp on long-term operations of the SWP and CVP also included the First Flush Action under the name “Integrated Early Winter Pulse Protection.” The new name was chosen to acknowledge the multi-species benefits associated with protecting the first large flow pulse event moving out of the Delta for both smelts and salmonids.

Specifically, the high flows triggering the First Flush Action encourage juvenile Winter-run to migrate downstream (del Rosario et al. 2013) where they often rear in non-natal habitats such as the Delta (Phillis et al., 2018). Salmon Delta entry timing is strongly associated with the first high flows of the migration season (del Rosario et al. 2013). DCC Gate operations and OMR management during a “First Flush” event discourage routing of salmon into the central and south Delta (Brandes and McClain 2001; Bureau et al. 2007; Vogel 2008; Henderson et al. 2019), where they would be at higher risk of mortality and entrainment.

Despite the established and understood benefit to salmonid survival of a First Flush Action, however, Action 5 includes an offramp to this measure if Reclamation prepares an assessment that determines abiotic factors indicate First Flush is not warranted to avoid exceeding the incidental take of Delta Smelt. That assessment does not consider the effects of a First Flush action on Winter-run and Spring-run, and is inconsistent with Reclamation’s Biological Assessment (2024), which states that the “First Flush and Start of OMR Management” conservation measure would minimize or compensate for effects of the operation of the CVP and SWP on entrainment of Winter-run. Off-ramping or altering implementation of the First Flush Action is expected to result in increased entrainment of juvenile salmon into the central and south Delta, where mortality rates and the risk of entrainment into export facilities are substantially greater.

Exhibit 4 – Endangered Species Act Section 7(a)(2) Compliance: Analyses of historic salmon salvage data (2010-2022) show that implementation of thresholds included in Action 5 would have resulted in an OMR action to protect Winter-run for only three weeks in a single year. In contrast, implementation of thresholds in the 2024 PA would have resulted in 1–5 weeks of protections in 8 years (Exhibit F Attachment F.1-2). This represents a decrease in Winter-run OMR protective actions of 88%, indicating that Action 5 is substantially less responsive to salmon entrainment events. The Salvage Density Model Loss Simulation estimates that these and other changes to OMR management will result in an 8–32% increase in Winter-run salvage at the fish collection facilities under Action 5 compared to the 2024 PA (Alternative 2 without TUCP Delta VA) (Exhibit 4 Attachment I-2).

The Winter-run Chinook Salmon Coded Wire Tag Salvage Model predicts similar increases in hatchery-origin Winter-run salvage for Action 5. The Environmental Compliance Sufficiency Review memo claims that the increase in salvage from 0.28–0.34% (Alternative 2 without TUCP without VA) to 0.37% (Action 5) of Winter-run is

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minimal; this is misleading, however, as Action 5 represents a 32% increase in salvage over the 2024 PA (Alternative 2 without TUCP without VA) and increases the risk of exceeding the annual loss threshold of 0.12% of the JPE for hatchery-origin Winter-run in the 2024 PA. Moreover, the largest increase in the estimated proportion of salvage would occur in above normal water years. These years are important for the population because favorable conditions are generally associated with higher survival and stronger year classes (Brandes and McClain 2001). Additionally, out-migration survival of salmonid smolts in the riverine waterway of the Sacramento and San Joaquin rivers increases with increasing flow (Sacramento, Henderson et al. 2019, Notch et al. 2020, Michel et al. 2021; San Joaquin, Buchanan et al. 2018, Buchanan et al. 2021). A large increase in salvage during these important years might have disproportionate impacts on the population, though a thorough analysis of this impact would require a life cycle model. It is important to note that the simple model used to estimate juvenile salvage is based on changes in Sacramento River flows and exports alone and ignores additional likely changes in routing or rearing behavior due to changes in other hydrologic conditions not included in the model.

CDFW is concerned that project modifications in Action 5 may result in effects to listed species or critical habitat that exceed those considered in Table 184 of the 2024 NMFS BiOp. In addition to the significant change in the numerical thresholds, Action 5 does not require salmon protections to automatically onramp when a threshold is exceeded, but rather calls for an action to be taken only when an assessment indicates annual salvage loss is on a trajectory to exceed the threshold and a reduction in export pumping would materially increase through-Delta survival. This is a cause for concern because, absent a definition of “materially increase,” the implementation of salmon protective measures is subjective, which potentially sets a bar that would prevent these protections from ever being implemented.

Longfin Smelt and Delta Smelt Protections

Start of Entrainment Management – First Flush Conditions: First Flush is a well-established protective measure for adult Delta Smelt that was refined during implementation of the 2008 USFWS BiOp on the coordinated operations of the CVP and SWP in California. It was included in both the 2019 and 2024 PAs. The 2024 PA does not include the ability to modify or off ramp First Flush implementation through governance and real-time decision-making. However, Action 5 includes an offramp to this measure if Reclamation prepares an assessment that determines abiotic factors indicate First Flush is not warranted to avoid exceeding the incidental take of Delta Smelt. Given that the 2024 USFWS BiOp defines the incidental take limit by the abiotic proxies that trigger the First Flush action, it is unclear how an assessment utilizing these same abiotic proxies could credibly make the determination that Delta Smelt incidental take limits will not be exceeded.

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Real-Time Assessment Thresholds – Longfin Smelt Adults: Action 5 includes a new flow criterion to trigger adult Longfin Smelt protections, which requires flow at Jersey Point (JPF) be less than 0 cubic feet per second (cfs), rather than a metric based on salvage. It is unclear how the new flow criterion provides adequate protection because there is no scientific evidence or modeling support for this or any flow threshold at this location that is protective for adult Longfin Smelt. Action 5 evaluated entrainment risk for adult Longfin Smelt using PTM, a model that is only appropriate to analyze effects to larval and juvenile life stages of smelt.

Real-Time Assessment Thresholds – Longfin Smelt and Delta Smelt Larvae and Juveniles: Action 5 decreases protections for larval and juvenile smelt. The larval and juvenile protection triggers for both Longfin Smelt and Delta Smelt require that JPF is less than 0 cfs before a protective action would be considered. As discussed in the State Water Project Effects on Longfin Smelt and Delta Smelt (Smelt Effects Analysis), prepared for the 2024 ITP for the Long-term Operations of the SWP, modeling conducted by CDFW and DWR showed that QWEST of 1,500 cfs is the lower range of flows that could be protective for larval fish, assuming that OMR flows do not become more negative than -5,000 cfs. The definition of JPF in Action 5 is similar to QWEST, and there is no evidence that a flow of 0 cfs at this tidally affected area would prevent larval fish from being entrained into the south Delta by project operations. CDFW is also concerned that a JPF of 0 cfs represents conditions with a high risk of larval and juvenile entrainment in which essentially all flow from the San Joaquin, Cosumnes, Calaveras, and Mokelumne rivers, as well as flow from the Sacramento River through the Delta Cross Channel Gates and Georgianna Slough, is being diverted or exported before reaching the confluence with the Sacramento River. With little to no flow from the San Joaquin River or eastside tributaries, which can be represented by a JPF of 0 cfs, larval smelt are likely to be entrained in the south Delta, with the rate of entrainment in the export facilities being dependent on the rate of exports.

Real-Time Assessment Thresholds – Longfin Smelt Larvae and Juveniles: The larval and juvenile Longfin Smelt protection measure in Action 5 requires that “a population model demonstrates the need to reduce entrainment to avoid population decline” before a protective action would be taken. It is our understanding that a Longfin Smelt population model does not currently exist. As a result, it is unclear how this protective measure could be implemented.

If a Longfin Smelt population model were developed, peer-reviewed, and used in real-time decision making as Action 5 requires, the expectation that any 7-day action would individually result in a change to the population trajectory is misguided (see “Population-Level Effects” comment below). The 2024 USFWS BiOp effects analysis considers take to be minimized by the “broad application of OMR management,” which work together over the season to protect Longfin Smelt. (2024 USFWS BiOp, p. 253.) Modeling results and conclusions regarding species impacts for Action 5 rely on implementing a suite of OMR management actions each year, as all actions for all species were layered

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together before being modeled (Exhibit 2 Attachment F.1-2). This framework assumes that all actions are implemented and together affect the habitat and species in the Delta.

Real-Time Assessment Thresholds – Delta Smelt Larvae and Juveniles: The Action 5 Larval and Juvenile Delta Smelt Protection trigger includes new turbidity and modeling criteria that are inconsistent with best available science.

The south Delta turbidity criterion requires turbidity greater than or equal to 12 FNU (as measured by continuous sensors in the Delta) to initiate a protective action and is inconsistent with the USFWS Delta Smelt Life Cycle Model, which was used to develop the larval and juvenile Delta Smelt protective measure in the 2024 PA. The Delta Smelt Life Cycle Model uses turbidity as measured by Secchi disc surveys to characterize entrainment risk of larval Delta Smelt. Action 5 does not contain adequate supporting information to explain the relationship between these two different turbidity metrics (FNU and Secchi depth) that would facilitate an analysis of impacts using the Delta Smelt Life Cycle Model.

The modeling criterion requires that “PTM modeling indicates that the action would avoid $\geq 5\%$ entrainment of the Delta smelt population at facilities after 30 days” before a protective action would be implemented. It is unclear whether Action 5 refers to an absolute value or a percent difference in entrainment greater than or equal to 5%. This detail is needed to implement the measure during real-time operations. Additionally, the criterion focuses on impacts of entrainment into the export facilities, which is not consistent with the 2024 USFWS BiOp’s definition of entrainment: “the movement of a fraction of the population into the south Delta, where they have little chance of successfully contributing to a subsequent generation.” (2024 USFWS BiOp, p. 88.) Thus, the Action 5 approach appears to ignore the risks and associated impacts of entrainment into the south Delta.

Delta Smelt Summer and Fall Habitat: Action 5 removes Fall X2, a protective measure for Delta Smelt. Scientific research has demonstrated that changes in abiotic conditions encountered by rearing Delta Smelt in the fall have significant overall effects on population size (Bever et al. 2016; Feyrer et al. 2011, IEP-MAST 2015). More recently, a life cycle model by Polansky et al. (2024) found a stronger relationship between summer outflows and Delta Smelt survivorship when compared to the fall. However, outflow in both the summer and the fall were shown to benefit Delta Smelt, even if the relationship is stronger in the summer, by expanding the spatial extent of habitat and augmenting food resources. No summer outflow, fall outflow, or food enhancement actions have been included in Action 5 that would expand habitat availability and augment food resources for Delta Smelt.

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Modeling

Comparison of Action 5 to Baseline: The Action 5 Alternative modeling depicts a potential future condition of increased spring flows from tributaries through Voluntary Agreements (VA flows, now called Healthy Rivers and Landscapes). As Action 5 could result in impacts before the implementation of VA flows, and Action 5 eliminates Reclamation's early implementation of VA flows, the modeling does not allow an evaluation of impacts on a shorter time horizon. The implementation of VA flows in modeling assumptions may obscure or ameliorate adverse impacts of Action 5. To evaluate potential impacts of Action 5, it needs to be compared to a current baseline of Alt 2v1, and all other factors that are not part of the action (VA flows, TUCP, etc.), must remain constant between the two runs. In addition to these issues, the modeling assumes that the Department of Water Resources (DWR) would adhere to Action 5, rather than the 2024 SWP ITP.

Representation of OMR Management in CalSim: The representation of OMR management (Exhibit 2 Attachment F.1-2) in CalSim is inconsistent with the actions described in Action 5. It is inconsistent because specific operating criteria are not accurately reflected in the modeling and because Action 5 includes subjective assessments and other offramps that appear likely to reduce the extent to which protections are implemented. As a result, the effects analysis generally underestimates changes in the impacts on species and their habitats as compared to the 2024 PA. Specific examples from Exhibit 2 Attachment F.1-2 include:

- Modeling for Action 5 assumes implementation of early season Winter-run protections consistent with the 2024 PA (Alternative 2). However, this protection was not included in Action 5.
- Modeling for First Flush under Action 5 assumes an off-ramp of export restrictions when JPF > 0 cfs. However, there is no specific JPF flow criteria for First Flush in Action 5.
- Modeling for the initiation of OMR management season assumes that a restriction to -5,000 cfs OMR would begin no later than January 1. This is not consistent with Action 5 which initiates OMR management only after the First Flush conditions occur, the adult Longfin Smelt salvage condition occurs, or when salvage of Winter-run occurs *after* January 1.
- Larval and juvenile Delta Smelt protections for Action 5 were modeled as a continuation of adult Delta Smelt protections and do not include any adjustments for the additional modeling criterion required to initiate this action under Action 5, i.e. that PTM modeling indicates that the action would avoid $\geq 5\%$ entrainment of the population into export facilities. This modeling criterion is expected to prevent or reduce implementation of protections as compared to the 2024 PA.
- Winter-run protections for Action 5 were modeled by assuming the action is triggered when observed loss exceeds the annual loss threshold. This assumes a greater

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level of protectiveness than is afforded by the criteria in Action 5, which requires that both (a) annual loss is on a trajectory to exceed the threshold, *and* (b) reducing exports would materially increase through-Delta survival. These criteria introduce additional subjective assessments into the action that may reduce the extent to which it is implemented.

- Modeling for Action 5 assumes that juvenile Steelhead protections would trigger when rolling cumulative 7-day loss exceeds 120 fish. If the action is triggered, each additional Steelhead in salvage is assumed to trigger a new 7-day action. These modeling assumptions are inconsistent with the Steelhead measure in Action 5, which is based on similar criteria to juvenile Winter-run protections (see bullet above) and relies on a Steelhead JPE that does not currently exist. Action 5 CalSim modeling assumes that juvenile Steelhead protection would result in OMR of -3,500 cfs for 10 weeks in 2010, 6 weeks in 2011, 8 weeks in 2013, and 9 weeks in 2018. This has an outsized contribution to the “combined coverage” historical OMR percentage calculations, as it assumes that OMR would be no more negative than -3,500 cfs 25–100% of April–June for four of the thirteen (13%) years included in the analysis. When sorted by water year type, this underestimates exports and impacts on all Delta species and their habitats during below normal and dry water years, and wet water years if OMR is controlling exports.
- Storm-Flex for Action 5 was modeled assuming operations would be limited to an OMR of -6,250 cfs, while Action 5 allows operations up to an OMR of -6,500 cfs.

Modeling of OMR management layers all actions for all species together for inclusion in CalSim 3, which is then used as the foundation for the various hydrologic, water quality, and species-specific models characterizing impacts of Action 5. In this way, any less negative OMR implemented in response to a specific measure is modeled as providing protections to all Delta species and their habitats, not solely the species and life stage associated with the triggered action. Therefore, any OMR action that is offramped, reduced, or not modeled appropriately would change the effects on all species present in the Delta in ways that are not evaluated or quantified in the Action 5 analyses. CDFW is concerned that the increase in species-specific offramp criteria in Action 5’s approach to OMR management would have cascading effects to all species that have not been fully analyzed.

Conclusions Regarding Population-Level Effects

Action 5 refers to several metrics (e.g., change in loss or salvage) to support the claim that proposed changes will not lead to population-level effects. However, in most cases, the use of such metrics does not clearly provide population-level insights or support conclusions regarding population-level effects. Population-level effects are changes to the population characteristics of a group of organisms (i.e., not individual members of the population) associated with a stressor or environmental change. These population characteristics could be population abundance, population size- or age-structure, or population vital rates (i.e., births, deaths, fertility, maturation, or growth). Estimating

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these metrics requires vast amounts of sampling data, a lifecycle modeling framework, or, usually, both. CDFW is concerned that conclusions regarding a supposed lack of population-level effect are used in Exhibit 4, Endangered Species Act Section 7(a)(2) Compliance, to dismiss documented increases in impacts to species and the elimination or weakening of important protective measures.

Given that water operations modeling, real-time action assessments, and the analysis used to support Action 5 are often evaluating current or future conditions (i.e., conditions not often observed in historical data), historical data alone are not sufficient to assess population-level effects. Instead, a lifecycle modeling framework that facilitates simulation would be required. Traditionally, ecologists refer to this type of analysis as a population viability analysis. A population viability analysis uses stochastic population models to assess the probability of population growth or decline (or even extinction) over a specific time horizon. Without such a model, claiming a population-level effect (or lack thereof) is questionable at best. In fact, the conclusions drawn from all biological modeling described in the Action 5 documentation range from highly inadequate to assess population-level effects (e.g., simply stating salvage numbers, absent of south Delta entrainment effects, does not equate to an assessment of the population), to falling just short of an effective population viability analysis (e.g., the life cycle models reporting either arbitrary metrics such as “terminal lambda” or neglecting to assess long-term trajectories or changes in population extinction risk).

Moreover, estimates of loss and salvage alone are not sufficient metrics to draw conclusions regarding population-level effects resulting from project operations. The modeling tools used to estimate loss and salvage, such as the *Salvage Density Model*, *Loss Simulation* and *Negative Binomial Estimated Total Salvage*, are primarily based on historical hydrologic, salvage, and loss data, which do not explicitly include or produce population-level information. Currently, the changes in loss and salvage between Action 5 and the 2024 PA are compared using either a difference in numbers of fish or a percentage change, and these estimates can vary between water years. A population-level impact due to changes in loss and salvage will depend on numerous factors, such as the population status (e.g., the current population growth rate relative to a stable growth rate of 1), frequency of water year types, and the relative importance of juvenile survival to population dynamics. In the absence of a comprehensive life cycle model, the estimated changes in loss or salvage (in numbers of fish or percentage change) should at least be reflected in the context of the population status or size. For example, an 8% increase in predicted loss of winter-run from 940 fish (2024 PA) to 1,018 fish (Action 5) would have greater population-level impacts for a population of 10,000 individuals than a population of 100,000 individuals. However, this information alone will not provide an adequate understanding of population-level effects that occur under future conditions, as changes in larval and juvenile abundance due to loss or salvage can affect future reproductive potential, which is not captured in the example above.

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Arguably, the analyses using the Delta Smelt Life Cycle Model are best suited to derive population-level effects. According to Table F.4-6 (Exhibit 4 Attachment F.4), the No Action Alternative resulted in a 5.6% greater population growth rate from 1995-2015 relative to Action 5 and an 8.3% greater population growth rate for wet and above normal water years during this period. Similarly, the empirical model (i.e., historical data) resulted in a 6.7% greater population growth rate from 1995-2015 than Action 5 and a 37.5% greater population growth rate for wet and above normal water years during this period. It is our understanding that the empirical model run analyzes observed historical data from 1995-2015. These changes to the population growth rates will likely lead to measurable population-level effects, but this was not explicitly evaluated. That is, the analysis should have included an assessment of differences in extinction potential or potential to fall below a specific threshold (e.g., the historic mean or the mean in the most recent five-years) while accounting for uncertainty (i.e., stochasticity).

In considering population-level effects, CDFW appreciates the inclusion of results from the CVPIA SIT DSM life cycle models in the analysis of operational changes of Action 5. However, CDFW suggests caution when inferring population-level effects based on these modeling results because specific demographic rates described by the model lack sensitivity to the flow and temperature changes associated with Action 5. Specifically, Reclamation provides an incomplete list of modeled demographic rates that have not been constructed to vary as a function of changing flow and temperature inputs which include adult salmon arrival and spawn timing, salmon egg-to-fry survival, and juvenile salmon growth rates. Given that the only life cycle modeling result provided by Reclamation estimates critical demographic rates that are, by Reclamation's own account (Exhibit 4 Attachment F.2), insensitive to the flow and temperature changes described by Action 5, CDFW further cautions that it is nigh impossible to assess a population-level effect without further life cycle modeling.

Other Activities

The 2024 NMFS BiOp considered "Other Activities" of the 2024 PA, which include components of the identified action that were not specifically proposed by Reclamation, but that would not occur but for the action, and are reasonably certain to occur. The 2024 NMFS BiOp specifically considered the Winter-Run Action Plan (WRAP) as one such activity. The WRAP included a list of six high-priority actions developed to reduce stressors affecting Winter-run; doing so through a combination of science, fishery actions, infrastructure improvements, and reintroduction to historic habitat. As described in the 2024 NMFS BiOp (Table 170), NMFS considered the effect of implementing the actions of the WRAP when evaluating the magnitude and direction of change caused by the 2024 PA on the Viable Salmonid Population parameters, which inform a salmonid species' extinction risk. Action 5 does not include a clear commitment to the WRAP such that the actions therein are no longer reasonably certain to occur. Given that the actions and effects of the WRAP were considered in the 2024 NMFS BiOp and that they

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were specifically identified as supporting the conclusion that the 2024 PA would not jeopardize the continued existence of Winter-run, it is not clear how Reclamation was able to conclude that Action 5 does not constitute a modification of the identified action that would cause an effect to listed species that was not considered in the 2024 NMFS BiOp.

Shasta Reservoir Operations

In the 2024 PA, Reclamation proposed a new approach to managing Shasta that changed the balance between risks of flood control releases and maintaining water in storage for future drought protection and temperature management. This new Shasta Management Plan Framework created a pivotal role for the Shasta Operations Team (SHOT), a policy-level group called for in the 2024 PA, which discusses water operation actions when implementation may have impacts of tradeoffs relevant to listed fish species, system conditions or water supply. The 2024 PA also described a key role for the SHOT in the WRAP and in making decisions on how Shasta-related VA flow assets would be managed. Action 5 eliminates the SHOT and does not include clear commitments to implement the WRAP. The collaborative governance structure and integrated plan to improve the survival and viability of Winter-run that functions alongside planned operation of Shasta Reservoir called for in the 2024 PA has been replaced by a structure in Action 5 that is not based on biological goals and objectives, nor does it contain any collaborative decision making groups, such as the SHOT.

Governance

The governance structure included in the 2024 PA was founded in six key principles including collaboration. Specifically, the 2024 PA (Section 3.13.1) stated “[T]he leading principle of CVP/SWP Governance is collaborative, science-based decision making. CVP/SWP governance is structured to seek consensus across scientific, technical and policy levels, with elevation and decision making processes in place when consensus cannot be reached.” The technical and management team structure established to support the 2024 PA governance principles included both a multi-agency management team, WOMT, “to discuss and resolve operational questions and technical issues, as requested or elevated from Delta and tributary technical teams, and to elevate unresolved operational issues to the Directors Group” and the Delta Monitoring Workgroup “with technical representatives from federal and state agencies and stakeholders who can provide information to DWR and Reclamation on species abundance, species distribution, life stage transitions, and relevant physical parameters”. This structure supported a clearly described elevation process to Directors of all five agencies (Reclamation, DWR, CDFW, USFWS, and NMFS) where unresolved issues could be discussed and addressed collaboratively. Or, in the absence of consensus, this process would thoroughly document differing opinions that lead to a final decision.

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In contrast, Action 5 eliminates technical, managerial, and Director-level working groups and the collaborative approach to real-time decision-making established in the 2024 PA. Instead, Action 5 emphasizes Reclamation autonomy in implementation of Biological Opinions and decision making. For example: "Reclamation determines whether and how to proceed with its proposed action in light of USFWS' and NMFS' biological opinion, even though the terms and conditions of incidental take statements are non-discretionary." Later, Action 5 states if a reasonable and prudent alternative is issued by NMFS and/or USFWS as part of their biological opinions, Reclamation may choose not to implement USFWS' or NMFS' reasonable and prudent alternative; instead, Reclamation can choose to develop a new Proposed Action. As a result, Action 5 relies on reinitiation and potential litigation as the tools to motivate changes in analyses of impacts to species and potential protective measures in the absence of collaboration.

Conclusion

CDFW appreciates the opportunity to comment on the LTO Action 5 Operation Plan for the Central Valley Project and State Water Project and the associated Environmental Compliance Sufficiency Review to assist Reclamation in identifying, evaluating, and considering changes in impacts of long-term operations of the CVP and SWP on biological resources. Due to the issues presented in this letter, CDFW is concerned that the Action 5 Operations Plan and Environmental Compliance Sufficiency Review do not adequately identify or provide detailed information to decisionmakers about the Project's significant impacts on biological resources, which in turn hinders Reclamation's capability to take a hard look at the consequences of implementing Action 5.

Questions regarding this letter or further coordination should be directed to Kristal Davis-Fadtke, Environmental Program Manager at 916-701-3226 or Kristal.Davis-Fadtke@wildlife.ca.gov.

Sincerely,

DocuSigned by:

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DEPARTMENT OF WATER RESOURCES

P.O. BOX 942836
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November 10, 2025

VIA EMAIL: ANickels@usbr.gov

Mr. Adam Nickels, Acting Regional Director
California Great Basin Region,
United States Bureau of Reclamation
2800 Cottage Way
Sacramento, California 95825-1898

Subject: Environmental Compliance Sufficiency Review for the Central Valley Project
and State Water Project Long-Term Operations Plan – Action 5

Dear Mr. Nickels:

Thank you for the opportunity to comment on the proposed action to implement the Action 5 Operations Plan for the Long-Term Operation of the Central Valley Project (CVP) and State Water Project (SWP) (Action 5). The Department of Water Resources (DWR) and United States Bureau of Reclamation (Reclamation) have a long history and shared interest in working together to maximize California water supplies while also protecting the environment in a legally defensible manner. Especially under climate change and resulting weather extremes, it is imperative that DWR and Reclamation find ways to protect water supply during periods of increased river inflows while at the same time use best available science and new science tools to maintain species protections.

With this larger goal in mind, DWR has reviewed Action 5 and its supporting documentation and has identified potential areas where Action 5 operations could impact SWP water supplies and, in turn, the ability to serve water to California communities. DWR is concerned that Reclamation has not adequately analyzed potential redirected impacts of Action 5 operations on SWP water supply. DWR submits these comments in the spirit of open and continued collaboration with Reclamation and is hopeful our agencies can draw on our history to ensure fair and legally supported coordinated operations this water year. DWR hopes to work with Reclamation on issues that may not be listed here as they arise in the future and remains committed to working through shared governance teams to evaluate scientifically sound modeling to evaluate these impacts.

I. Concerns Regarding SWP Water Supply Impacts

Fundamentally, DWR's concerns relate to the SWP's continued ability to supply and deliver water to 27 million Californians, 750,000 acres of farmland, and businesses throughout California. In carrying out water delivery responsibilities, DWR must operate within the authorizations of the Federal Endangered Species Act (ESA) and California Endangered Species Act (CESA), which are currently set forth in the 2024 United States Fish and Wildlife Service (USFWS) Biological Opinion, the 2024 National Marine Fisheries Service (NMFS) Biological Opinion (collectively, BiOps), and the 2024 CESA Incidental Take Permit (ITP). It is imperative for DWR to understand whether Reclamation's operations under Action 5 will result in any impacts to SWP water supply.

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Reclamation provided its Action 5 CALSIM modeling to DWR for review. DWR's review indicated that Reclamation's CALSIM modeling for Action 5 assumes the SWP will operate to Action 5. This assumption, which is noted in Exhibit 2 to the Environmental Sufficiency Memo, dated October 10, 2025, is incorrect. Reclamation should update its modeling to accurately reflect SWP's anticipated operations, which will be governed by the then-current ESA and CESA authorizations. DWR and the California Department of Fish and Wildlife (CDFW) work together to consider new science and information as set forth in the adaptive Management Plan, but for the purposes of modeling, Reclamation should assume the SWP will be operated to the current regulatory requirements in the ITP. Reclamation should also further analyze Action 5's potential impacts to the SWP water supplies, consistent with National Environmental Policy Act (NEPA) requirements. This letter includes examples where misalignment between SWP and CVP operations could occur, and evaluates those that are likely to occur during the winter and spring months. SWP and CVP operations and permit requirements are complex, so evaluating an exhaustive list of potential impacts is difficult. The items below do not represent an exhaustive list. Others may include, for example, impacts to the summer-fall habitat action and changes in operations of upstream CVP reservoirs (e.g., Shasta, American River, etc.). It is our hope that by specifically describing potential areas of misalignment and redirected impacts, DWR and Reclamation can work collaboratively to avoid those impacts.

A. Start of Old and Middle River Entrainment Management

Pursuant to the NMFS BiOp analysis and the ITP, the SWP must initiate Old and Middle River (OMR) entrainment management no later than January 1 each year, unless it begins earlier as a result of Winter-Run Chinook Salmon salvage levels. If those loss thresholds are met, DWR and Reclamation must coordinate to adjust total exports, which could occur as early as November 1 or December 1.

In contrast, Action 5 lists several conditions that could initiate OMR entrainment management, but no hard date for commencement is included. (Exhibit 1 to the Sufficiency Memo, 5.3.1, p. 5-8). Thus, it is possible SWP could be operating to OMR for weeks before CVP implements OMR management, creating misalignment. DWR is supporting the development of a winter-run prediction model and other tools that may be useful for assessing when winter-run salmon are vulnerable to entrainment risk. Until these tools are developed and incorporated in an ITP amendment and BiOps, Reclamation's Action 5 start date for OMR management could lead to disruptions as the SWP curtails exports to adjust OMR levels while the CVP continues to operate at a higher pumping rate, particularly if other listed fish (e.g. longfin smelt) are vulnerable to entrainment risk (see below). CVP's higher pumping rate could continue to draw fish to the pumps, making the SWP's export decreases less effective at reducing entrainment.

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B. Winter-Run Chinook Salmon

Action 5 identifies a different, higher annual loss threshold for Winter-Run Chinook Salmon than the proposed action analyzed in the NMFS BiOp and the 2024 ITP. Specifically, under the NMFS BiOp's analysis and consistent with the ITP, the Projects coordinate Delta exports to avoid exceeding a 0.5% juvenile production estimate (JPE) threshold for natural-origin winter-run and 0.12% JPE for hatchery winter-run. Under the BiOp analysis and ITP, if cumulative loss exceeds 50% of the annual threshold, the Projects must adjust exports to maintain a seven-day OMR rate no more negative than -3,500 cfs, and a -2,500 cfs OMR rate, if 75% of the annual loss threshold is exceeded. Action 5 raises the annual loss thresholds to 1% for both natural-run and hatchery winter-run and calls for a determination that reducing exports would increase through-Delta survival before requiring an OMR rate no more negative than -3,500 cfs.

In the meantime, if the CVP were to operate to Action 5's winter-run requirement while the SWP continued to operate to the current regulatory requirements, the SWP could be forced to take action to ramp down its operations separate from, and earlier than, the CVP. The CVP's higher pumping levels could continue to attract and entrain fish, making it challenging for the SWP to avoid exceeding the annual loss triggers and potentially forcing the SWP to reduce exports even further and at an earlier date than would otherwise occur to offset the effects from the CVP's pumping. Such an outcome would unfairly burden the SWP and compromise the SWP's ability to deliver water to its contractors.

Under the Adaptive Management Program described in the BiOps and ITP, DWR supports studies and models that better determine the relative impact of SWP and CVP on population cohort replacement rate or population impacts. Such studies and models may yield different protection thresholds than identified in the 2024 ITP or analyzed by the NMFS BiOp. DWR is committed to working through interagency teams to understand how new science and modeling could inform potentially different thresholds.

C. Longfin Smelt (LFS)

Action 5 eliminates the hard triggers set forth in the USFWS BiOp and the ITP for managing OMR to reduce juvenile LFS entrainment. Specifically, Action 5 would remove the hard triggers in exchange for a "population model that demonstrates a need to reduce entrainment to avoid population decline." To DWR's knowledge, such a population model is yet to be developed for real-time operations. DWR is currently working on a model for real-time application per the Adaptive Management Program described in the BiOps and the ITP, however this effort will not be completed for potential application until 2027. The real-time model will be based on newly published research showing that entrainment impacts are not responsible for variations in LFS fall abundance. In the absence of a peer reviewed real-time

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population model, it is uncertain how the CVP will operate during periods when longfin are being salvaged at the projects.

Like DWR's winter-run concerns, it is possible that the SWP could be forced to reduce water exports to minimize entrainment of the juvenile LFS while the CVP continues to pump at a higher rate. And, again, the CVP's pumping could continue to attract and entrain fish at a higher rate than it would otherwise do under the BiOp. The SWP should not be forced to forego its water exports earlier or more than its fair share to comply with juvenile LFS measures.

D. Spring Run Chinook Salmon

Action 5 identifies an annual loss threshold for Spring-Run Chinook Salmon of one-percent JPE. DWR supports the use of a JPE to manage take based on population level effects, but is unaware of a peer-reviewed JPE for application of spring run entrainment management in 2026. DWR, in collaboration with Reclamation, NMFS, and CDFW, are working on development of the spring-run JPE that should be ready for potential application in WY 2027 or 2028. The spring-run JPE is identified in the Adaptive Management Program described in the BiOps and the ITP with the intent of modifying the spring-run action when it is completed. Until then, the NMFS BiOp and the 2024 ITP rely on surrogate approaches to manage spring-run losses at the pumps. It is uncertain how Reclamation would operate under Action 5 and potential misalignment could occur assuming DWR continues to operate to a surrogate approach. Under Action 5, the CVP could remain at higher pumping levels for a longer period than the SWP before reducing exports to reduce spring-run entrainment risk. DWR recognizes that the Projects have not historically exceeded spring-run loss thresholds, but such a situation is possible and, therefore, creates a concern regarding misalignment. If this misalignment occurs, the CVP's heightened pumping levels could increase the risk of entrainment, triggering the SWP to reduce pumping earlier and more often than would occur if the CVP operated pursuant to the NMFS BiOp.

E. Sharing of Restricted Export Capacity

The export capacity sharing splits set forth in Article 10(i) of the 1986 Coordinated Operation Agreement, as amended in 2018 (COA), could exacerbate Action 5's impacts on SWP water supply. In excess water conditions, when releases from upstream reservoirs plus unregulated flow exceed Sacramento Valley in-basin uses and exports are constrained by non-discretionary requirements, Article 10(i) provides that the CVP may utilize 60% of the applicable export capacity whereas the SWP may only utilize the remaining 40%. In other words, the CVP is able to pump a higher proportion of available water than the SWP. Thus, to the extent the CVP were to pump at a higher level pursuant to Action 5 than the SWP is allowed, the SWP would have to reduce pumping even further to offset the CVP's entrainment impacts because the CVP will have access to a greater proportion of export capacity than the

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SWP under the 60/40 COA split. This compounding effect should be evaluated and mitigated as it was not contemplated in, nor is it consistent with, the 2018 COA amendment.

II. Legal Concerns

A. Coordinated Operation Agreement

The Action 5 operations described above could be inconsistent with Reclamation's obligations under COA. COA requires the CVP and SWP to coordinate operations of each system in a cooperative manner "so as to provide the maximum benefits to the people of California and the Nation" (Article 2.) It further requires Reclamation to "use all reasonable means to guard against a condition of shortage in the quantity of water available to the State pursuant to this [COA]." (Exhibit E, paragraph 1(a).) If Reclamation implements Action 5 in a way that harms the SWP's ability to deliver water to its contractors and customers, the CVP export increase would be at the expense of all SWP water contractors, and due to the different water purposes the SWP and CVP serve, disproportionately impact Californians' water supplies.

DWR and Reclamation, through COA, have worked together for almost 40 years to carry out water deliveries to Californians. Action 5's potential SWP water supply impacts, as outlined above, could risk jeopardizing this collaborative operational relationship under COA.

B. National Environmental Policy Act

DWR questions whether Reclamation has carried out the necessary environmental review for the Action 5 operations described in this letter. Under NEPA, federal agencies must evaluate the environmental effects of its actions on the environment. (42 U.S.C. §4332(2)(C), NEPA §102.) This evaluation acts to inform the public of the environmental impacts of the government's action, providing transparency in government relations.

The "Draft Memorandum for Interested Party Review" and supporting documentation do not purport to be official NEPA documents. Neither do they meet the statutory requirements to evaluate the effects of Action 5. The memo asserts that Action 5 falls within the Final Environmental Impact Statement (FEIS) issued by Reclamation in November 2024. However, the FEIS did not analyze the removal of the thresholds Reclamation now proposes. Additionally, no document to date analyzes the impacts on the SWP water users, a part of the human environment, as required by 42 U.S.C §4332(2)(A). As noted above, Reclamation's modeling incorrectly assumes the SWP will operate to Action 5 in a manner identical to the CVP. The transparency of a full NEPA review could also add to a greater understanding of how Action 5 fits within other relevant laws, such as the ESA.

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III. Conclusion

Action 5 could have adverse consequences, depending on its implementation, on the SWP and the water users who depend on SWP water supplies. The Action 5 documentation Reclamation has produced, to date, is vague in how it will be implemented in real-time, and neither discloses nor analyzes these impacts. DWR urges Reclamation to continue to strive for consistent real-time operations and invest and collaborate on new science tools and population models to inform operations that protect water supply and species. DWR also asks Reclamation to reconsider Action 5 and to comply with the legal requirements regarding environmental review, endangered species restrictions, and coordinated SWP and CVP operations. We are hopeful that as our shared investments in models and other tools become available for use in the 2027 water year and beyond, and our science-based operations will be realigned to the benefit of water supply and species. In the meantime, we remain ready to work collaboratively to responsibly manage the SWP and CVP water supplies in 2026.

Sincerely,

A handwritten signature in blue ink, appearing to read "John Yarbrough".

John Yarbrough
Deputy Director



Comments: Environmental Compliance Sufficiency Review – Action 5

From Ellen Wehr <ellen@wehrwater.com>
Date Mon 11/10/2025 9:23 AM
To BDO Comments, BOR MPR <sha-MPR-BDO@usbr.gov>
Cc Ric Ortega <rortega@gwdwater.org>

1 attachment (640 KB)

Environmental Compliance Sufficiency Memorandum_LTO_Action 5_Oct 2025 1.pdf;

Good morning,
Grassland Water District submits this comment and requests one edit on the Action 5 Operations Plan, page 2-6 (.pdf p. 15):

In Section 2.5, the Action 5 Operations Plan briefly describes the Shasta Operations Framework in a text box. Under the "*Drought*" scenario, one of the last listed actions is "Refuges Water Supply Reduction." GWD requests that this shorthand description be changed to: "North of Delta Refuges Water Supply Coordination Reduction."

The requested change better reflects the description of refuge operations in the Shasta Operations Framework discussion in Section 2.18 on page 2-10 (on .pdf p. 19), which states that "if conditions remain dry through the fall, Reclamation and USFWS will coordinate on how to address instream flow objectives, lake levels and refuge needs."

Our concern with the language in the text box on page 2-6 is that it could be interpreted to apply to all refuges, and it broadly describes water "reductions" even though Reclamation has carefully crafted the Shasta Operations Plan to describe the close coordination that Reclamation undertakes with refuges during drought.

Thank you for your consideration in making this change, we appreciate the opportunity to comment.

Ellen Wehr
Wehr Water Law & Policy
2001 H Street, Sacramento CA 95811
wehrwater.com
(916) 873-2020 (cell)
ellen@wehrwater.com

From: Beck, Jo Anna M <jbeck@usbr.gov>
Sent: Tuesday, October 7, 2025 5:43 PM
To: Beck, Jo Anna M <jbeck@usbr.gov>

Cc: BDO Comments, BOR MPR <sha-MPR-BDO@usbr.gov>

Subject: Environmental Compliance Sufficiency Review – Action 5 (CVP and SWP Long-Term Operations Plan)

Dear Interested Parties,

Please find attached the draft memorandum titled “Environmental Compliance Sufficiency Review for the Central Valley Project and State Water Project Long-Term Operations Plan – Action 5.” Supporting exhibits can be found here: [Bay Delta Office - Action 5 - All Documents](#)

Action 5 was developed to operate the CVP in accordance with *Executive Order 14181 – Emergency Measures to Provide Water Resources in California and Improve Disaster Response in Certain Areas*, dated January 24, 2025 (E.O. 14181).

The purpose of this memorandum is to support compliance with National Environmental Policy Act and Endangered Species Act responsibilities. Reclamation has also provided these materials to the U.S. Fish and Wildlife Service and the National Marine Fisheries Service (collectively, the Services). At this time, Reclamation is targeting the signing of a Record of Decision to implement Action 5 in December 2025, following coordination with the Services.

Please review the materials at your earliest convenience. If desired, comments may be submitted to <sha-MPR-BDO@usbr.gov> (also cc’ed on this message) by Monday, November 10.

If you have questions, please feel free to reach out.

Regards,

Jo Anna Beck

Natural Resources Specialist

[Bay-Delta Office](#)



November 10, 2025

Acting Regional Director Adam Nickels
Bureau of Reclamation
California Great Basin – Region 10
2800 Cottage Way
Sacramento, CA 95825

Submitted via email to: sha-MPR-BDO@usbr.gov

Re: Comments on Environmental Compliance Sufficiency Review – Action 5 (CVP and SWP Long-Term Operations Plan)

Dear Acting Regional Director Nickels,

This letter is to provide comments on behalf of the San Luis & Delta-Mendota Water Authority ("Water Authority") and the San Joaquin River Exchange Contractors Water Authority ("Exchange Contractors") on the Environmental Compliance Sufficiency Review for the Central Valley Project ("CVP") and State Water Project ("SWP") Long-Term Operations Plan ("LTO") – Action 5.

The Water Authority is a joint-powers authority that serves two important roles: 1) to provide representation on common interests of the Water Authority's 27 member agencies; and 2) to operate and maintain certain Central Valley Project ("CVP") facilities, including the Jones Pumping Plant, the Delta-Mendota Canal ("DMC") and the O'Neill Pumping Plant, that the Authority's member agencies depend on for delivery of CVP water. Twenty-five of the Water Authority's member agencies contract with the United States for the delivery of water from the CVP as the principal source of water they provide to users within their service areas, including the four member agencies of the Exchange Contractors. That water supply serves approximately 1.2 million acres of agricultural lands within areas of San Joaquin, Stanislaus, Merced, Fresno, Kings, San Benito, and Santa Clara Counties, a portion of the water supply for nearly 2 million people, including in urban areas within Santa Clara County referred to as the "Silicon Valley," and millions of waterfowl that depend upon up to 200,000 acres of managed wetlands and other critical habitat within the largest contiguous wetland in the western United States.

Given this connection, the Water Authority and its member agencies have a strong interest in the operations of the CVP and how sound and effective implementation of the federal Endangered Species Act ("ESA") can influence the reliability and affordability of our member agencies' contracted water supplies, as well as ensure scientifically supported, reasonable protection for species listed under the ESA. The experience of our member agencies, and the farms and communities reliant on their contracted supplies, demonstrates that for the past thirty years, restrictions on the operations of the CVP have resulted in progressively more severe reductions in water supply for the farms, communities, and ecosystems served by our member agencies, with little measurable population-level benefit to species listed under the ESA.



Action 5 was developed to operate the CVP in accordance with *Executive Order 14181 – Emergency Measures to Provide Water Resources in California and Improve Disaster Response in Certain Areas*, dated January 24, 2025 (E.O. 14181), and does so by modifying components included in Alternative 2 in the 2024 LTO Final Environmental Impact Statement (“EIS”). Action 5 operates the CVP to deliver more water to high-need communities by increasing storage and conveyance. Specifically, Action 5: (1) removes the Delta Smelt Summer and Fall Habitat Action (“Fall X2”), (2) removes the Early Implementation Measure of the Delta export reduction of the Healthy Rivers and Landscapes (“HRL”) Program, and (3) updates Delta operating criteria and governance.

Water Supply and Species Impacts

Importantly, the changes proposed by Action 5 are anticipated to improve water supply deliveries for south-of-Delta CVP and SWP contractors by an average of 129,000 acre-feet annually, or the equivalent of enough water to support approximately 258,000 households or 36,860 acres of farmland. Importantly, this increased water supply trend holds true for critical and dry years, years when additional water available for deliveries is at its highest value. Action 5 improves water supply conditions without modifying the Proposed Action in a manner that causes an effect to winter-run Chinook salmon or its critical habitat, to spring-run Chinook salmon or its critical habitat, to California Central Valley steelhead species or its critical habitat, to green sturgeon or its critical habitat, or to Southern Resident Killer Whale that were not considered in the National Marine Fisheries Service’s 2024 LTO Biological Opinion. We understand that similar findings regarding the effects of Action 5 were made in Reclamation’s review of aquatic and terrestrial species covered under the U.S. Fish and Wildlife Service’s 2024 LTO Biological Opinion.

Delta Smelt Summer and Fall Habitat Action (Fall X2)

The Water Authority has a long history of investments in research designed to reduce the uncertainties associated with the effects of management actions on listed species in the Delta. One management action that has significant water supply costs and little to no measurable impact on listed species has been the implementation of the Fall X2 action. The U.S. Fish and Wildlife Service (“FWS”), in its 2024 LTO Biological Opinion, determined that Fall X2 is not anticipated to have observable effects on delta smelt survival. We thank the FWS for its acknowledgment of the scientific record and support the removal of Fall X2 in the Proposed Action included as Action 5.

Adaptive Management and Future Operations

The 2024 LTO included a framework for adaptive management of the CVP and SWP in response to the development of new scientific information and analytical tools. The Water Authority supports the expedited development of information and/or modeling tools to analyze the population-level effects of various project operations, including further analysis of the impacts of various operational scenarios on winter-run Chinook salmonid cohort replacement rates, and expediting the development of juvenile population estimates for spring-run chinook salmon and longfin smelt. The development and use of these tools will lead to improved analysis that has the potential to further inform operations in the future and we support coordination with CVP contractors and the scientific community to advance these efforts.

Conclusion

The Water Authority and its member agencies have long supported operating the CVP and SWP in a scientifically supported, adaptive manner that is responsive to real-time conditions and we view Action 5 as a further step towards implementing that vision. We commend Reclamation for



its work in analyzing this proposed change to operations of the CVP and SWP and for advancing efforts to improve water supply conditions in response to E.O. 14181 in a manner that can be implemented for operations in the current water year.

Thank you for your continued leadership on improving operations of the CVP. If you have any further questions, please reach out to J. Scott Petersen, Water Policy Director, at scott.petersen@sldmwa.org.

Sincerely,

A handwritten signature in blue ink, appearing to read "Federico Barajas".

Federico Barajas
Executive Director
San Luis & Delta-Mendota Water Authority

A handwritten signature in blue ink, appearing to read "Chris White".

Christopher White
Executive Director
San Joaquin River Exchange
Contractors Water Authority

CC:

The Honorable Alex Padilla, U.S. Senate
The Honorable Adam Schiff, U.S. Senate
The Honorable Jared Huffman, Ranking Member, House Committee on Natural Resources
The Honorable Harriet Hageman, Chair, House Subcommittee on Water, Wildlife, and Fisheries
The Honorable Val Hoyle, Ranking Member, House Subcommittee on Water, Wildlife, and Fisheries
The Honorable Josh Harder, U.S. House of Representatives
The Honorable Mark DeSaulnier, U.S. House of Representatives
The Honorable Adam Gray, U.S. House of Representatives
The Honorable Eric Swalwell, U.S. House of Representatives
The Honorable Sam Liccardo, U.S. House of Representatives
The Honorable Ro Khanna, U.S. House of Representatives
The Honorable Zoe Lofgren, U.S. House of Representatives
The Honorable Jimmy Panetta, U.S. House of Representatives
The Honorable Vince Fong, U.S. House of Representatives
The Honorable David Valadao, U.S. House of Representatives



TCCA Tehama-Colusa Canal Authority

P.O. Box 1025 ~ 5513 Hwy 162 ~ Willows, CA 95988 ~ Phone: (530) 934-2125 ~ Fax: (530) 934-2355

November 10, 2025

Via Electronic Mail Only

Adam Nickels
Acting Regional Director
U.S. Bureau of Reclamation
anickels@usbr.gov

David Mooney
Bay-Delta Office Manager
U.S. Bureau of Reclamation
dmmooney@usbr.gov
sha-MPR-BDO@usbr.gov

Re: Comments on Long-Term Operations Plan – Action 5

The Sacramento River Settlement Contractors (SRS Contractors) and Tehama-Colusa Canal Authority (TCCA) appreciate the opportunity to review and comment on the U.S. Bureau of Reclamation's (Reclamation) Long-Term Operations Plan – Action 5 (Action 5) and the associated environmental compliance documents and modeling. Reclamation has determined that Action 5 is within the range of impacts analyzed in the Final Environmental Impact Statement on the Coordinated Long-Term Operation (LTO) of the Central Valley Project (CVP) and State Water Project and the effects analyzed within the 2024 National Marine Fisheries Service and U.S. Fish and Wildlife Service biological opinions. Although Action 5 focuses on changes to operations in the Delta (e.g., removal of Fall X2 and relaxation of Old and Middle River (OMR) reverse flow limits), the SRS Contractors and TCCA remain focused on potential impacts to Shasta operations and reservoir storage and offer comments for consideration from that perspective.

Our review of the supporting documentation and modeling for Action 5 confirms that removal of Fall X2 has little to no risk to North-of-Delta (NOD) water supplies or reservoir storage and is likely to improve upstream reservoir carryover storage at Trinity, Shasta, and Folsom reservoirs. This is a welcome benefit to the CVP as a whole. With respect to the change to OMR reverse flow limits, the primary effect is to increase Delta

export of water that would otherwise be surplus outflow from the Delta. This change carries a small risk to NOD water supplies and storage in spring months when the Delta is in balanced conditions (mostly in drier years). Under these conditions, relaxed OMR reverse flow limits can increase the ability to move previously stored water from Shasta, Trinity, and Folsom across the Delta.

Reclamation and the SRS Contractors executed the Drought Protection Program Agreement (DPP Agreement) at the beginning of 2025 to support Reclamation's ability to satisfy the requirements of the 2024 LTO consultation and avoid the impacts associated with previous CVP drought operations. The SRS Contractors and TCCA support Reclamation's efforts to respond to new science and implement adaptive management like Action 5. However, the SRS Contractors expect Reclamation to keep its commitments under the DPP Agreement and operate according to the Shasta Framework analyzed in the 2024 LTO consultation, until further changes to long-term operations plans can be supported.

The SRS Contractors and TCCA also note the changes to the governance framework in Action 5. Previously, the SRS Contractors participated in the Shasta Operations Team (SHOT). Action 5 removes the SHOT and other management teams from the governance structure and instead implements a more streamlined structure with tributary groups reporting to the "Fish and Water Operations Group," which reports to Reclamation and California Department of Water Resources Directors. The SRS Contractors and TCCA support the clarification of operational responsibility for the projects and to develop a governance structure that is both efficient and allows for necessary input from agency and stakeholder representatives. As Action 5 identifies, the SRS Contractors are also responsible for actions under the Shasta Framework components and both SRS Contractors and TCCA are significantly affected by operational decisions that impact Shasta storage and potentially trigger a "Program Year" under the DPP Agreement. As such, the SRS Contractors and TCCA expect to work closely with Reclamation, continue to be timely updated on operational decision making, provide timely feedback, and engage in meet-and-confer discussions with the SRS Contractors when necessary and as provided under the DPP Agreement.

We appreciate Reclamation's adaptive management efforts to find opportunities for increased and more reliable water supply within the regulatory framework of the 2024 consultation.



Thaddeus Bettner
Executive Director
Sacramento River Settlement Contractors



William Vanderwaal, PE
General Manager
Tehama-Colusa Canal Authority

State Water Resources Control Board

November 10, 2025

Via Email: sha-MPR-BDO@usbr.gov

Adam Nickels
Acting Regional Director
California-Great Basin
United States Bureau of Reclamation
2800 Cottage Way
Sacramento, CA 95825

Jo Anna Beck
Natural Resource Specialist
U.S. Bureau of Reclamation, Bay-Delta Office
801 I Street, Suite 140
Sacramento, CA 95814-2536

Re: Action 5 Assumptions and Environmental Compliance

Dear Mr. Nickels:

The Central Valley Project (CVP), operated by the U.S. Department of Interior, Bureau of Reclamation (Reclamation) lies wholly within the State of California, and its operations uniquely impact California water management and California species. The State Water Resources Control Board (State Water Board) is the sole California agency with jurisdiction over both water rights and water quality. The State Water Board allocates water rights, develops statewide protection plans, establishes water quality standards, regulates public drinking water systems, enforces the Sustainable Groundwater Management Act (Water Code, § 10720 et seq.), and acts as the state water pollution control agency for all purposes under the federal Clean Water Act (33 U.S.C., § 1251 et seq.) and state Porter-Cologne Water Quality Control Act (Porter-Cologne) (Water Code, § 13000 et seq.). Consistent with Clean Water Act and Porter-Cologne requirements and authorities, the State Water Board adopts and implements a Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (Bay-Delta Plan) for the reasonable protection of beneficial uses.

On January 24, 2025, the Trump Administration issued Executive Order 14181 (E.O.), "Emergency Measures to Provide Water Resources in California and Improve Disaster

E. JOAQUIN ESQUIVEL, CHAIR | ERIC OPPENHEIMER, EXECUTIVE DIRECTOR

Response in Certain Areas.” Section 2 of the E.O. directs multiple federal agencies to take immediate actions to maximize water deliveries. Consistent with E.O. 14181, Reclamation sent an email on October 7, 2025, to interested parties, including the State Water Board, soliciting comments on “Action 5,” its proposed changes to CVP long-term operations to fulfill E.O. 14181. Reclamation asserts that Action requires no further environmental or biological analysis and is “within the range of impacts analyzed and disclosed in the 2024 Final Environmental Impact Statement on the Coordinated Long-Term Operations of the Central Valley Project and State Water Project (2024 LTO Final EIS) and the effects analyzed within the 2024 National Marine Fisheries Services (NMFS) and U.S. Fish and Wildlife Service (USFWS) issued biological opinions” and that “Action 5 is not expected to result in additional significant impacts to the environment nor additional effects to listed species.”¹

The State Water Board submits the following comments regarding Reclamation’s reliance on the 2024 LTO Final EIS and prior biological opinions for a proposed change in CVP LTO. Action 5 was not included in the 2024 LTO Final EIS and removes actions that were included in that analysis. With respect to the CVP LTO biological opinions, the State Water Board notes there is a pattern of the CVP exceeding take limits for listed species and either taking no action or pursuing increased take limits without sufficient analysis as to whether such continued actions are reasonably expected, directly or indirectly, to diminish a species’ numbers, reproduction, or distribution so that the likelihood of both survival and recovery is appreciably reduced.

Finally, the State Water Board previously advised Reclamation that it should not incorporate reliance upon Temporary Urgency Change Petitions (TUCPs) in its analyses as TUCPs are not legally available to Reclamation absent an emergency drought declaration by a California Governor, a subsequent discretionary action by a California Governor to issue an Executive Order that waives compliance with Porter-Cologne under the Emergency Services Act (Government Code, § 8550 et seq.), and a further discretionary approval by the State Water Board, relying upon the hypothetical Executive Order, with findings appropriate to that Executive Order. Such continued speculation appears to be a defective basis for Reclamation’s Action 5 analysis and conclusions.

¹ Draft Memorandum for Interested Party Review from David Mooney to Kristin White, p. 1.

Summary of Possible Issues Related to Federal Executive Order 14181 Action 5 Changes Regarding Long-Term Operations of the Central Valley Project and State Water Project

The following sections describe the State Water Board's current understanding of the Action 5 changes Reclamation identifies that it will implement and associated concerns with those actions. Overall, action 5 provides less protection for native aquatic species than was proposed with the 2024 LTO operations. However, it is difficult to fully assess the action 5 changes because the measures are vague and subjective; rely on models that are not developed yet; the CalSim modeling does not appear to accurately portray the actions; and it is not possible to compare the No Action with the proposed action because too many assumptions in the modeling were changed among model runs.

Healthy Rivers and Landscapes / Voluntary Agreements

Healthy Rivers and Landscapes (HRL), formerly called "Voluntary Agreements," are water user proposals for providing flows and habitat submitted to the State Water Board as an implementation pathway for updates to the Bay-Delta Plan. The HRL includes various habitat and flow commitments by water users, including flow commitments on CVP operated rivers and for CVP export reductions and bypasses of Delta outflows provided by all HRL parties on top of HRL base conditions that will interact with action 5 measures. As described in the July 2025 draft of the Bay-Delta Water Quality Control Plan, the HRL flows are intended to be additive to base flows which include Decision 1641 (D-1641) and flows resulting from implementation of the 2024 LTO (the MOU previously identified the 2019 LTO, but was updated at the request of the HRL parties to 2024). Action 5 assumes regular relaxations of D-1641 and significant changes to CVP 2024 LTO operations (described further below) that were not contemplated in the analyses performed by the State Water Board for the HRL. In addition, these changes would impact the accounting for the HRL in ways that have not been contemplated that would create significant complications. Reclamation should work with the HRL parties, and particularly the California Department of Water Resources, to ensure that Reclamation has sufficiently considered and analyzed these impacts and propose means of addressing any impacts, including relative to the operational changes identified below.

Old and Middle River (OMR) Flow Management and Exports

Action 5 proposes to reduce or remove Old and Middle River (OMR) flow limitations and would result in more negative reverse flows which can lead to greater entrainment of fish into the interior Delta and direct and indirect mortality to California fish species, including possible population level effects. In addition, action 5 OMR changes contain requirements for triggering that lack specificity, are subjective, and establish criteria that may never be met. Action 5 modifies or eliminates several thresholds used to initiate the OMR Flow Management Season, as well as other real-time OMR Management criteria designed to protect native fish populations in the Delta. Effects of these modified or eliminated OMR Management criteria on native fish populations have not been adequately evaluated. Specifically, Action 5: removes the January 1 start date for OMR management; does not include the Adult Delta Smelt Entrainment Protection Action (or

Turbidity Bridge Avoidance) as a condition to initiate the OMR Management Season; adds additional qualifiers to the Real-Time Assessment Thresholds (Exhibit 5.3.2); adds additional pre-requisite Jersey Point flow criteria to initiate OMR protections for Longfin Smelt Adult, Longfin Smelt Larvae and Juveniles, Delta Smelt Adults (Turbidity Bridge Avoidance), and Delta Smelt Larvae and Juveniles.

Action 5 increases the annual salvage loss thresholds for juvenile winter-run and spring-run Chinook salmon and steelhead that would trigger export pumping reductions. Action 5 incorporates the Juvenile Production Estimates (JPEs) for spring-run Chinook salmon and steelhead to inform the OMR management and export pumping changes. However, JPEs for spring-run Chinook salmon and steelhead populations have not been established in the Delta.

In addition, the Proposed Action (Exhibit 1) states that “Action 5 may reduce mortality by drawing fish into export facilities for salvage instead of exposure to the poor survival conditions in the south Delta.” This statement is listed for Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, and Central Valley Steelhead. This is a fundamentally flawed premise because fish mortality at the south Delta Export facilities prior to reaching the fish facility is very high (prescreen loss rates: 15% at CVP and 77% at SWP), and recent studies on the effects of spatial, environmental, and hydrologic parameters on through-Delta survival of juvenile salmonids have demonstrated that survival is correlated with net positive OMR flows.

Modeling indicates that operations under Action 5 would generally cause OMR flows to be more negative in the spring and fall months of most water year types as summarized below. However, as indicated above, this modeling may also significantly underestimate the actual effects of changes to OMR requirements.

Seasonal Differences in OMR (monthly average cfs)

Action 5 (with TUCPs with VAs) minus Preferred Alt (without TUCP with VAs)	Jan-June	July-Dec
<i>All Water Year Type Average</i>	-299 cfs	-372 cfs
Wet Years	-191 cfs	-536 cfs
Above Normal Years	-478 cfs	-566 cfs
Below Normal Years	-372 cfs	-434 cfs
Dry Years	-336 cfs	-268 cfs
Critical Years	-191 cfs	26 cfs

Modeling results show that Action 5 would increase Delta exports on average across all water year types. The seasonal results by water year type are shown below.

Seasonal Differences in Total Delta Export Volumes (total seasonal volume TAF)

Action 5 (with TUCPs with VAs) minus Preferred Alt (without TUCP with VAs)	Jan-June	July-Dec	Total
<i>All Water Year Type Average</i>	<i>114 TAF</i>	<i>146 TAF</i>	<i>260 TAF</i>
Wet Years	73 TAF	196 TAF	270 TAF
Above Normal Years	180 TAF	223 TAF	403 TAF
Below Normal Years	142 TAF	187 TAF	330 TAF
Dry Years	130 TAF	107 TAF	238 TAF
Critical Years	73 TAF	-12 TAF	61 TAF

Delta Outflows

Several aspects of Action 5 could cause impacts to Delta outflows, on both a seasonal and yearly basis. For example, Action 5 proposes to eliminate the fall X2 component of the Delta Smelt Summer and Fall Habitat Action without any alternative action (such as potential summer habitat actions if supported by science). And, as noted above, Action 5 assumes the use and approval of TUCPs on a consistent and prolonged basis. Reclamation is already on notice that assuming TUCPs will be requested and granted is inappropriate and unsupported and the State Water Board has consistently raised legal concerns with this assumption during the LTO processes for the Projects. TUCPs are intended for unforeseen, unplanned, urgent emergency circumstances and assuming a chain of discretionary actions that culminates in a state waiver of its legal authorities is not appropriate for long-term operational planning. Modeling indicates that action 5 would result in a net average reduction of 290 thousand acre-feet (TAF) of Delta outflow annually which would have significant impacts to native fish species, particularly during dry and critical years when species are already stressed by dry conditions. These changes would also likely affect the implementation of the HRL. The seasonal results by water year type are shown below. However, again, this modeling comparison may significantly underestimate the actual changes in Delta outflows.

Seasonal Differences in Delta Outflow Volumes (total seasonal volume TAF)

Action 5 (with TUCPs with VAs) minus Preferred Alt (without TUCP with VAs)	Jan-June	July-Dec	Total
<i>All Water Year Type Average</i>	<i>-62 TAF</i>	<i>-226 TAF</i>	<i>-289 TAF</i>
Wet Years	15 TAF	-504 TAF	-498 TAF
Above Normal Years	11 TAF	-546 TAF	-535 TAF
Below Normal Years	57 TAF	-23 TAF	34 TAF
Dry Years	-109 TAF	17 TAF	-91 TAF
Critical Years	-327 TAF	-23 TAF	-350 TAF

Shasta Operations

Management of Shasta Reservoir for temperature control and other fisheries purposes is critical for the protection of winter-run Chinook salmon and other California salmon runs and native species on the Sacramento River. Action 5 eliminates important elements of Shasta operations that could weaken protections for native fish species. Specifically, Action 5 eliminates Reclamation's commitment to the Winter-run Action Plan, including its science, fishery actions, infrastructure improvements, and reintroduction efforts to benefit Winter-run as well as the operational and biological goals and objectives that were in the 2024 Proposed Action (PA) for Shasta Reservoir temperature management and operations. It also removes the multi-agency Shasta Operations Team (SHOT), which included the State Water Board and fisheries agencies, in favor of a governance framework limited to Reclamation, which would retain sole discretion to determine operations each year. While the 2024 PA described governance as "structured to seek consensus across scientific, technical and policy levels", Action 5 states that its forums for input "do not make decisions nor seek consensus." So, Action 5 replaces the prior collaborative multi-agency governance structure with a less collaborative approach to real-time decision making. These changes will likely result in less protective conditions for listed, as well as non-listed species like fall-run Chinook salmon that multi-agency coordination has historically benefited from. Regardless of these changes, Reclamation will still be required to comply with State Water Board Order 90-5 Sacramento River temperature management requirements, including requirements for coordination.

Effects on Special-Status Species

Action 5 concludes that it will not result in impacts with a "population level effect" on species. However, these conclusions are not supported.

Relative to the 2024 Proposed Action, Reclamation's assessment indicates that predicted salvage losses under Action 5 would increase for the following species, depending on water year type:

- Sacramento River winter-run Chinook salmon (additional loss varies between 8-32%)
- Central Valley spring-run Chinook Salmon (additional loss varies between 1-9%)
- California Central Valley steelhead (additional loss varies between 5-9%, except in dry years)
- Central Valley fall-run Chinook salmon (additional loss up to 5%)

Under Action 5, Reclamation's assessment indicates that mean annual population growth rate for Delta smelt would be reduced in all years and up to 7.5% during wetter water years (Wet and Above Normal) relative to the 2024 Proposed Action (PA). Longfin smelt abundance was predicted to vary, ranging from 1% decrease to 11% increase relative to the 2024 PA, depending on water year type.

Reclamation's analyses indicate that green sturgeon salvage losses are predicted to be largely unchanged in wet, below normal, dry and critical water years. However, green

sturgeon losses under Action 5 in above normal years are estimated to be 20% higher compared to the 2024 PA. Green sturgeon and steelhead are federally listed only, and it is notable that take limits at Project facilities for both species have been recently exceeded. When the take limit for steelhead was exceeded in early 2024, operations were not modified. When the take limit for green sturgeon was exceeded in September 2025, Reclamation proposed an Incidental Take Statement amendment to raise the take limit. These take limit issues further reduce protection for these California species.

Governance, Coordination, and Oversight

The governance structure proposed under Action 5 minimizes meaningful multi-agency feedback and input in decision making through the elimination of technical, managerial, and Director level working groups and instead provides autonomy to Reclamation in decision making rather than collaboration to ensure that decisions are well informed and supported. These changes will likely result in less protective conditions for listed, as well as non-listed species like fall-run Chinook salmon that multi-agency coordination has historically benefited from.

In addition to the issues identified above, Reclamation is currently unilaterally making significant changes to long-standing ecological monitoring activities in the Delta. For over 60 years these efforts have been collaboratively managed between state and federal agencies with significant expertise and regulatory responsibilities. Reclamation's changes create concerns about the availability, reliability, and transparency of data used to inform management decisions, including the action 5 changes.

In summary, relying on the existing 2024 LTO EIS and biological opinions for proposed Action 5 appears legally unsupported as Action 5:

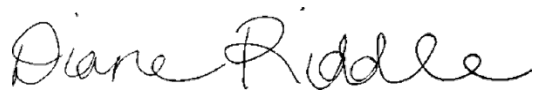
- Speculatively relies on TUCPs that are legally unavailable from the State Water Board absent extraordinary state action.
- Suggests that water supply deliveries under Action 5 are within the range analyzed in the 2024 LTO Final EIS, but water supply deliveries under Action 5 are outside the range of the four versions of Alternative 2, the Preferred Alternative, in the LTO EIS.
- Does not analyze Action 5 as it relates to potential HRL activities.
- Does not analyze or detail potential impacts of inconsistent operations between the SWP and CVP on water quality and species protection.
- Does not adequately analyze the scope or consequences of likely increased adverse impacts on listed species and whether this is reasonably expected, directly or indirectly, to diminish species' numbers, reproduction, or distribution so that the likelihood of both survival and recovery is appreciably reduced.

The concerns identified in this letter are based on staff's initial review of Action 5 and are not necessarily exhaustive.

The State Water Board staff appreciate the opportunity to provide comments on the LTO Action 5.

If you would like to discuss these comments further, please contact me at diane.riddle@waterboards.ca.gov.

Sincerely,

A handwritten signature in cursive script that reads "Diane Riddle".

Diane Riddle
Assistant Deputy Director
Division of Water Rights



Westlands Water District

Monday, November 10, 2025

Acting Regional Director Adam Nickels
Bureau of Reclamation
California Great Basin – Region 10
2800 Cottage Way
Sacramento, CA 95825

Sent Via Email (sha-MPR-BDO@usbr.gov)

**Subject: Westlands Water District Comments re Environmental Compliance Sufficiency
Memorandum for Action 5 – Central Valley Project and State Water Project Long-Term
Operations Plan**

Dear Acting Regional Director Nickels:

On behalf of Westlands Water District (“Westlands”), thank you for the opportunity to provide comments to the Bureau of Reclamation (“Reclamation”) on the Environmental Compliance Sufficiency Review for the Central Valley Project (“CVP”) and State Water Project (“SWP”) Long-Term Operations Plan (“LTO”) – Action 5. Westlands agrees with and supports Reclamation’s determination that Action 5 is environmentally compliant and within the scope of the LTO Final Environmental Impact Statement (“EIS”). Action 5 represents a legally and scientifically sound approach to minimizing adverse impacts to water users while maintaining protections for listed species, water quality, and other resources. As explained below, Action 5 also corrects significant legal deficiencies identified by Westlands and other commenters during the administrative process that culminated in the release of the 2024 LTO EIS, Record of Decision (“ROD”), and associated biological opinions.

Westlands is a California water district formed under California Water Code sections 34000 et seq. Westlands’ principal office is in Fresno, California. Westlands’ service area is in western Fresno and Kings counties and encompasses approximately 614,000 acres that include some of the most highly productive agricultural lands in the world. Growers in Westlands produce more than 60 high-quality food and fiber crops, including almonds, pistachios, tomatoes, cotton, grapes, melons, wheat, lettuce, and onions. Farms in Westlands produce an average of more than \$2 billion worth of food and fiber annually, generating more than twice that in farm-related economic activity, and contribute significantly to nine of the State of California’s top 15 exported agricultural commodities. On average, agricultural activities within Westlands generate over 38,000 jobs and approximately \$4.7 billion in economic activity. These jobs and economic output are integrally tied to water supply.

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Westlands provides water primarily for irrigation, but also provides water for some municipal and industrial uses, including for use by disadvantaged communities, and to Naval Air Station Lemoore. To provide water in its service area, Westlands has contracted with Reclamation to receive water from the CVP and is therefore “a public water agency that contracts for the delivery of water from the Central Valley Project.” Water Infrastructure Improvements for the Nation (“WIIN”) Act, Section 4004(a), P.L. 114-322, 130 Stat. 1858. Westlands has contractual entitlements to approximately 1,195,000 acre-feet of CVP water per year. The contractual rights to CVP water that are delivered to areas within Westlands are held by Westlands, as well as two distribution districts formed by Westlands.

Westlands is also a member agency of the San Luis & Delta-Mendota Water Authority (“SLDMWA”), a twenty-seven member joint powers authority. As cooperating agencies, the SLDMWA and its members, including Westlands, submitted numerous comments during the administrative process on the 2024 LTO. These included comments on the first draft of the Cooperating Agency Draft EIS on October 16, 2023, and the second draft on April 19, 2024, raising issues regarding the improper application of California Endangered Species Act (“CESA”) requirements to the CVP, inadequacies in the alternatives analysis, and the effect of the Sustainable Groundwater Management Act (“SGMA”) on the proposed project, among other issues. SLDMWA and Westlands also submitted comments on the draft biological opinions and on the public draft EIS. Throughout this process, including in Westlands’ September 9, 2024 comments on the draft EIS, Westlands identified significant flaws in the Proposed Action (Alternative 2), ultimately selected in the 2024 ROD, including those related to groundwater impacts, the Fall X2 measure, violations of Section 4004(a) of the WIIN Act and circumvention of Congressional direction, and significant impacts on water supply that could be mitigated or lessened without causing significant additional adverse impacts to fish and wildlife species or water quality.

Action 5 is superior to the Proposed Action selected in the 2024 ROD because it results in fewer adverse water supply and economic impacts in comparison to the Proposed Action and lessens impacts on groundwater resources, while still avoiding jeopardy to listed species or adverse modification of critical habitat. Action 5 therefore corrects significant deficiencies in the Proposed Action, including those related to compliance with the WIIN Act and Congressional directives.

Action 5’s removal of the Fall X2 action is also particularly sound and justified. This is in line with an evaluation of a peer-reviewed, published study, and the U.S. Fish and Wildlife Service (“FWS”) biological opinion that demonstrate that Fall X2 provides little to no measurable benefit to Delta smelt. Its elimination avoids unnecessary water supply losses to the CVP and SWP, which amounted to up to approximately 350,000 acre-feet in 2024 alone. This avoids significant socioeconomic costs and redirected environmental impacts (e.g., on groundwater resources) that would otherwise be incurred without scientific justification.

Importantly, Action 5 also provides improvements to the daily administrative processes for maximizing water supply while avoiding important, population level impacts to endangered aquatic species. The processes for applying science and judgement have historically been cumbersome and demonstrably prevented utilization of best commercially available science for improving water deliveries in instances of unavoidably time sensitive decision-making. Action 5 moving forward provides mechanisms to further refine the management and operation of the CVP and SWP in a manner that can make best use of information and science, when available.

Additionally, Action 5 omits the early implementation of the Delta export reduction of the Healthy Rivers and Landscapes (“HRL”) program, (formerly, the “Voluntary Agreements”), which has not yet been adopted by the State Water Resources Control Board and is therefore not ripe for implementation.

Finally, Action 5 is vastly superior to the Proposed Action because it will lessen impacts on groundwater resources. Westlands, in its capacity as Groundwater Sustainability Agency (“GSA”) for the Westside Subbasin, is tasked with implementing its Department of Water Resources-approved Groundwater Sustainability Plan (“GSP”). Since the 2024 LTO Final EIS, Westlands and other GSAs responsible for managing groundwater under the California Sustainable Groundwater Management Act (“SGMA”) have been engaged in the required 5-year updates to their GSPs. During that process, public comments have been received from the California State Water Contractors alleging that GSPs need to make greater strides to prevent land subsidence and its impacts on critical water conveyance infrastructure.

With respect to impacts to groundwater resources, including associated impacts such as subsidence, the adoption of the Proposed Action – as opposed to a proposal like Action 5 – was an egregious error because it would exacerbate groundwater overdraft by increasing (not reducing) pressure on groundwater resources to backfill the shortages in surface water availability. As Westlands previously commented, it is not clear what reasonably, feasible legal mechanism there is for GSAs in the Central Valley to curtail groundwater production on the massive scale that would be required to ameliorate the threats of subsidence after Reclamation curtails deliveries from the CVP as provided in the Proposed Action. Action 5 is vastly superior in this regard because it will reduce impacts to groundwater resources, allow GSPs to achieve sustainability, and assist in halting subsidence impacts to the benefit of all Californians.

For these reasons, Westlands agrees that Action 5 is the best near-term path forward to operating the CVP and SWP in a scientifically supported, adaptive manner that will improve water supply conditions in response to Executive Order 14181- *Emergency Measures to Provide Water Resources in California and Improve Disaster Response in Certain Areas*, dated January 24, 2025 (E.O. 14181).

Over the longer term, however, we believe that there is more that can be done to improve CVP operations consistent with applicable law and directives. For one, Westlands suggests that Reclamation evaluate whether there are other actions that it “voluntarily” undertook to “harmonize” or “reconcile” CVP operations with constraints placed on operations of the SWP

under CESA that can be eliminated or modified to implement E.O. 14181. As noted in earlier comments submitted to Reclamation and on the administrative draft biological opinions, Reclamation is only obligated to consult with FWS regarding the effects of CVP operations on listed species under Section 7 of the federal Endangered Species Act (ESA). In contrast, the CVP is not subject to the requirements of the California Endangered Species Act or the determinations of the California Department of Fish and Wildlife. Despite the inapplicability of CESA to operations of the CVP, the Proposed Action that served as the basis for the incidental take statement that Reclamation now proposes to change includes actions, like trigger dates for management of OMR, designed to “voluntarily” operate the CVP to “harmonize” or “reconcile” its operations with requirements imposed on operations of the State Water Project under CESA. To ensure full compliance with E.O. 14181, Reclamation should examine each conservation action included in the Proposed Action on which it consulted with the FWS and eliminate or modify those actions which are not required to comply with Reclamation’s obligations under Section 7.

Westlands appreciates this opportunity to comment and looks forward to working closely with Reclamation to continue improving operations of the CVP.

Sincerely,

A handwritten signature in blue ink that reads "Allison Febbo". The signature is fluid and cursive, with the first name "Allison" and the last name "Febbo" clearly distinguishable.

Allison Febbo
General Manager
Westlands Water District
afebbo@wwd.ca.gov

Attachment 7 Comment Responses

Table 1. California Department of Fish and Wildlife

Number	Comment	Response
1	The California Department of Fish and Wildlife (CDFW), along with the California Department of Water Resources (DWR), U.S. Fish and Wildlife Service (USFWS), and National Marine Fisheries Service (NMFS), collaborated closely with the U.S. Bureau of Reclamation (Reclamation) over a four-year period in the development of the 2024 Proposed Action (PA) for the Long-term Operations of the Central Valley Project (CVP) and State Water Project (SWP) and the subsequent Biological Opinions (BiOp) issued by NMFS and USFWS. CDFW has reviewed the Action 5 Operation Plan (Action 5) for the CVP and SWP and associated Environmental Compliance Sufficiency Review and appreciates the opportunity to provide comments.	Comment noted.

Number	Comment	Response
2	Overall, Action 5 provides less protection for species than the 2019 and 2024 BiOps for the Long-term Operations of the CVP and SWP, issued by the USFWS and NMFS.	No scientific evidence has been provided to substantiate the assertions in these comments. Action 5 includes a specific definitive measure to minimize effects to listed species by operating to OMR no more negative than -5,000 cfs. Action 5 includes additional protections when warranted by publicly available monitoring and modeling tools with thresholds established in literature or previous ESA consultations. Certainty is established by describing the specific analytic criteria tools to be applied in real-time rather than requiring an action regardless of environmental benefit. Action 5 favors proactive measures and seasonal thresholds with certainty provided through the use of analytical tools. Action 5 may result in listed species more frequently reaching seasonal and weekly salvage thresholds. Real-time assessments and the use of science-based tools will inform export restrictions to avoid population level impacts and remain within the estimated incidental take from the 2024 Biological Opinions. Action 5 maintains protections minimizing routing fish into the south Delta and may reduce mortality of listed species by drawing fish already in the south Delta more frequently into export facilities for salvage instead of continued exposure to the poor survival conditions in the south Delta.

Number	Comment	Response
2 (continued)	Overall, Action 5 provides less protection for species than the 2019 and 2024 BiOps for the Long-term Operations of the CVP and SWP, issued by the USFWS and NMFS.	According to tagging studies: 1) Juvenile winter-run and spring-run rarely approach the South Delta with OMRI no more negative than -5,000; 2) Acoustic tagging studies show that for juvenile salmon reaching the South Delta, survival is extremely low and does not improve with reduced exports; entrained fish often survive to exit the Delta, while un-entrained fish rarely do; and 2) Statistical analyses demonstrate factors influencing survival vary by region of the Delta; river inflows are positively associated with survival in riverine and tidal-transitions zones; OMR flows are less predictive of survival than river inflows in these zones. In the tidal Delta, OMR management flows have not been associated with improved survival of juvenile salmon. See STWG (2024). Tools to be used to assess whether export reductions are needed include: Longfin and Delta Smelt monitoring data and Distribution-Based Particle Tracking (PTM); Salmonid Salvage Loss Trajectory in conjunction with hatchery releases, historical traces and Tillotson modeling; Salmonid Through-Delta Survival will be accomplished with acoustic tagging, STARS and/or ECO-PTM, Zone of Influence (ZOI), Hydraulic Footprint.
3	Many of the protective measures in Action 5 are vague and some are not implementable because they rely on models or metrics that do not exist or are not based in best available science.	Protective measures provide specific numerical criteria. Models and metrics are published and publicly available in literature. Action 5 relies on multiple lines of evidence weighted consistent with the methodology described in NMFS 2024 Biological Opinion. The comment does not include alternative evidence for Reclamation to consider.
4	Measures related to Old and Middle River (OMR) management contain requirements for triggering that are subjective and potentially set a bar for implementation that is arbitrary and less protective than requirements established in the 2024 PA. Taken together, this renders many of the actions not reasonably certain to occur.	Requirements for triggering are described in terms of modeling and analysis. Decisions take place in open and transparent forums. The use of analytical tools and models make decisions more likely to occur when warranted. Certainty is additionally provided through Interested Party engagement to hold agencies accountable.
5	In addition, CDFW is concerned that the analysis and assumptions reflected in the Environmental Compliance Sufficiency Review and its supporting documents in many cases do not support the conclusions regarding the impacts to species from Action 5. Below we offer more specific comments on aspects of Action 5.	Reclamation believes the analyses support the conclusions made in the Environmental Compliance Sufficiency Review. Reclamation provided responses to each assertion below.

Number	Comment	Response
6	Real-Time Assessment Thresholds – Winter-Run Chinook Salmon Juveniles: Action 5 includes annual loss thresholds that are substantially greater than the thresholds used in the 2024 PA and analyzed in the BiOps. Specifically, thresholds have doubled for natural-origin Sacramento River Winter-run Chinook Salmon (Winter-run) and increased 8-fold for hatchery-origin Winter-run.	Table 184 of the NMFS 2024 Biological Opinion identifies the incidental take anticipated from the 2024 Proposed Action. The assertion in the comment is not substantiated. Reclamation notes the incorporation of some length at date identification during real-time operations. NMFS 2024 Biological Opinion uses quality control genetic data. Real-time assessments historically incorporate uncertainty and conservative projections.
7	Action 5 also removes early season protections in November and December and weekly distributed loss thresholds from January through June for Winter-run.	No scientific evidence was provided by CDFW on the effectiveness of these restrictions and how they would contribute to the population. Action 5 additionally restricts exports when those restrictions are effective in contributing to the populations of listed species. The updated thresholds better align with empirical relationships between loss, population abundance, and survival, ensuring that triggers correspond to biologically meaningful levels of risk rather than absolute counts.
8	Additionally, the 2024 PA included protective measures intended to minimize loss when 50% and 75% of the annual loss threshold is exceeded that were not included in Action 5. CDFW's Effects Analysis, State Water Project Effects on Winter-run and Spring-run Chinook Salmon (Salmon Effects Analysis), prepared for the 2024 SWP Incidental Take Permit (ITP), determined the annual loss threshold used in the 2024 PA, in combination with weekly loss thresholds, would reduce entrainment and protect Winter-run juveniles during periods of peak loss, particularly in years with low juvenile production and high salvage.	No scientific evidence was provided by CDFW on the effectiveness of these restrictions and how they would contribute to the population. Action 5 evaluates through-Delta survival rather than loss at export facilities to determine whether restrictions contribute to populations of listed species.
9	Action 5 would eliminate the 50%, 75% and weekly loss protections in the 2024 PA, increasing impacts to Winter-run if they are present in the Delta.	No scientific evidence was provided by CDFW on the effectiveness of these restrictions and how they would contribute to the population. Action 5 evaluates through-Delta survival rather than loss at export facilities to determine whether restrictions contribute to populations of listed species.

Number	Comment	Response
10	Real-Time Assessment Thresholds – Spring-run Chinook Salmon Juveniles: Action 5 states: “If an assessment indicates annual salvage loss is on a trajectory to exceed 1% of the JPE entering the Delta and a reduction in export pumping would materially increase through-Delta survival, Reclamation and DWR will reduce CVP and SWP exports to maintain an average OMR no more negative than -3,500 cfs for 7 days and prepare a subsequent assessment.” The loss threshold in Action 5 for Central Valley Spring-run Chinook Salmon (Spring-run) is 4 times greater than the hatchery surrogate loss threshold used in the 2024 PA and analyzed in the BiOps.	Comparing the hatchery surrogate and a hatchery surrogate JPE is not accurate and these are not equivalent. The hatchery surrogate does not incorporate river survival, while the spring run JPE using hatchery releases and historic survival estimates does (Exhibit 5). In this exhibit, using historic data from 2009-2024, total loss ranged from 0.03%-1.07% of the spring run JPE with the 1.0% threshold being exceeded once. As described in the Proposed Action, Appendix I: Old and Middle River (Reclamation 2024) between 2009-2020, there were 62 spring-run and fall-run CWT release groups from Feather River Hatchery and 2 were observed to have salvage of between 0.01-0.03%, suggesting hatchery surrogates is less likely to be an informative indicator of increased loss than the hatchery surrogate JPE method. The NMFS 2024 Biological Opinion estimates incidental take of up to 0.5% of hatchery surrogates. No scientific evidence was provided by CDFW that would indicate an increased influence on spring-run Chinook salmon beyond the scientific literature.
11	Additionally, a JPE for Spring-run does not currently exist and it is unclear how this measure would be implemented. Unlike the 2024 PA, Action 5 does not require the development of a Spring-run JPE or life cycle model that could support implementation of the measure at some point in the future.	Action 5 does not rely upon a specific wild spring-run JPE yet to be determined. The text of Action 5 describes the use of hatchery production releases as surrogates. Hatchery surrogates have been used since the 2009 Biological Opinion. If, in the future, the State is able to develop a reasonable spring-run wild JPE, the Proposed Action may be adjusted through adaptive management subject to NEPA requirements and reinitiation of consultation under 50 CFR 402.16. Additional clarification was added to Exhibit 5 of the Environmental Compliance Sufficiency Memorandum, Entrainment Management.

Number	Comment	Response
12	Furthermore, it is not clear how a "material increase in through-Delta survival" would be defined, creating substantial uncertainty in understanding how this measure would be implemented in real time.	Reclamation would perform an assessment at different OMR rates. If an assessment indicates annual salvage loss is on a trajectory to exceed 1% of the Juvenile Production Estimate (JPE) entering the Delta and a reduction in export pumping would materially increase through-Delta survival, Reclamation and DWR will reduce CVP and SWP exports to maintain an average OMRI no more negative than -3,500 cfs for at least seven days and prepare a subsequent assessment. "Material increase in through-Delta survival" addresses the tendency of agency representatives to inadequately consider best available science provided by survival models. In real-time groups, agency representatives often assert a need for export restrictions even where model results show little or no survival improvement with OMR changes. Under Action 5, CDFW may participate in real-time technical teams and assist in the development of lines of evidence (including but not limited to entrainment loss) to assess how different operational scenarios will perform with respect to survival outcomes for listed species.
13	The Spring-run measure in Action 5 also states that "The annual salvage loss as a proportion of the spring-run Chinook salmon JPE shall be tracked by surrogates." Action 5 points to Late-fall Chinook production releases as surrogates for yearling life stages and Feather River Hatchery Spring-run production releases as surrogates for young-of-year life stages. However, no information is provided to explain how hatchery production would be used to develop a total estimate of Spring-run juvenile production (Spring-run JPE), including natural origin fish. To our knowledge, this has not been done and there is currently no published, peer-reviewed scientific literature to support this approach.	Action 5 describes the use of hatchery surrogates to support development of the spring-run JPE. Hatchery surrogates have been used since the 2009 NMFS Biological Opinion. Surrogates assume the proportional fate of hatchery releases sufficiently represents the fate of wild fish. The behaviors of wild and hatchery fish are different and variously documented. Given the scientific literature on the limited effect of exports on route selection and survival of listed salmonids for OMR no more negative than -5,000 cfs, and the range of operations under Action 5 no more negative than -5,000 cfs, the surrogate is a reasonable approximation for use in determining a need to make additional restrictions. Additional clarification was added to Exhibit 5 of the Environmental Compliance Sufficiency Memorandum, Entrainment Management.

Number	Comment	Response
14	Start of Entrainment Management and First Flush Conditions: The benefits of minimizing impacts to Winter-run juveniles and Spring-run yearlings during a "First Flush" event have long been recognized. A First Flush Action (COA 8.3.1 in the 2024 SWP ITP), was originally developed as a part of the 2008 USFWS Reasonable and Prudent Alternative (RPA) with a focus on Delta Smelt, but was subsequently included in the NMFS 2009 BiOp as part of its RPA to reduce the level of mortality for NMFS-trust resources.	The description of First Flush conditions in Operation Plan - Action 5 (section 5.3.1, <i>Start of Entrainment Management</i>) specifically includes the criteria "avoid exceeding incidental take of listed species." Winter-run Chinook salmon are a listed species.
15	The 2020 ITP for long-term operations of the State Water Project and the 2019 NMFS BiOp on long-term operations of the SWP and CVP also included the First Flush Action under the name "Integrated Early Winter Pulse Protection." The new name was chosen to acknowledge the multi-species benefits associated with protecting the first large flow pulse event moving out of the Delta for both smelts and salmonids.	The description of First Flush conditions in Operation Plan - Action 5 (section 5.3.1, <i>Start of Entrainment Management</i>) specifically includes the criteria "avoid exceeding incidental take of listed species." Winter-run Chinook salmon are a listed species.
16	Specifically, the high flows triggering the First Flush Action encourage juvenile Winter-run to migrate downstream (del Rosario et al. 2013) where they often rear in non-natal habitats such as the Delta (Phillis et al., 2018). Salmon Delta entry timing is strongly associated with the first high flows of the migration season (del Rosario et al. 2013). DCC Gate operations and OMR management during a "First Flush" event discourage routing of salmon into the central and south Delta (Brandes and McClain 2001; Burau et al. 2007; Vogel 2008; Henderson et al. 2019), where they would be at higher risk of mortality and entrainment.	The description of First Flush conditions in Operation Plan - Action 5 (section 5.3.1, <i>Start of Entrainment Management</i>) specifically includes the criteria "avoid exceeding incidental take of listed species." Winter-run Chinook salmon and spring-run Chinook salmon are a listed species. After 15 years of intensive acoustic tagging studies, no analyses have found support for OMRI (at no more negative than -5,000) influencing routing into the Central or South Delta. These intensive acoustic tagging studies have also not shown that OMRI (at no more negative than -5,000) influences survival of fish that do enter the Central or South Delta.

Number	Comment	Response
17	Despite the established and understood benefit to salmonid survival of a First Flush Action, however, Action 5 includes an offramp to this measure if Reclamation prepares an assessment that determines abiotic factors indicate First Flush is not warranted to avoid exceeding the incidental take of Delta Smelt. That assessment does not consider the effects of a First Flush action on Winter-run and Spring-run, and is inconsistent with Reclamation’s Biological Assessment (2024), which states that the “First Flush and Start of OMR Management” conservation measure would minimize or compensate for effects of the operation of the CVP and SWP on entrainment of Winter-run.	The description of First Flush conditions in Operation Plan - Action 5 (section 5.3.1, Start of Entrainment Management) specifically includes the criteria "avoid exceeding incidental take of listed species." Winter-run Chinook salmon are a listed species. The modified Start of Entrainment Management Action in Action 5 related to First Flush Conditions is consistent with the Biological Assessment of 2024. Any benefit from Start of Entrainment Management from exceeding First Flush Condition criteria by reducing the risk of entrainment are still expected to translate to winter-run and spring-run Chinook salmon. Any assessment prepared related to First Flush Action will assess if the action is not warranted to avoid exceeding incidental take of listed species.
18	Off-ramping or altering implementation of the First Flush Action is expected to result in increased entrainment of juvenile salmon into the central and south Delta, where mortality rates and the risk of entrainment into export facilities are substantially greater.	The description of First Flush conditions in Operation Plan - Action 5 (section 5.3.1, Start of Entrainment Management) specifically includes the criteria "avoid exceeding incidental take of listed species." Winter-run Chinook salmon are a listed species. During January and February, when a First Flush Action is likely, Action 5 modeling demonstrated no change or similar average monthly salvage of winter-run Chinook salmon and steelhead compared to modeled salvage in the 2024 Biological Assessment (see Exhibit 4 LOE Attachment I1 Negative Binomial Model). Salvage density results showed slightly increased winter-run Chinook and steelhead loss during January and February under Action 5 compared to the 2024 Biological Assessment (see Exhibit 4 LOE Attachment I2 Salvage Density Model). These results do not exceed effects considered in the 2024 Biological Opinion. These results support Action 5’s continued use of population level based thresholds to manage entrainment risk and loss. After 15 years of intensive acoustic tagging studies, no analyses has found support for OMRI (at no more negative than -5,000) influencing routing into the Central or South Delta. These intensive acoustic tagging studies have also not shown that OMRI (at no more negative than -5,000) influences survival of fish that do enter the Central or South Delta.

Number	Comment	Response
19	Exhibit 4 – Endangered Species Act Section 7(a)(2) Compliance: Analyses of historic salmon salvage data (2010-2022) show that implementation of thresholds included in Action 5 would have resulted in an OMR action to protect Winter-run for only three weeks in a single year. In contrast, implementation of thresholds in the 2024 PA would have resulted in 1–5 weeks of protections in 8 years (Exhibit F Attachment F.1-2). This represents a decrease in Winter-run OMR protective actions of 88%, indicating that Action 5 is substantially less responsive to salmon entrainment events.	Action 5 includes Old and Middle River Reverse flows no more negative than -5,000 cfs in every year. The scientific literature shows that within these ranges, exports do not change through-Delta survival. Salmon entrainment events have not occurred since the OMR management began.
20	The Salvage Density Model Loss Simulation estimates that these and other changes to OMR management will result in an 8–32% increase in Winter-run salvage at the fish collection facilities under Action 5 compared to the 2024 PA (Alternative 2 without TUCP Delta VA) (Exhibit 4 Attachment I-2).	The lines of evidence supporting Action 5 show similar route selection and survival for winter-run Chinook salmon. The number of winter-run entering the south Delta is likely to remain the same. Entrainment of winter-run Chinook salmon already present in the South Delta is expected to increase under Action 5. Therefore, for winter-run Chinook salmon that do reach the South Delta, Action 5 may reduce mortality by more rapidly drawing fish into export facilities for salvage instead of leaving them exposed to severely altered hydrodynamics and poor survival conditions in the south Delta. Once juvenile salmon are near the export facility intakes, acoustic tagging studies have shown that entrainment and salvage provide for the highest survival outcomes. As provided in Exhibit 4 of the Sufficiency Review Memo, Action 5 is expected to either increase or be similar to Alternative 2 of the 2024 LTO Final EIS in terms of survival. Additional clarification has been added to this exhibit.
21	The Winter-run Chinook Salmon Coded Wire Tag Salvage Model predicts similar increases in hatchery-origin Winter-run salvage for Action 5. The Environmental Compliance Sufficiency Review memo claims that the increase in salvage from 0.28–0.34% (Alternative 2 without TUCP without VA) to 0.37% (Action 5) of Winter-run is minimal; this is misleading, however, as Action 5 represents a 32% increase in salvage over the 2024 PA (Alternative 2 without TUCP without VA) and increases the risk of exceeding the annual loss threshold of 0.12% of the JPE for hatchery-origin Winter-run in the 2024 PA.	CDFW does not provide evidence to substantiate the significance of this statement. The use of relative percentages is misleading. If a single winter-run Chinook salmon is salvaged out of a population of 100,000 and a model estimates that two winter-run Chinook salmon may be salvaged under an alternative model, then that is a 50% increase for 0.002% of the population.

Number	Comment	Response
22	Moreover, the largest increase in the estimated proportion of salvage would occur in above normal water years. These years are important for the population because favorable conditions are generally associated with higher survival and stronger year classes (Brandes and McClain 2001).	CDFW does not provide information to substantiate the significance of this statement. There are no years that are unimportant to the species, water supply, or power generation. Action 5 modeling showed higher survival in above normal years. Reclamation believes there is an increase in the estimated salvage in above normal years due to higher survival, not due to higher population effects. Life cycle modeling of winter-run Chinook salmon had similar population growth rates during above normal years compared to the action presented in the 2024 LTO Biological Assessment.
23	Additionally, out-migration survival of salmonid smolts in the riverine waterway of the Sacramento and San Joaquin rivers increases with increasing flow (Sacramento, Henderson et al. 2019, Notch et al. 2020, Michel et al. 2021; San Joaquin, Buchanan et al. 2018, Buchanan et al. 2021).	Action 5 does not modify Delta inflows.
24	A large increase in salvage during these important years might have disproportionate impacts on the population, though a thorough analysis of this impact would require a life cycle model. It is important to note that the simple model used to estimate juvenile salvage is based on changes in Sacramento River flows and exports alone and ignores additional likely changes in routing or rearing behavior due to changes in other hydrologic conditions not included in the model.	No scientific evidence was provided by CDFW to substantiate this assertion. The Action 5 evaluation considered through-Delta survival. No life cycle model is required and none was provided by CDFW. Fifteen years of intensive acoustic tagging studies (reported in numerous papers and integrated into hydro-biological models) do not support the assertion that juvenile salmon "routing or rearing behavior" is widely or meaningfully influenced by export-induced hydrodynamic changes.
25	CDFW is concerned that project modifications in Action 5 may result in effects to listed species or critical habitat that exceed those considered in Table 184 of the 2024 NMFS BiOp.	CDFW does not provide scientific evidence to substantiate this assertion. Action 5 includes a thorough evaluation.

Number	Comment	Response
26	In addition to the significant change in the numerical thresholds, Action 5 does not require salmon protections to automatically onramp when a threshold is exceeded, but rather calls for an action to be taken only when an assessment indicates annual salvage loss is on a trajectory to exceed the threshold and a reduction in export pumping would materially increase through-Delta survival. This is a cause for concern because, absent a definition of “materially increase,” the implementation of salmon protective measures is subjective, which potentially sets a bar that would prevent these protections from ever being implemented.	The assertion of a significant change is incorrect; however, CDFW does not define significance thresholds. The description of materially increase was provided above, as was CDFW's ability to participate in the real time groups.
27	Longfin Smelt and Delta Smelt Protections Start of Entrainment Management – First Flush Conditions: First Flush is a well-established protective measure for adult Delta Smelt that was refined during implementation of the 2008 USFWS BiOp on the coordinated operations of the CVP and SWP in California. It was included in both the 2019 and 2024 PAs. The 2024 PA does not include the ability to modify or off ramp First Flush implementation through governance and real-time decision-making. However, Action 5 includes an offramp to this measure if Reclamation prepares an assessment that determines abiotic factors indicate First Flush is not warranted to avoid exceeding the incidental take of Delta Smelt. Given that the 2024 USFWS BiOp defines the incidental take limit by the abiotic proxies that trigger the First Flush action, it is unclear how an assessment utilizing these same abiotic proxies could credibly make the determination that Delta Smelt incidental take limits will not be exceeded.	Reclamation as the Action Agency consults with USFWS on whether that action is likely to jeopardize the continued existence of listed species or adversely modify their critical habitats. The USFWS evaluates that action based on best available commercial and scientific information and provides a Biological Opinion that estimates the incidental take statement of those species. An ecological surrogate can be used when the specific take of individuals cannot be quantified. USFWS can provide clarifications without reinitiating consultation. USFWS provided an amendment to the incidental take statement on November 14, 2025 which includes updated environmental surrogates consistent with Operation Plan - Action 5 and is attached to the Record of Decision.
28	Real-Time Assessment Thresholds – Longfin Smelt Adults: Action 5 includes a new flow criterion to trigger adult Longfin Smelt protections, which requires flow at Jersey Point (JPF) be less than 0 cubic feet per second (cfs), rather than a metric based on salvage. It is unclear how the new flow criterion provides adequate protection because there is no scientific evidence or modeling support for this or any flow threshold at this location that is protective for adult Longfin Smelt. Action 5 evaluated entrainment risk for adult Longfin Smelt using PTM, a model that is only appropriate to analyze effects to larval and juvenile life stages of smelt.	The work by Kimmerer (2022) shows a limited influence of exports on longfin smelt; therefore, seeking a restriction on exports beyond the hydrodynamic range evaluated is not warranted. However, Reclamation included a measure. The significance of flows at Jersey Point is well documented in the literature, including citations within the State's ITP. While PTM is more applicable to larval and juvenile smelts due to weak swimming ability, adult smelts similarly experience the hydrodynamic effects of exports. PTM provides a representation of those hydrodynamic effects. CDFW does not provide alternative scientific lines of evidence.

Number	Comment	Response
29	Real-Time Assessment Thresholds – Longfin Smelt and Delta Smelt Larvae and Juveniles: Action 5 decreases protections for larval and juvenile smelt. The larval and juvenile protection triggers for both Longfin Smelt and Delta Smelt require that JPF is less than 0 cfs before a protective action would be considered. As discussed in the State Water Project Effects on Longfin Smelt and Delta Smelt (Smelt Effects Analysis), prepared for the 2024 ITP for the Long-term Operations of the SWP, modeling conducted by CDFW and DWR showed that QWEST of 1,500 cfs is the lower range of flows that could be protective for larval fish, assuming that OMR flows do not become more negative than -5,000 cfs. The definition of JPF in Action 5 is similar to QWEST, and there is no evidence that a flow of 0 cfs at this tidally affected area would prevent larval fish from being entrained into the south Delta by project operations.	Positive daily JPF values indicate flows will tend to move larvae downstream and away from the influence of the export facility in the San Joaquin River. The asserted need for additional OMR limitations when QWEST is positive (different surrogate for flow at Jersey Point) appears to be a matter of opinion. No information was submitted to evaluate other than a reference to the ITP. Reclamation reviewed analysis provided within the ITP. The State appears to recognize that OMR no more negative than -5,000 cfs is protective citing Kimmerer and Nobriga (2008). Action 5 OMR limitations will maintain OMR more positive than -5,000, and storm flex requires JPF to be greater than +1,500 cfs. The State did not appear to model negative Jersey Point flows within the ITP. The ITP on page 266 (pdf pg) does reference that, "Positive daily averaged QWEST values indicate that flows will tend to move larvae downstream and away from the influence of the south Delta export facilities. Negative daily averaged QWEST values indicate that flows are being pulled through the San Joaquin River towards the south Delta and the export facilities."
30	CDFW is also concerned that a JPF of 0 cfs represents conditions with a high risk of larval and juvenile entrainment in which essentially all flow from the San Joaquin, Cosumnes, Calaveras, and Mokelumne rivers, as well as flow from the Sacramento River through the Delta Cross Channel Gates and Georgianna Slough, is being diverted or exported before reaching the confluence with the Sacramento River. With little to no flow from the San Joaquin River or eastside tributaries, which can be represented by a JPF of 0 cfs, larval smelt are likely to be entrained in the south Delta, with the rate of entrainment in the export facilities being dependent on the rate of exports.	CDFW provides no scientific evidence to substantiate this concern. The Action 5 analysis includes literature, datasets, and modeling to support its conclusions.

Number	Comment	Response
31	Real-Time Assessment Thresholds – Longfin Smelt Larvae and Juveniles: The larval and juvenile Longfin Smelt protection measure in Action 5 requires that “a population model demonstrates the need to reduce entrainment to avoid population decline” before a protective action would be taken. It is our understanding that a Longfin Smelt population model does not currently exist. As a result, it is unclear how this protective measure could be implemented.	Recent publications (Kimmerer and Gross 2022, Gross et al. 2022) investigated the population dynamics of Longfin Smelt in the San Francisco Estuary to understand the species' relationship with Delta flow and diversions. Both papers conclude that direct losses of larvae to freshwater diversions are minimal—averaging 1.5% annually in one study and estimated at ~2% in a dry year and near-zero in a wet year in the other—and are therefore too low to explain the population's decline or its link to flow. Action 5 maintains the hydrologic and hydrodynamic regimes observed during these modeled estimates. Reclamation is aware of the State efforts to develop a new longfin smelt lifecycle model and will review once available. In the interim, the lifecycle calculations described by Kimmerer and Gross 2022, Gross et al. 2022 are the best available lifecycle model.
32	If a Longfin Smelt population model were developed, peer-reviewed, and used in real-time decision making as Action 5 requires, the expectation that any 7-day action would individually result in a change to the population trajectory is misguided (see “Population-Level Effects” comment below).	Reclamation refers CDFW to the Kimmerer (2024) model. Please also refer to previous response.
33	The 2024 USFWS BiOp effects analysis considers take to be minimized by the “broad application of OMR management,” which work together over the season to protect Longfin Smelt. (2024 USFWS BiOp, p. 253.) Modeling results and conclusions regarding species impacts for Action 5 rely on implementing a suite of OMR management actions each year, as all actions for all species were layered together before being modeled (Exhibit 2 Attachment F.1-2). This framework assumes that all actions are implemented and together affect the habitat and species in the Delta.	CDFW does not provide scientific evidence invalidating this assumption.

Number	Comment	Response
34	Real-Time Assessment Thresholds – Delta Smelt Larvae and Juveniles: The Action 5 Larval and Juvenile Delta Smelt Protection trigger includes new turbidity and modeling criteria that are inconsistent with best available science. The south Delta turbidity criterion requires turbidity greater than or equal to 12 FNU (as measured by continuous sensors in the Delta) to initiate a protective action and is inconsistent with the USFWS Delta Smelt Life Cycle Model, which was used to develop the larval and juvenile Delta Smelt protective measure in the 2024 PA. The Delta Smelt Life Cycle Model uses turbidity as measured by Secchi disc surveys to characterize entrainment risk of larval Delta Smelt. Action 5 does not contain adequate supporting information to explain the relationship between these two different turbidity metrics (FNU and Secchi depth) that would facilitate an analysis of impacts using the Delta Smelt Life Cycle Model.	While CDFW correctly cites the parameter for visibility incorporated into the Delta Smelt LCM, Secchi disc surveys are difficult to collect in real time. Turbidity provides a continuous record as a reasonable analog correlated with Secchi depth. CDFW does not provide scientific evidence to the contrary. In support of developing Action 5, Reclamation analyzed continuous sensor turbidity monitoring station data and secchi data (see Exhibit 5 of the Environmental Compliance Sufficiency Memo, <i>Entrainment Management</i>). Higher turbidity values (FNU) at stations are generally observed when secchi depth <100cm, suggesting 12 FNU will be a precautionary value (e.g. secchi depths may be >100cm in some cases) using turbidity station data.
35	The modeling criterion requires that “PTM modeling indicates that the action would avoid $\geq 5\%$ entrainment of the Delta smelt population at facilities after 30 days” before a protective action would be implemented. It is unclear whether Action 5 refers to an absolute value or a percent difference in entrainment greater than or equal to 5%. This detail is needed to implement the measure during real-time operations. Additionally, the criterion focuses on impacts of entrainment into the export facilities, which is not consistent with the 2024 USFWS BiOp’s definition of entrainment: “the movement of a fraction of the population into the south Delta, where they have little chance of successfully contributing to a subsequent generation.” (2024 USFWS BiOp, p. 88.) Thus, the Action 5 approach appears to ignore the risks and associated impacts of entrainment into the south Delta.	Action 5 uses multiple lines of evidence to look at the entrainment into the central and south Delta, as well as into the export facilities. A review of the lines of evidence provided in the Action 5 analysis shows that Reclamation did analyze entrainment into the south Delta.

Number	Comment	Response
36	Delta Smelt Summer and Fall Habitat: Action 5 removes Fall X2, a protective measure for Delta Smelt. Scientific research has demonstrated that changes in abiotic conditions encountered by rearing Delta Smelt in the fall have significant overall effects on population size (Bever et al. 2016; Feyrer et al. 2011, IEP-MAST 2015). More recently, a life cycle model by Polansky et al. (2024) found a stronger relationship between summer outflows and Delta Smelt survivorship when compared to the fall. However, outflow in both the summer and the fall were shown to benefit Delta Smelt, even if the relationship is stronger in the summer, by expanding the spatial extent of habitat and augmenting food resources.	The 2024 USFWS Biological Opinion determined that: <i>"The Fall X2 action is not anticipated to have observable effects on Delta smelt survival"</i> and that <i>"since there may be circumstances when measurable benefits could be achieved with outflow augmentations; adaptive experimentation regarding flow pulses in the summer or fall could be helpful."</i> (USFWS 2024, page 135). Reclamation refers CDFW to its ITP issued Fall of 2025 where the State did not include the Fall X2 action. CDFW provides no evidence that summer and fall outflow are an obligation of the CVP and SWP. There is no specific operation proposal to evaluate.
37	No summer outflow, fall outflow, or food enhancement actions have been included in Action 5 that would expand habitat availability and augment food resources for Delta Smelt.	The Long-Term Operation of the CVP and SWP address the effects from the operation of the CVP and SWP. While it does not preclude additional actions, these are not part of the operation of the projects. Reclamation is open to science based collaboration on actions; however, CDFW declined to participate in related Structured Decision Making efforts.
38	Modeling Comparison of Action 5 to Baseline: The Action 5 Alternative modeling depicts a potential future condition of increased spring flows from tributaries through Voluntary Agreements (VA flows, now called Healthy Rivers and Landscapes). As Action 5 could result in impacts before the implementation of VA flows, and Action 5 eliminates Reclamation's early implementation of VA flows, the modeling does not allow an evaluation of impacts on a shorter time horizon.	The analysis provided in the 2024 Final EIS includes a range of operational scenarios that supports a wide range of evaluations.

Number	Comment	Response
39	The implementation of VA flows in modeling assumptions may obscure or ameliorate adverse impacts of Action 5. To evaluate potential impacts of Action 5, it needs to be compared to a current baseline of Alt 2v1, and all other factors that are not part of the action (VA flows, TUCP, etc.), must remain constant between the two runs. In addition to these issues, the modeling assumes that the Department of Water Resources (DWR) would adhere to Action 5, rather than the 2024 SWP ITP.	The analysis provided in the 2024 Final EIS includes a range of operational scenarios that supports a wide range of evaluations. The evaluation for NEPA purposes compares the Proposed Action to the No Action Alternative. Reclamation also provided comparisons to all of the alternatives in the 2024 LTO FEIS. For the ESA analysis (Exhibit 4, Endangered Species Act Section 7 (a)(2) Compliance), Reclamation provided comparison to all phases of Alternative 2. Reclamation assumed that DWR would operate to the same OMR requirements and removal of Fall X2 that was in Action 5. Otherwise, the ITP requirements were not changed from Alt 2.
40	Representation of OMR Management in CalSim: The representation of OMR management (Exhibit 2 Attachment F.1-2) in CalSim is inconsistent with the actions described in Action 5. It is inconsistent because specific operating criteria are not accurately reflected in the modeling and because Action 5 includes subjective assessments and other offramps that appear likely to reduce the extent to which protections are implemented. As a result, the effects analysis generally underestimates changes in the impacts on species and their habitats as compared to the 2024 PA.	Reclamation addresses the specific CDFW issues below; however, a range of modeling was provided including a sensitivity study of different OMR flows. The Assessments component in Action 5 is captured by the sensitivity study and discussed and analyzed qualitatively, which is appropriate in this case. The Assessments are real-time, management-triggered actions that depend on conditions and information not reasonably represented in long-term planning models such as CalSim.
41	Modeling for Action 5 assumes implementation of early season Winter-run protections consistent with the 2024 PA (Alternative 2). However, this protection was not included in Action 5.	Neither Action 5 nor Alternative 2 model implementation of early season winter-run Chinook salmon protection. This action was not modeled because it would not have triggered historically.
42	Modeling for First Flush under Action 5 assumes an off-ramp of export restrictions when JPF > 0 cfs. However, there is no specific JPF flow criteria for First Flush in Action 5.	The CalSim 3 modeling performed is the best representation of Action 5 at this time. Reclamation provides a range of OMR modeling. Modeling assumptions are described on Exhibit 2. Although not prescribed in Action 5, JPF is a reasonable assumption of when First Flush may off-ramp for modeling purposes. CDFW does not provide an alternative assumption to consider.

Number	Comment	Response
43	Modeling for the initiation of OMR management season assumes that a restriction to -5,000 cfs OMR would begin no later than January 1. This is not consistent with Action 5 which initiates OMR management only after the First Flush conditions occur, the adult Longfin Smelt salvage condition occurs, or when salvage of Winter-run occurs after January 1.	The CalSim 3 modeling performed is the best representation of Action 5 at this time. Reclamation provides a range of OMR modeling. Modeling assumptions are described on Exhibit 2. Although not prescribed in Action 5, January 1 is a reasonable assumption of when OMR Management would begin for modeling purposes. CDFW does not provide an alternative assumption to consider.
44	Larval and juvenile Delta Smelt protections for Action 5 were modeled as a continuation of adult Delta Smelt protections and do not include any adjustments for the additional modeling criterion required to initiate this action under Action 5, i.e. that PTM modeling indicates that the action would avoid $\geq 5\%$ entrainment of the population into export facilities. This modeling criterion is expected to prevent or reduce implementation of protections as compared to the 2024 PA.	Modeling in CalSim 3 was implemented as a proxy for these criteria. Action 5 real time operations address uncertainty through use of analytical tools including but not limited to PTM to implement protections for larval and juvenile Delta smelt.
45	Winter-run protections for Action 5 were modeled by assuming the action is triggered when observed loss exceeds the annual loss threshold. This assumes a greater level of protectiveness than is afforded by the criteria in Action 5, which requires that both (a) annual loss is on a trajectory to exceed the threshold, and (b) reducing exports would materially increase through-Delta survival. These criteria introduce additional subjective assessments into the action that may reduce the extent to which it is implemented.	Action 5 favors proactive measures and seasonal thresholds with certainty provided through the use of analytical tools. Action 5 may result in listed species more frequently reaching seasonal and weekly salvage thresholds. Real-time assessments and the use of science-based tools will inform export restrictions to avoid population level impacts and remain within the estimated incidental take from the 2024 Biological Opinions. Action 5 maintains protections minimizing routing fish into the south Delta and may reduce mortality of listed species by drawing fish already in the south Delta more frequently into export facilities for salvage instead of continued exposure to the poor survival conditions in the south Delta.

Number	Comment	Response
46	Modeling for Action 5 assumes that juvenile Steelhead protections would trigger when rolling cumulative 7-day loss exceeds 120 fish. If the action is triggered, each additional Steelhead in salvage is assumed to trigger a new 7-day action. These modeling assumptions are inconsistent with the Steelhead measure in Action 5, which is based on similar criteria to juvenile Winter-run protections (see bullet above) and relies on a Steelhead JPE that does not currently exist. Action 5 CalSim modeling assumes that juvenile Steelhead protection would result in OMR of -3,500 cfs for 10 weeks in 2010, 6 weeks in 2011, 8 weeks in 2013, and 9 weeks in 2018. This has an outsized contribution to the "combined coverage" historical OMR percentage calculations, as it assumes that OMR would be no more negative than -3,500 cfs 25–100% of April–June for four of the thirteen (13%) years included in the analysis. When sorted by water year type, this underestimates exports and impacts on all Delta species and their habitats during below normal and dry water years, and wet water years if OMR is controlling exports.	Reclamation developed a steelhead JPE method using hatchery steelhead releases and telemetry-based survival rates (see Exhibit 5 of the Environmental Compliance Sufficiency Memorandum, Entrainment Management). Additional clarification was added to this exhibit. A similar method will be used for real-time operations with hatchery releases and telemetry-based survival rates until a new method is available.
47	Storm-Flex for Action 5 was modeled assuming operations would be limited to an OMR of -6,250 cfs, while Action 5 allows operations up to an OMR of -6,500 cfs.	Reclamation has updated the modeling appendix to correct this erratum (See Exhibit 2). Based on the updated model run, no additional impacts would occur compared to the previous version of Action 5 modeling.
48	Modeling of OMR management layers all actions for all species together for inclusion in CalSim 3, which is then used as the foundation for the various hydrologic, water quality, and species-specific models characterizing impacts of Action 5. In this way, any less negative OMR implemented in response to a specific measure is modeled as providing protections to all Delta species and their habitats, not solely the species and life stage associated with the triggered action. Therefore, any OMR action that is offramped, reduced, or not modeled appropriately would change the effects on all species present in the Delta in ways that are not evaluated or quantified in the Action 5 analyses. CDFW is concerned that the increase in species-specific offramp criteria in Action 5's approach to OMR management would have cascading effects to all species that have not been fully analyzed.	All listed species were evaluated (see Exhibit 4 of the Environmental Compliance Sufficiency Memorandum). The memorandum provides analysis of water temperatures, flows and water quality in addition of analysis associated with listed species.

Number	Comment	Response
49	Conclusions Regarding Population-Level Effects Action 5 refers to several metrics (e.g., change in loss or salvage) to support the claim that proposed changes will not lead to population-level effects. However, in most cases, the use of such metrics does not clearly provide population-level insights or support conclusions regarding population-level effects. Population-level effects are changes to the population characteristics of a group of organisms (i.e., not individual members of the population) associated with a stressor or environmental change. These population characteristics could be population abundance, population size- or age-structure, or population vital rates (i.e., births, deaths, fertility, maturation, or growth). Estimating these metrics requires vast amounts of sampling data, a lifecycle modeling framework, or, usually, both. CDFW is concerned that conclusions regarding a supposed lack of population-level effect are used in Exhibit 4, Endangered Species Act Section 7(a)(2) Compliance, to dismiss documented increases in impacts to species and the elimination or weakening of important protective measures.	CDFW does not provide scientific evidence that Reclamation can use to evaluate Action 5. Population models use parameters such as through-Delta survival. A population model will not show an effect when through-Delta survival remains consistent. Reclamation did not selectively use metrics (e.g. change in loss or salvage) to make population-level conclusions. Reclamation presented multiple lines of evidence based on input from NMFS to evaluate independent stressors and overall population level metrics. Reclamation will operate consistent with the 2024 LTO ITS from NMFS. This comment does not describe any new analyses that could be completed or are available to Reclamation. Life cycle models were analyzed. In winter-run and spring-run Chinook salmon, similar mean population growth rates across water year types are observed in Action 5 as in the NAA and Biological Assessment prepared for and considered in the NMFS 2024 LTO Biological Opinion. Action 5 operations do not appreciably decrease survival outcomes relative to the 2024 LTO alternatives. If Delta survival is unaffected by Delta operations, the likelihood of species' survival and recovery will not be appreciably reduced.

Number	Comment	Response
50	Given that water operations modeling, real-time action assessments, and the analysis used to support Action 5 are often evaluating current or future conditions (i.e., conditions not often observed in historical data), historical data alone are not sufficient to assess population-level effects. Instead, a lifecycle modeling framework that facilitates simulation would be required. Traditionally, ecologists refer to this type of analysis as a population viability analysis. A population viability analysis uses stochastic population models to assess the probability of population growth or decline (or even extinction) over a specific time horizon. Without such a model, claiming a population-level effect (or lack thereof) is questionable at best. In fact, the conclusions drawn from all biological modeling described in the Action 5 documentation range from highly inadequate to assess population-level effects (e.g., simply stating salvage numbers, absent of south Delta entrainment effects, does not equate to an assessment of the population), to falling just short of an effective population viability analysis (e.g., the life cycle models reporting either arbitrary metrics such as “terminal lambda” or neglecting to assess long-term trajectories or changes in population extinction risk).	No scientific evidence was provided by CDFW indicating available commercial or scientific information that could be used to evaluate Action 5. Modeling and metrics reported is based on NMFS input. Population viability analysis tools are not available and were not requested by federal agencies. Reclamation will operate consistent with the 2024 LTO ITS from NMFS. Life cycle models were analyzed where available. In winter-run and spring-run Chinook salmon, similar mean population growth rates across water year types are observed in Action 5 as in the No Action Alternative and Biological Assessment prepared for and considered in the NMFS 2024 LTO Biological Opinion.
51	Moreover, estimates of loss and salvage alone are not sufficient metrics to draw conclusions regarding population-level effects resulting from project operations. The modeling tools used to estimate loss and salvage, such as the Salvage Density Model Loss Simulation and Negative Binomial Estimated Total Salvage, are primarily based on historical hydrologic, salvage, and loss data, which do not explicitly include or produce population-level information.	Reclamation did not selectively use these tools to make population-level conclusions. Reclamation presented multiple lines of evidence coordinated with NMFS to evaluate independent stressors and overall population level metrics. Overall, multiple lines of evidence regarding Action 5 potential effects including modeling tools described in the comment are used to make population-level conclusion. See comment above regarding life cycle modeling.

Number	Comment	Response
52	Currently, the changes in loss and salvage between Action 5 and the 2024 PA are compared using either a difference in numbers of fish or a percentage change, and these estimates can vary between water years. A population-level impact due to changes in loss and salvage will depend on numerous factors, such as the population status (e.g., the current population growth rate relative to a stable growth rate of 1), frequency of water year types, and the relative importance of juvenile survival to population dynamics. In the absence of a comprehensive life cycle model, the estimated changes in loss or salvage (in numbers of fish or percentage change) should at least be reflected in the context of the population status or size. For example, an 8% increase in predicted loss of winter-run from 940 fish (2024 PA) to 1,018 fish (Action 5) would have greater population-level impacts for a population of 10,000 individuals than a population of 100,000 individuals.	No scientific evidence was provided by CDFW indicating available commercial or scientific information that could be used to evaluate Action 5. Action 5 included multiple lines of evidence in coordination with NMFS and USFWS building from the multi-agency action described in Alternative 2.
53	However, this information alone will not provide an adequate understanding of population-level effects that occur under future conditions, as changes in larval and juvenile abundance due to loss or salvage can affect future reproductive potential, which is not captured in the example above. Arguably, the analyses using the Delta Smelt Life Cycle Model are best suited to derive population-level effects. According to Table F.4-6 (Exhibit 4 Attachment F.4), the No Action Alternative resulted in a 5.6% greater population growth rate from 1995-2015 relative to Action 5 and an 8.3% greater population growth rate for wet and above normal water years during this period. Similarly, the empirical model (i.e., historical data) resulted in a 6.7% greater population growth rate from 1995-2015 than Action 5 and a 37.5% greater population growth rate for wet and above normal water years during this period. It is our understanding that the empirical model run analyzes observed historical data from 1995-2015. These changes to the population growth rates will likely lead to measurable population-level effects, but this was not explicitly evaluated. That is, the analysis should have included an assessment of differences in extinction potential or potential to fall below a specific threshold (e.g., the historic mean or the mean in the most recent five-years) while accounting for uncertainty (i.e., stochasticity).	Action 5 continues Delta Smelt supplementation, in collaboration with DWR, CDFW, and USFWS to avoid Delta smelt extinction. Until the supplementation program reaches increased production objectives. Allee effects are likely to maintain the population in an extinction vortex. Until such time, an assessment of extinction potential related to specific operations (e.g. Delta entrainment, seasonal habitat) is unlikely to demonstrate any variation.

Number	Comment	Response
54	In considering population-level effects, CDFW appreciates the inclusion of results from the CVPIA SIT DSM life cycle models in the analysis of operational changes of Action 5. However, CDFW suggests caution when inferring population-level effects based on these modeling results because specific demographic rates described by the model lack sensitivity to the flow and temperature changes associated with Action 5. Specifically, Reclamation provides an incomplete list of modeled demographic rates that have not been constructed to vary as a function of changing flow and temperature inputs which include adult salmon arrival and spawn timing, salmon egg-to-fry survival, and juvenile salmon growth rates. Given that the only life cycle modeling result provided by Reclamation estimates critical demographic rates that are, by Reclamation's own account (Exhibit 4 Attachment F.2), insensitive to the flow and temperature changes described by Action 5, CDFW further cautions that it is high impossible to assess a population-level effect without further life cycle modeling.	Reclamation believes it understands the CVPIA SIT DSM lifecycle models. The lines of evidence in the analysis of Action 5 potential effects were coordinated with the Services. Please refer to life cycle model attachments for winter-run Chinook salmon, spring-run Chinook salmon, and Delta smelt that include a section on assumptions/uncertainty on the topics described in the comment.

Number	Comment	Response
55	The 2024 NMFS BiOp considered “Other Activities” of the 2024 PA, which include components of the identified action that were not specifically proposed by Reclamation, but that would not occur but for the action, and are reasonably certain to occur. The 2024 NMFS BiOp specifically considered the Winter-Run Action Plan (WRAP) as one such activity. The WRAP included a list of six high-priority actions developed to reduce stressors affecting Winter-run; doing so through a combination of science, fishery actions, infrastructure improvements, and reintroduction to historic habitat. As described in the 2024 NMFS BiOp (Table 170), NMFS considered the effect of implementing the actions of the WRAP when evaluating the magnitude and direction of change caused by the 2024 PA on the Viable Salmonid Population parameters, which inform a salmonid species’ extinction risk. Action 5 does not include a clear commitment to the WRAP such that the actions therein are no longer reasonably certain to occur. Given that the actions and effects of the WRAP were considered in the 2024 NMFS BiOp and that they were specifically identified as supporting the conclusion that the 2024 PA would not jeopardize the continued existence of Winter-run, it is not clear how Reclamation was able to conclude that Action 5 does not constitute a modification of the identified action that would cause an effect to listed species that was not considered in the 2024 NMFS BiOp.	Reclamation determined there is no change in the Proposed Action that would have an effect on the species not considered in the NMFS 2024 Biological Opinion. Reclamation signed the WRAP along with all other agencies and intends to participate consistent with the terms in the WRAP.

Number	Comment	Response
56	In the 2024 PA, Reclamation proposed a new approach to managing Shasta that changed the balance between risks of flood control releases and maintaining water in storage for future drought protection and temperature management. This new Shasta Management Plan Framework created a pivotal role for the Shasta Operations Team (SHOT), a policy-level group called for in the 2024 PA, which discusses water operation actions when implementation may have impacts of tradeoffs relevant to listed fish species, system conditions or water supply. The 2024 PA also described a key role for the SHOT in the WRAP and in making decisions on how Shasta-related VA flow assets would be managed. Action 5 eliminates the SHOT and does not include clear commitments to implement the WRAP. The collaborative governance structure and integrated plan to improve the survival and viability of Winter-run that functions alongside planned operation of Shasta Reservoir called for in the 2024 PA has been replaced by a structure in Action 5 that is not based on biological goals and objectives, nor does it contain any collaborative decision making groups, such as the SHOT.	The Shasta Framework remains unchanged in Action 5, including the biological goals and objectives. Action 5 includes collaborative real-time groups and increases collaboration by including interested parties. CDFW is invited to participate in real-time groups, which includes the management of Shasta Reservoir (Section 11.2.1 Sacramento River Group). Reclamation remains a signatory to the WRAP. CDFW however has not signed the WRAP. The incidental take statement for the NMFS 2024 Biological Opinion includes the WRAP, however the effects of WRAP activities are not analyzed in the Biological Assessment nor the Biological Opinion and its implementation would require subsequent consultation.
57	The governance structure included in the 2024 PA was founded in six key principles including collaboration. Specifically, the 2024 PA (Section 3.13.1) stated “[T]he leading principle of CVP/SWP Governance is collaborative, science-based decision making. CVP/SWP governance is structured to seek consensus across scientific, technical and policy levels, with elevation and decision making processes in place when consensus cannot be reached.” The technical and management team structure established to support the 2024 PA governance principles included both a multi-agency management team, WOMT, “to discuss and resolve operational questions and technical issues, as requested or elevated from Delta and tributary technical teams, and to elevate unresolved operational issues to the Directors Group” and the Delta Monitoring Workgroup “with technical representatives from federal and state agencies and stakeholders who can provide information to DWR and Reclamation on species abundance, species distribution, life stage transitions, and relevant physical parameters”.	Reclamation determined there is no change in the Proposed Action that would have an effect on the species not considered in the NMFS 2024 Biological Opinion. Action 5 includes collaborative real-time groups and increases collaboration by including interested parties. CDFW is invited to participate in real-time groups, which includes the management of Shasta Reservoir (Section 11.2.1 Sacramento River Group).

Number	Comment	Response
58	This structure supported a clearly described elevation process to Directors of all five agencies (Reclamation, DWR, CDFW, USFWS, and NMFS) where unresolved issues could be discussed and addressed collaboratively. Or, in the absence of consensus, this process would thoroughly document differing opinions that lead to a final decision.	As the action agency, the responsibility and authority to comply with environmental laws, while meeting the needs of communities to achieve a reasonable balance among competing demands for use of CVP and SWP water, including environmental, water supply, and power generation, rests with Reclamation and DWR. Action 5 relies on decision making among the action agencies and technical input on specific actions described in Section 11.2. Forums are established for the purpose of sharing operational plans via notifications, gathering scientific and commercial data to inform the operation of the CVP and SWP, and for reporting the outcomes of operations. Forums do not make decisions nor seek consensus. CDFW is invited to participate in real-time groups.
59	In contrast, Action 5 eliminates technical, managerial, and Director-level working groups and the collaborative approach to real-time decision-making established in the 2024 PA. Instead, Action 5 emphasizes Reclamation autonomy in implementation of Biological Opinions and decision making. For example: "Reclamation determines whether and how to proceed with its proposed action in light of USFWS' and NMFS' biological opinion, even though the terms and conditions of incidental take statements are non-discretionary."	Action 5 retains the collaboration in technical and management forums. Action 5 more clearly identifies the authority reserved by Reclamation to make decisions on the operation of the CVP, consistent with its statutory responsibilities.

Number	Comment	Response
60	Later, Action 5 states if a reasonable and prudent alternative is issued by NMFS and/or USFWS as part of their biological opinions, Reclamation may choose not to implement USFWS' or NMFS' reasonable and prudent alternative; instead, Reclamation can choose to develop a new Proposed Action. As a result, Action 5 relies on reinitiation and potential litigation as the tools to motivate changes in analyses of impacts to species and potential protective measures in the absence of collaboration.	As described in the Services' Endangered Species Consultation Handbook, page 2-11: <i>If a jeopardy or adverse modification determination results from the consultation, the action agency may:</i> -adopt one of the reasonable and prudent alternatives for eliminating the jeopardy or adverse modification of critical habitat in the opinion; -decide not to grant the permit, fund the project, or undertake the action; -request an exemption from the Endangered Species Committee; -reinitiate the consultation by proposing modification of the action or offering reasonable and prudent alternatives not yet considered; -or choose to take other action if it believes, after a review of the biological opinion and the best available scientific information, such action satisfies section 7(a)(2). As described in 50 CFR 402.15 (a) <i>Following the issuance of a biological opinion, the Federal agency shall determine whether and in what manner to proceed with the action in light of its section 7 obligations and the Service's biological opinion.</i> <i>(b) If a jeopardy biological opinion is issued, the Federal agency shall notify the Service of its final decision on the action.</i> <i>(c) If the Federal agency determines that it cannot comply with the requirements of section 7(a)(2) after consultation with the Service, it may apply for an exemption.</i>
61	CDFW appreciates the opportunity to comment on the LTO Action 5 Operation Plan for the Central Valley Project and State Water Project and the associated Environmental Compliance Sufficiency Review to assist Reclamation in identifying, evaluating, and considering changes in impacts of long-term operations of the CVP and SWP on biological resources.	Reclamation will continue to be transparent and provide opportunities for collaboration on the processes that have the potential to affect resources and communities.

Number	Comment	Response
62	Due to the issues presented in this letter, CDFW is concerned that the Action 5 Operations Plan and Environmental Compliance Sufficiency Review do not adequately identify or provide detailed information to decisionmakers about the Project's significant impacts on biological resources, which in turn hinders Reclamation's capability to take a hard look at the consequences of implementing Action 5.	Reclamation documented the approach and methodology used to take a hard look at potential changes and impacts associated with Action 5 in the Environmental Compliance Sufficiency Memo, including agreed upon lines of evidence with the Services to evaluate potential impacts.

Table 2. California Department of Water Resources

Number	Comment	Response
1	With this larger goal in mind, DWR has reviewed Action 5 and its supporting documentation and has identified potential areas where Action 5 operations could impact SWP water supplies and, in turn, the ability to serve water to California communities. DWR is concerned that Reclamation has not adequately analyzed potential redirected impacts of Action 5 operations on SWP water supply. DWR submits these comments in the spirit of open and continued collaboration with Reclamation and is hopeful our agencies can draw on our history to ensure fair and legally supported coordinated operations this water year. DWR hopes to work with Reclamation on issues that may not be listed here as they arise in the future and remains committed to working through shared governance teams to evaluate scientifically sound modeling to evaluate these impacts.	Reclamation's analysis shows Action 5 would increase SWP water supplies and are within the range of effects analyzed.
2	Fundamentally, DWR's concerns relate to the SWP's continued ability to supply and deliver water to 27 million Californians, 750,000 acres of farmland, and businesses throughout California. In carrying out water delivery responsibilities, DWR must operate within the authorizations of the Federal Endangered Species Act (ESA) and California Endangered Species Act (CESA), which are currently set forth in the 2024 United States Fish and Wildlife Service (USFWS) Biological Opinion, the 2024 National Marine Fisheries Service (NMFS) Biological Opinion (collectively, BiOps), and the 2024 CESA Incidental Take Permit (ITP). It is imperative for DWR to understand whether Reclamation's operations under Action 5 will result in any impacts to SWP water supply.	Reclamation has provided modeling on the water supply consequences of operation to the proposed Action 5 Operations Plan, to which DWR would need to operate within in order to comply with federal ESA. Reclamation's Record of Decision, which includes the Biological Opinions, provides the environmental compliance for DWR's operation of the SWP.

Number	Comment	Response
3	Reclamation provided its Action 5 CALSIM modeling to DWR for review. DWR's review indicated that Reclamation's CALSIM modeling for Action 5 assumes the SWP will operate to Action 5. This assumption, which is noted in Exhibit 2 to the Environmental Sufficiency Memo, dated October 10, 2025, is incorrect. Reclamation should update its modeling to accurately reflect SWP's anticipated operations, which will be governed by the then-current ESA and CESA authorizations. DWR and the California Department of Fish and Wildlife (CDFW) work together to consider new science and information as set forth in the adaptive Management Plan, but for the purposes of modeling, Reclamation should assume the SWP will be operated to the current regulatory requirements in the ITP. Reclamation should also further analyze Action 5's potential impacts to the SWP water supplies, consistent with National Environmental Policy Act (NEPA) requirements. This letter includes examples where misalignment between SWP and CVP operations could occur, and evaluates those that are likely to occur during the winter and spring months. SWP and CVP operations and permit requirements are complex, so evaluating an exhaustive list of potential impacts is difficult. The items below do not represent an exhaustive list. Others may include, for example, impacts to the summer-fall habitat action and changes in operations of upstream CVP reservoirs (e.g., Shasta, American River, etc.). It is our hope that by specifically describing potential areas of misalignment and redirected impacts, DWR and Reclamation can work collaboratively to avoid those impacts.	A consistency determination (Fish and Game Code § 2080.1) would allow the State to align SWP criteria under the California ESA with the federal Long-Term Operation Plan. This approach was used in the 2000s including during the consultations in 2008 and 2009 to avoid misalignment. The State does not provide for public participation nor does the State coordinate with Reclamation on the contents of its ITP creating the potential for misaligned operations. As of November 25, the State has not made its current ITP and subsequent amendments publicly available (https://water.ca.gov/Programs/State-Water-Project/Endangered-Species-Protection). The State may voluntarily operate to divert less water, subject to COA, but must ensure those actions do not exceed effects analyzed and are consistent with the ROD, which incorporates the 2024 Biological Opinions.

Number	Comment	Response
4	Pursuant to the NMFS BiOp analysis and the ITP, the SWP must initiate Old and Middle River (OMR) entrainment management no later than January 1 each year, unless it begins earlier as a result of Winter-Run Chinook Salmon salvage levels. If those loss thresholds are met, DWR and Reclamation must coordinate to adjust total exports, which could occur as early as November 1 or December 1.	The Record of Decision identifies Reclamation's action. Under the ESA, Reclamation consults with FWS and NMFS. FWS and NMFS estimate incidental take. Reclamation must reinitiate if: 1) If the amount or extent of taking specified in the incidental take statement is exceeded; 2) If new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered; 3) If the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion or written concurrence; or 4) If a new species is listed or critical habitat designated that may be affected by the identified action. Action 5 falls within the effects considered in the NMFS 2024 Biological Opinion.
5	In contrast, Action 5 lists several conditions that could initiate OMR entrainment management, but no hard date for commencement is included. (Exhibit 1 to the Sufficiency Memo, 5.3.1, p. 5-8). Thus, it is possible SWP could be operating to OMR for weeks before CVP implements OMR management, creating misalignment.	Action 5 provides specific environmental criteria for when restrictions are necessary for species protections. The State may voluntarily operate to divert less water, subject to COA, but must ensure those actions do not exceed effects analyzed and are consistent with the ROD, which incorporates the 2024 Biological Opinions.
6	DWR is supporting the development of a winter-run prediction model and other tools that may be useful for assessing when winter-run salmon are vulnerable to entrainment risk.	These are great tools that hopefully can be used in future consultations, assessments, and analysis once developed and peer reviewed. Reclamation looks forward to collaborating consistent with the principles of Gold Standard Science.
7	Until these tools are developed and incorporated in an ITP amendment and BiOps, Reclamation's Action 5 start date for OMR management could lead to disruptions as the SWP curtails exports to adjust OMR levels while the CVP continues to operate at a higher pumping rate, particularly if other listed fish (e.g. longfin smelt) are vulnerable to entrainment risk (see below). CVP's higher pumping rate could continue to draw fish to the pumps, making the SWP's export decreases less effective at reducing entrainment.	The potential for new information in the future that may or may not be adopted does not warrant a delay in actions today. Reclamation is not required to create new science to operate in a manner consistent with modern science.

Number	Comment	Response
8	Action 5 identifies a different, higher annual loss threshold for Winter-Run Chinook Salmon than the proposed action analyzed in the NMFS BiOp and the 2024 ITP. Specifically, under the NMFS BiOp's analysis and consistent with the ITP, the Projects coordinate Delta exports to avoid exceeding a 0.5% juvenile production estimate (JPE) threshold for natural-origin winter-run and 0.12% JPE for hatchery winter-run. Under the BiOp analysis and ITP, if cumulative loss exceeds 50% of the annual threshold, the Projects must adjust exports to maintain a seven-day OMR rate no more negative than -3,500 cfs, and a -2,500 cfs OMR rate, if 75% of the annual loss threshold is exceeded. Action 5 raises the annual loss thresholds to 1% for both natural-run and hatchery winter-run and calls for a determination that reducing exports would increase through-Delta survival before requiring an OMR rate no more negative than -3,500 cfs.	Action 5 includes the same salvage loss that was estimated in the 2024 NMFS Biological Opinion's incidental take statement. Real-time assessments and the use of science-based tools will inform export restrictions to avoid population level impacts and remain within the estimated incidental take from the 2024 Biological Opinions. Action 5 maintains protections minimizing routing fish into the south Delta and may reduce mortality of listed species by drawing fish already in the south Delta more frequently into export facilities for salvage instead of continued exposure to the poor survival conditions in the south Delta.
9	In the meantime, if the CVP were to operate to Action 5's winter-run requirement while the SWP continued to operate to the current regulatory requirements, the SWP could be forced to take action to ramp down its operations separate from, and earlier than, the CVP. The CVP's higher pumping levels could continue to attract and entrain fish, making it challenging for the SWP to avoid exceeding the annual loss triggers and potentially forcing the SWP to reduce exports even further and at an earlier date than would otherwise occur to offset the effects from the CVP's pumping. Such an outcome would unfairly burden the SWP and compromise the SWP's ability to deliver water to its contractors.	From 2000 to 2025, the CDFW salvage database shows 69% of genetically identified winter-run Chinook salmon, 71% of length-at-date spring-run Chinook salmon, and 85% of unclipped steelhead salvage loss occurs at SWP facilities. The CVP continues to be disproportionately restricted due to impacts on listed species associated with operation of the SWP. Real-time assessments and the use of science-based tools will inform export restrictions to avoid population level impacts and remain within the estimated incidental take from the 2024 Biological Opinions. Action 5 maintains protections minimizing routing fish into the south Delta and may reduce mortality of listed species by drawing fish already in the south Delta more frequently into export facilities for salvage instead of continued exposure to the poor survival conditions in the south Delta.

Number	Comment	Response
10	Action 5 eliminates the hard triggers set forth in the USFWS BiOp and the ITP for managing OMR to reduce juvenile LFS entrainment. Specifically, Action 5 would remove the hard triggers in exchange for a “population model that demonstrates a need to reduce entrainment to avoid population decline.” To DWR’s knowledge, such a population model is yet to be developed for real-time operations.	Action 5 includes a number of triggers to reduce juvenile longfin smelt entrainment. Recent publications (Kimmerer and Gross 2022, Gross et al. 2022) investigated the population dynamics of Longfin Smelt in the San Francisco Estuary to understand the species' relationship with Delta flow and diversions, and additional lines of evidences including Kimmerer and Nobriga 2008. The ITP on page 266 (pdf pg) does reference that, "Positive daily averaged QWEST values indicate that flows will tend to move larvae downstream and away from the influence of the south Delta export facilities. Negative daily averaged QWEST values indicate that flows are being pulled through the San Joaquin River towards the south Delta and the export facilities."
11	DWR is currently working on a model for real-time application per the Adaptive Management Program described in the BiOps and the ITP, however this effort will not be completed for potential application until 2027. The real-time model will be based on newly published research showing that entrainment impacts are not responsible for variations in LFS fall abundance.	Reclamation looks forward to reviewing this real-time model. However, the potential for new information in the future that may or may not be adopted does not warrant a delay in actions today.
12	In the absence of a peer reviewed real-time population model, it is uncertain how the CVP will operate during periods when longfin are being salvaged at the projects.	Reclamation will conduct an assessment to determine if population impacts are expected. Reclamation will also stay within the revised USFWS LTO 2025 ITS.
13	Like DWR’s winter-run concerns, it is possible that the SWP could be forced to reduce water exports to minimize entrainment of the juvenile LFS while the CVP continues to pump at a higher rate. And, again, the CVP’s pumping could continue to attract and entrain fish at a higher rate than it would otherwise do under the BiOp. The SWP should not be forced to forego its water exports earlier or more than its fair share to comply with juvenile LFS measures.	DWR and Reclamation will be restricted by the same Federal requirements. From 2000 to 2025, the CDFW salvage database shows 69% of genetically identified winter-run Chinook salmon, 71% of length-at-date spring-run Chinook salmon, and 85% of unclipped steelhead salvage loss occurs at SWP facilities. The CVP continues to be disproportionately restricted due to impacts on listed species associated with operation of the SWP.

Number	Comment	Response
14	Action 5 identifies an annual loss threshold for Spring-Run Chinook Salmon of one-percent JPE. DWR supports the use of a JPE to manage take based on population level effects, but is unaware of a peer-reviewed JPE for application of spring run entrainment management in 2026.	Action 5 proposes assessing a proportion of the spring-run JPE by using spring-run Chinook hatchery surrogates and telemetry-based survival rates. The use of hatchery surrogates have been in place since at least the 2009 NMFS Biological Opinion, and is a technique that is also included in the State's ITP. Clarification to this real-time assessment criteria has been added to Exhibit 5 of the Environmental Compliance Sufficiency Memorandum <i>Entrainment Management</i> .
15	Action 5 eliminates the hard triggers set forth in the USFWS BiOp and the ITP for managing OMR to reduce juvenile LFS entrainment. Specifically, Action 5 would remove the hard triggers in exchange for a "population model that demonstrates a need to reduce entrainment to avoid population decline." To DWR's knowledge, such a population model is yet to be developed for real-time operations.	Action 5 includes a number of triggers to reduce juvenile longfin smelt entrainment. Recent publications (Kimmerer and Gross 2022, Gross et al. 2022) investigated the population dynamics of Longfin Smelt in the San Francisco Estuary to understand the species' relationship with Delta flow and diversions, and additional lines of evidences including Kimmerer and Nobriga 2008. The ITP on page 266 (pdf pg) does reference that, "Positive daily averaged QWEST values indicate that flows will tend to move larvae downstream and away from the influence of the south Delta export facilities. Negative daily averaged QWEST values indicate that flows are being pulled through the San Joaquin River towards the south Delta and the export facilities."
16	DWR, in collaboration with Reclamation, NMFS, and CDFW, are working on development of the spring-run JPE that should be ready for potential application in WY 2027 or 2028. The spring-run JPE is identified in the Adaptive Management Program described in the BiOps and the ITP with the intent of modifying the spring-run action when it is completed. Until then, the NMFS BiOp and the 2024 ITP rely on surrogate approaches to manage spring-run losses at the pumps. It is uncertain how Reclamation would operate under Action 5 and potential misalignment could occur assuming DWR continues to operate to a surrogate approach.	If and when a new technique for assessing a percent of the spring-run JPE, Reclamation will evaluate it and may update its operation.

Number	Comment	Response
17	Under Action 5, the CVP could remain at higher pumping levels for a longer period than the SWP before reducing exports to reduce spring-run entrainment risk. DWR recognizes that the Projects have not historically exceeded spring-run loss thresholds, but such a situation is possible and, therefore, creates a concern regarding misalignment. If this misalignment occurs, the CVP's heightened pumping levels could increase the risk of entrainment, triggering the SWP to reduce pumping earlier and more often than would occur if the CVP operated pursuant to the NMFS BiOp.	Reclamation will continue to operate to stay within the 2024 NMFS Biological Opinion ITS for spring-run Chinook salmon. DWR and Reclamation will be restricted by the same Federal requirements.
18	The export capacity sharing splits set forth in Article 10(i) of the 1986 Coordinated Operation Agreement, as amended in 2018 (COA), could exacerbate Action 5's impacts on SWP water supply. In excess water conditions, when releases from upstream reservoirs plus unregulated flow exceed Sacramento Valley in-basin uses and exports are constrained by non-discretionary requirements, Article 10(i) provides that the CVP may utilize 60% of the applicable export capacity whereas the SWP may only utilize the remaining 40%. In other words, the CVP is able to pump a higher proportion of available water than the SWP. Thus, to the extent the CVP were to pump at a higher level pursuant to Action 5 than the SWP is allowed, the SWP would have to reduce pumping even further to offset the CVP's entrainment impacts because the CVP will have access to a greater proportion of export capacity than the SWP under the 60/40 COA split. This compounding effect should be evaluated and mitigated as it was not contemplated in, nor is it consistent with, the 2018 COA amendment.	Action 5 would increase water supplies for the SWP. From 2000 to 2025, the CDFW salvage database shows 69% of genetically identified winter-run Chinook salmon, 71% of length-at-date spring-run Chinook salmon, and 85% of unclipped steelhead salvage loss occurs at SWP facilities.

Number	Comment	Response
19	The Action 5 operations described above could be inconsistent with Reclamation’s obligations under COA. COA requires the CVP and SWP to coordinate operations of each system in a cooperative manner “so as to provide the maximum benefits to the people of California and the Nation . . .” (Article 2.) It further requires Reclamation to “use all reasonable means to guard against a condition of shortage in the quantity of water available to the State pursuant to this [COA].” (Exhibit E, paragraph 1(a).) If Reclamation implements Action 5 in a way that harms the SWP’s ability to deliver water to its contractors and customers, the CVP export increase would be at the expense of all SWP water contractors, and due to the different water purposes the SWP and CVP serve, disproportionately impact Californians’ water supplies.	Action 5 would increase water supplies for the SWP. The State misrepresents the requirements of COA, the condition of shortage relates to water purchased by the State and is generally not the subject of Action 5.
20	DWR and Reclamation, through COA, have worked together for almost 40 years to carry out water deliveries to Californians. Action 5’s potential SWP water supply impacts, as outlined above, could risk jeopardizing this collaborative operational relationship under COA.	Reclamation and DWR have been able to operate the projects under COA even though the State does not provide for public participation nor does the State coordinate with Reclamation on whether the contents of its ITP may create the potential for misaligned operations.

Number	Comment	Response
21	DWR questions whether Reclamation has carried out the necessary environmental review for the Action 5 operations described in this letter. Under NEPA, federal agencies must evaluate the environmental effects of its actions on the environment. (42 U.S.C. §4332(2)(C), NEPA §102.) This evaluation acts to inform the public of the environmental impacts of the government’s action, providing transparency in government relations.	Please refer to the 2025 DOI NEPA Handbook Implementing Procedures regarding Determinations of NEPA Adequacy. In accordance with the 2025 DOI NEPA Handbook, Reclamation reviewed the LTO 2024 Final EIS and answered yes to the following questions to determine whether the EIS adequately covers Action 5: (1) Is the new proposed action a feature of, or essentially like an alternative analyzed in the existing environmental document? (2) Is the proposed action within the same analysis area? (3) Is the range of alternatives analyzed in the existing environmental document appropriate with respect to the new proposed action, given current environmental concerns and resource values? (4) Is the existing analysis valid considering any new information or circumstances relevant to the proposed action? Can the bureau reasonably conclude that new information and new circumstances do not warrant substantial change to the analysis of the new proposed action? (5) Are the environmental effects that would result from implementation of the new proposed action similar (both quantitatively and qualitatively) to those analyzed in the existing environmental document?
22	The “Draft Memorandum for Interested Party Review” and supporting documentation do not purport to be official NEPA documents. Neither do they meet the statutory requirements to evaluate the effects of Action 5. The memo asserts that Action 5 falls within the Final Environmental Impact Statement (FEIS) issued by Reclamation in November 2024. However, the FEIS did not analyze the removal of the thresholds Reclamation now proposes. Additionally, no document to date analyzes the impacts on the SWP water users, a part of the human environment, as required by 42 U.S.C §4332(2)(A).	Please refer to the 2025 DOI NEPA Handbook Implementing Procedures regarding Determinations of NEPA Adequacy. Additional detail is provided in the response above.
23	As noted above, Reclamation’s modeling incorrectly assumes the SWP will operate to Action 5 in a manner identical to the CVP. The transparency of a full NEPA review could also add to a greater understanding of how Action 5 fits within other relevant laws, such as the ESA.	No information was included to suggest Reclamation did not analyze a reasonable range of alternatives and disclose potential impacts. Reclamation is not required to analyze every possible combination of alternatives. If the SWP does not adopt Action 5, water supply benefits may be lower.

Number	Comment	Response
24	Action 5 could have adverse consequences, depending on its implementation, on the SWP and the water users who depend on SWP water supplies. The Action 5 documentation Reclamation has produced, to date, is vague in how it will be implemented in real-time, and neither discloses nor analyzes these impacts. DWR urges Reclamation to continue to strive for consistent real-time operations and invest and collaborate on new science tools and population models to inform operations that protect water supply and species. DWR also asks Reclamation to reconsider Action 5 and to comply with the legal requirements regarding environmental review, endangered species restrictions, and coordinated SWP and CVP operations. We are hopeful that as our shared investments in models and other tools become available for use in the 2027 water year and beyond, and our science-based operations will be realigned to the benefit of water supply and species. In the meantime, we remain ready to work collaboratively to responsibly manage the SWP and CVP water supplies in 2026.	Action 5 relies upon multiple lines of evidence from literature, datasets, and models. Reclamation looks forward to collaborating consistent with the principles of Gold Standard Science.

Table 3. State Water Resources Control Board Comments

Number	Comment	Response
1	The State Water Board submits the following comments regarding Reclamation's reliance on the 2024 LTO Final EIS and prior biological opinions for a proposed change in CVP LTO. Action 5 was not included in the 2024 LTO Final EIS and removes actions that were included in that analysis.	Action 5 did not remove any of the actions that were included in the range of alternatives that were evaluated in the 2024 LTO Final EIS.
2	With respect to the CVP LTO biological opinions, the State Water Board notes there is a pattern of the CVP exceeding take limits for listed species and either taking no action or pursuing increased take limits without sufficient analysis as to whether such continued actions are reasonably expected, directly or indirectly, to diminish a species' numbers, reproduction, or distribution so that the likelihood of both survival and recovery is appreciably reduced.	Incidental take is an estimate by NMFS and USFWS on the take of species resulting from the proposed action. If an agency exceeds incidental take, it is a trigger to reinstate consultation pursuant 50 CFR 402.15(a). The State Board provides no evidence to substantiate this claim.
3	Finally, the State Water Board previously advised Reclamation that it should not incorporate reliance upon Temporary Urgency Change Petitions (TUCPs) in its analyses as TUCPs are not legally available to Reclamation absent an emergency drought declaration by a California Governor, a subsequent discretionary action by a California Governor to issue an Executive Order that waives compliance with PorterCologne under the Emergency Services Act (Government Code, § 8550 et seq.), and a further discretionary approval by the State Water Board, relying upon the hypothetical Executive Order, with findings appropriate to that Executive Order. Such continued speculation appears to be a defective basis for Reclamation's Action 5 analysis and conclusions.	Despite advancement in forecasting tools and three decades of new hydrologic information, including two severe multi-year droughts, the State Water Board has consistently not updated D-1641. In order to alleviate the impacts of droughts on communities and protect listed species, Reclamation and DWR have been required to seek multiple TUCPs, each with onerous additional requirements. The assumptions for Action 5 assume the terms of the multiple previous Orders issued by the State Water Board. While past Orders do not guarantee a future decision, they are a reasonable basis for analysis.

Number	Comment	Response
4	Reclamation should work with the HRL parties, and particularly the California Department of Water Resources, to ensure that Reclamation has sufficiently considered and analyzed these impacts and propose means of addressing any impacts, including relative to the operational changes identified below.	Alternative 2 and Action 5 include a HRL program and a pre-HRL phase to demonstrate the range of potential impacts (both beneficial and adverse) that could occur due to implementation. Action 5 does not include the Early Implementation of Delta export reduction component. The State Water Board has not adopted the HRL Program and does not appear likely to adopt the HRL Program within the 2-year timeframe provided by the early implementation program. The State did not adopt the early implementation provision as part of its 2024 ITP. Removal of the Early Implementation of Delta export reduction component does not result in impacts outside of the range discussed and analyzed in the 2024 LTO Final EIS. Action 5 includes the ability for Reclamation to facilitate implementation of the CVP component of the HRL Program, as contemplated in the March 2022 MOU signed by the HRL parties, which included coordination with the State Water Board. For operation under the HRL Program, Reclamation agreed to operate its facilities to maximize the benefits of water contributed by HRL parties including not diverting protected flows and potentially making reservoir releases to advance flow contributions into more favorable times of the year.
5	Effects of these modified or eliminated OMR Management criteria on native fish populations have not been adequately evaluated.	Please refer to Exhibit 4 of the Environmental Compliance Sufficiency memo for Action 5. The State Water Board did not provide any additional lines of evidence to support this comment.
6	Action 5 incorporates the Juvenile Production Estimates (JPEs) for spring-run Chinook salmon and steelhead to inform the OMR management and export pumping changes. However, JPEs for spring-run Chinook salmon and steelhead populations have not been established in the Delta.	Action 5 proposes assessing a proportion of the spring-run JPE and for steelhead by using hatchery surrogates and telemetry-based survival rates. The use of hatchery surrogates have been in place since at least the 2009 NMFS Biological Opinion, and is a technique that is also included in the State's ITP. Clarification to this real time assessment criteria has been added to Exhibit 5 of the Environmental Compliance Sufficiency Memorandum Entrainment Management.

Number	Comment	Response
7	In addition, the Proposed Action (Exhibit 1) states that “Action 5 may reduce mortality by drawing fish into export facilities for salvage instead of exposure to the poor survival conditions in the south Delta.” This statement is listed for Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, and Central Valley Steelhead. This is a fundamentally flawed premise because fish mortality at the south Delta Export facilities prior to reaching the fish facility is very high (prescreen loss rates: 15% at CVP and 77% at SWP), and recent studies on the effects of spatial, environmental, and hydrologic parameters on through-Delta survival of juvenile salmonids have demonstrated that survival is correlated with net positive OMR flows.	The lines of evidence supporting Action 5 show similar route selection and survival for winter-run Chinook salmon. The number of winter-run entering the south Delta is likely to remain the same. Entrainment of winter-run Chinook salmon already present in the South Delta is expected to increase under Action 5. Therefore, for winter-run Chinook salmon that do reach the South Delta, Action 5 may reduce mortality by more rapidly drawing fish into export facilities for salvage instead of leaving them exposed to the severely altered hydrodynamics and poor survival conditions in the south Delta. Once juvenile salmon are near the export facility intakes, acoustic tagging studies have shown that entrainment and salvage provide for the highest survival outcomes. According to acoustic tagging studies: 1) once juvenile salmonids reach the South Delta survival is extremely low; entrained fish often survive to exit the Delta, un-entrained fish rarely do; and 2) Statistical analyses demonstrates factors influencing survival vary by region of the Delta; river inflows are positively associated with survival in riverine and tidal-transitions zones; river inflow and much better supported as survival covariates than OMRI values. See STWG (2024) cited in 2024 NMFS BiOp. This answer is similar for spring-run Chinook salmon and steelhead. As provided in Exhibit 4 of the Sufficiency Review Memo, Action 5 is expected to either increase or be similar to Alternative 2 of the 2024 LTO Final EIS in terms of survival. Additional clarification has been added to this exhibit.
8	Modeling indicates that operations under Action 5 would generally cause OMR flows to be more negative in the spring and fall months of most water year types as summarized below. However, as indicated above, this modeling may also significantly underestimate the actual effects of changes to OMR requirements. [Table showing Seasonal Differences in OMR] and [Table with Seasonal Differences in Total Delta Export Volumes] Modeling results show that Action 5 would increase Delta exports on average across all water year types. The seasonal results by water year type are shown below.	Modeling under Action 5 considers more than merely OMR. The State Board does not provide additional lines of evidence to support the assertion of underestimated effects.

Number	Comment	Response
9	Delta Outflows Several aspects of Action 5 could cause impacts to Delta outflows, on both a seasonal and yearly basis. For example, Action 5 proposes to eliminate the fall X2 component of the Delta Smelt Summer and Fall Habitat Action without any alternative action (such as potential summer habitat actions if supported by science).	The 2024 USFWS Biological Opinion determined that: <i>"The Fall X2 action is not anticipated to have observable effects on Delta smelt survival"</i> and that <i>"since there may be circumstances when measurable benefits could be achieved with outflow augmentations; adaptive experimentation regarding flow pulses in the summer or fall could be helpful."</i> (USFWS 2024, page 135). Reclamation refers State Water Board to the CDFW ITP issued Fall of 2025 where the State did not include the Fall X2 action. State Water Board provides no evidence that summer and fall outflow are an obligation of the CVP and SWP. There is no specific operation proposal to evaluate.
10	And, as noted above, Action 5 assumes the use and approval of TUCPs on a consistent and prolonged basis. Reclamation is already on notice that assuming TUCPs will be requested and granted is inappropriate and unsupported and the State Water Board has consistently raised legal concerns with this assumption during the LTO processes for the Projects. TUCPs are intended for unforeseen, unplanned, urgent emergency circumstances and assuming a chain of discretionary actions that culminates in a state waiver of its legal authorities is not appropriate for long-term operational planning.	Despite advancement in forecasting tools and three decades of new hydrologic information, including two severe multi-year droughts, the State Water Board has consistently not updated D-1641. In order to alleviate the impacts of droughts on communities and protect listed species, Reclamation and DWR have been required to seek multiple TUCPs, each with onerous additional requirements. The assumptions for Action 5 assume the terms of the multiple previous Orders issued by the State Water Board. While past Orders do not guarantee a future decision, they are a reasonable basis for analysis. Reclamation is unaware of the State Water Board repudiating its prior Order. Historically, the State Water Board seeks a determination from the federal fish agencies under their ESA authorities prior to granting a Temporary Urgency Change Order. Waiting until a drought occurs places all agencies under tremendous time pressure. Delays cost valuable water, thus limiting the State's ability to alleviate drought impacts on communities and species. The State's proposed update to the Bay-Delta Water Quality Control Plan would not address the droughts of the last decade nor the month-to-month hydrologic variability ("weather whiplash") that necessitate TUCPs for known hydrologic conditions.

Number	Comment	Response
11	Modeling indicates that action 5 would result in a net average reduction of 290 thousand acre-feet (TAF) of Delta outflow annually which would have significant impacts to native fish species, particularly during dry and critical years when species are already stressed by dry conditions. These changes would also likely affect the implementation of the HRL. The seasonal results by water year type are shown below. However, again, this modeling comparison may significantly underestimate the actual changes in Delta outflows. [Table for Seasonal Difference in Delta Outflow Volumes]	There is no evidence provided by the State Water Board on significant impacts to native fish species or the accuracy of the estimated changes to Delta outflows. The State Water Board continues to modify and recirculate the HRL proposal. Action 5 is consistent with the 2022 MOU signed by the HRL parties.
12	Management of Shasta Reservoir for temperature control and other fisheries purposes is critical for the protection of winter-run Chinook salmon and other California salmon runs and native species on the Sacramento River. Action 5 eliminates important elements of Shasta operations that could weaken protections for native fish species. Specifically, Action 5 eliminates Reclamation's commitment to the Winter-run Action Plan, including its science, fishery actions, infrastructure improvements, and reintroduction efforts to benefit Winter-run as well as the operational and biological goals and objectives that were in the 2024 Proposed Action (PA) for Shasta Reservoir temperature management and operations.	odThe Shasta Framework remains unchanged in Action 5, including the biological goals and objectives. Action 5 includes collaborative real-time groups and increases collaboration by including interested parties. The State Water Board is invited to participate in real-time groups, which includes the management of Shasta Reservoir (Section 11.2.1 Sacramento River Group). Reclamation remains a signatory to the WRAP. The State Water Board however has not signed the WRAP. The incidental take statement for the NMFS 2024 Biological Opinion includes the WRAP, however the effects of WRAP activities are not analyzed in the Biological Assessment nor the Biological Opinion and its implementation would require subsequent consultation.

Number	Comment	Response
13	It also removes the multi-agency Shasta Operations Team (SHOT), which included the State Water Board and fisheries agencies, in favor of a governance framework limited to Reclamation, which would retain sole discretion to determine operations each year. While the 2024 PA described governance as “structured to seek consensus across scientific, technical and policy levels”, Action 5 states that its forums for input “do not make decisions nor seek consensus.” So, Action 5 replaces the prior collaborative multi-agency governance structure with a less collaborative approach to real-time decision making. These changes will likely result in less protective conditions for listed, as well as non-listed species like fall-run Chinook salmon that multi-agency coordination has historically benefited from. Regardless of these changes, Reclamation will still be required to comply with State Water Board Order 90-5 Sacramento River temperature management requirements, including requirements for coordination.	Reclamation determined there is no change in the Proposed Action that would have an effect on the species not considered in the NMFS 2024 Biological Opinion. SWRCB is invited to participate in real-time groups. As the action agency, the responsibility and authority to comply with environmental laws, while meeting the needs of communities to achieve a reasonable balance among competing demands for use of CVP and SWP water, including environmental, water supply, and power generation, rests with Reclamation and DWR. Action 5 relies on decision making among the action agencies and technical input on specific actions described in Section 11.2. Forums are established for the purpose of sharing operational plans via notifications, gathering scientific and commercial data to inform the operation of the CVP and SWP, and for reporting the outcomes of operations. Forums do not make decisions nor seek consensus. Reclamation defers to Order 90-5, which speaks for itself. Reclamation continues to comply with Order 90-5.

Number	Comment	Response
14	Effects on Special-Status Species: Action 5 concludes that it will not result in impacts with a “population level effect” on species. However, these conclusions are not supported. Relative to the 2024 Proposed Action, Reclamation’s assessment indicates that predicted salvage losses under Action 5 would increase for the following species, depending on water year type: • Sacramento River winter-run Chinook salmon (additional loss varies between 8-32%) • Central Valley spring-run Chinook Salmon (additional loss varies between 1-9%) • California Central Valley steelhead (additional loss varies between 5-9%, except in dry years) • Central Valley fall-run Chinook salmon (additional loss up to 5%) Under Action 5, Reclamation’s assessment indicates that mean annual population growth rate for Delta smelt would be reduced in all years and up to 7.5% during wetter water years (Wet and Above Normal) relative to the 2024 Proposed Action (PA). Longfin smelt abundance was predicted to vary, ranging from 1% decrease to 11% increase relative to the 2024 PA, depending on water year type.	The lines of evidence supporting Action 5 show similar route selection and survival for winter-run Chinook salmon. The number of winter-run entering the south Delta is likely to remain the same. Entrainment of winter-run Chinook salmon already present in the South Delta is expected to increase under Action 5. Therefore, for winter-run Chinook salmon that do reach the South Delta, Action 5 may reduce mortality by more rapidly drawing fish into export facilities for salvage instead of leaving them exposed to severely altered hydrodynamics and poor survival conditions in the south Delta. Once juvenile salmon are near the export facility intakes, acoustic tagging studies have shown that entrainment and salvage provide for the highest survival outcomes. Similar effects are anticipated for spring-run, steelhead, and fall-run. As provided in Exhibit 4 of the Sufficiency Review Memo, Action 5 is expected to either increase or be similar to Alternative 2 of the 2024 LTO Final EIS in terms of survival. Additional clarification has been added to this exhibit.
15	Reclamation’s analyses indicate that green sturgeon salvage losses are predicted to be largely unchanged in wet, below normal, dry and critical water years. However, green sturgeon losses under Action 5 in above normal years are estimated to be 20% higher compared to the 2024 PA. Green sturgeon and steelhead are federally listed only, and it is notable that take limits at Project facilities for both species have been recently exceeded. When the take limit for steelhead was exceeded in early 2024, operations were not modified. When the take limit for green sturgeon was exceeded in September 2025, Reclamation proposed an Incidental Take Statement amendment to raise the take limit. These take limit issues further reduce protection for these California species.	The State Water Board is mistaken and the incidental take for steelhead was not exceeded. Reclamation and DWR coordinated with NMFS on green sturgeon through the weekly assessment process. Reclamation is unaware of what proposed incidental take statement amendment the State Water Board references.

Number	Comment	Response
16	In addition to the issues identified above, Reclamation is currently unilaterally making significant changes to long-standing ecological monitoring activities in the Delta. For over 60 years these efforts have been collaboratively managed between state and federal agencies with significant expertise and regulatory responsibilities. Reclamation's changes create concerns about the availability, reliability, and transparency of data used to inform management decisions, including the action 5 changes.	Ecological monitoring is described programmatically in Alternative 2, and retained in Action 5. Reclamation is unaware of what activities the State Water Board is referencing. Reclamation identifies all monitoring activities during the weekly Delta coordination process.
17	In summary, relying on the existing 2024 LTO EIS and biological opinions for proposed Action 5 appears legally unsupported as Action 5: Speculatively relies on TUCPs that are legally unavailable from the State Water Board absent extraordinary state action.	See response to comment 10 above.
18	water supply deliveries under Action 5 are outside the range of the four versions of Alternative 2, the Preferred Alternative, in the LTO EIS	No information was included to suggest Reclamation did not analyze a reasonable range of alternatives and disclose potential impacts. Reclamation is not required to analyze every possible combination of alternatives. Water supply deliveries under Action 5 are expected to be similar or, more often, increase for CVP and SWP water contracts on average compared to the Preferred Alternative (Alt2v3) in the 2024 LTO Final EIS due to reduced weekly restrictions on Delta exports. Water supply deliveries to CVP south of Delta agriculture under Action 5 are within the range analyzed in the 2024 LTO Final EIS (Attachment 1).
19	Does not analyze Action 5 as it relates to potential HRL activities	Action 5 includes the ability for Reclamation to facilitate implementation of the CVP component of the HRL Program, as contemplated in the March 2022 MOU signed by the HRL parties, which included coordination with the State Water Board. For operation under the HRL Program, Reclamation agreed to operate its facilities to maximize the benefits of water contributed by HRL parties including not diverting protected flows and potentially making reservoir releases to advance flow contributions into more favorable times of the year.

Number	Comment	Response
20	Does not analyze or detail potential impacts of inconsistent operations between the SWP and CVP on water quality and species protection.	Action 5 relied upon multiple lines of evidence. No additional information was included to suggest Reclamation did not analyze a reasonable range of alternatives and disclose potential impacts. Reclamation is not required to analyze every possible combination of alternatives. Reclamation has made all of its modeling available should parties desire to explore additional options under Adaptive Management.
21	Does not adequately analyze the scope or consequences of likely increased adverse impacts on listed species and whether this is reasonably expected, directly or indirectly, to diminish species' numbers, reproduction, or distribution so that the likelihood of both survival and recovery is appreciably reduced.	Models and metrics are published and publicly available in literature. Action 5 relies on multiple lines of evidence that are weighted consistent with the methodology described in NMFS 2024 Biological Opinion. The comment does not include alternative best available science for Reclamation to consider. Action 5 operations do not appreciably decrease survival outcomes relative to the 2024 LTO alternatives. If Delta survival is unaffected by Delta operations, the likelihood of species' survival and recovery will not be appreciably reduced.

Table 4. Grassland Water District

Number	Comment	Response
1	In Section 2.5, the Action 5 Operations Plan briefly describes the Shasta Operations Framework in a text box. Under the "Drought" scenario, one of the last listed actions is "Refuges Water Supply Reduction." GWD requests that this shorthand description be changed to: "<u>North of Delta</u> Refuges Water Supply <u>Coordination</u> Reduction." The requested change better reflects the description of refuge operations in the Shasta Operations Framework discussion in Section 2.18 on page 2-10 (on .pdf p. 19), which states that "if conditions remain dry through the fall, Reclamation and USFWS will coordinate on how to address instream flow objectives, lake levels and refuge needs." Our concern with the language in the text box on page 2-6 is that it could be interpreted to apply to all refuges, and it broadly describes water "reductions" even though Reclamation has carefully crafted the Shasta Operations Plan to describe the close coordination that Reclamation undertakes with refuges during drought.	Reclamation coordinated with Grassland Water District and the existing language is acceptable. No changes to the document were made.

Table 5. San Luis & Delta-Mendota Water Authority and the San Joaquin River Exchange Contractors Water Authority

Number	Comment	Response
1	See letter	Reclamation coordinated with CVP contractors and no changes were needed.

Table 6. Sacramento River Settlement Contractors and Tehama-Colusa Canal Authority

Number	Comment	Response
1	See letter	Reclamation coordinated with CVP contractors and no changes were needed.

Table 7. Westlands Water District

Number	Comment	Response
1	See letter	Reclamation coordinated with CVP contractors and no changes were needed.

Attachment 8 – USFWS Amended Incidental Take Statement

Record of Decision

**Long-Term Operation of the Central Valley Project and
State Water Project**



United States Department of the Interior

FISH AND WILDLIFE SERVICE
San Francisco Bay-Delta Fish and Wildlife Office
650 Capitol Mall, Suite 8-300
Sacramento, California 95814



In reply refer to:
2022-0059509

Memorandum

To: Manager, Bay Delta Office, U.S. Bureau of Reclamation, Sacramento, California

From: Project Leader, San Francisco Bay-Delta Fish and Wildlife Office, Sacramento, California

Subject: Amendment to the Incidental Take Statement for the Programmatic Biological Opinion for the Reinitiation of Consultation of the Long-Term Operations of the Central Valley Project and State Water Project

This memorandum transmits the amendment to our incidental take statement (“ITS”) for the November 8, 2024, Programmatic Biological Opinion for the Reinitiation of Consultation of the Long-Term Operations of the Central Valley Project and State Water Project (“CVP BiOp”). On October 27, 2025, we transmitted to you a proposed amendment to the ITS based on your October 7, 2025 transmittal of the Action 5 Operation Plan for the Central Valley Project (“CVP”) and State Water Project (“SWP”) (“Action 5 Operation Plan”). In that transmittal, Reclamation determined that reinitiation of consultation is not required under 50 CFR 402.16 and requested an updated ITS to reflect the proposed modifications to the CVP and SWP operations. We have incorporated minor editorial changes to the October 27, 2025 proposed amendment as mutually agreed upon. The amended ITS is attached.

As a reminder, this amended incidental take statement is effective only upon issuance by Reclamation of a record of decision adopting the operations described in the 2025 Operation Plan. If you have any questions about this matter, please contact me at Donald_Ratcliff@fws.gov or Jana Affonso at Jana_Affonso@fws.gov.

Incidental Take Statement

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without 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 in the definition of “take” in the Act means an act which actually kills or injures wildlife. Such [an] act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering (50 CFR 17.3). Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not the purpose of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of an incidental take statement.

The measures described in the Reasonable and Prudent Measures and Terms and Conditions are non-discretionary and must be undertaken by Reclamation so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, for the exemption in section 7(o)(2) to apply. Reclamation has a continuing duty to regulate the activity covered by this incidental take statement. If Reclamation (1) fails to assume and implement the terms and conditions or (2) fails to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, Reclamation and DWR must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR §402.14(i)(4)].

The Service has determined that the PA presents a mixed programmatic action, as described in the *Consultation Approach* section of this BiOp and defined in 50 CFR 402.02 (i.e., the proposed action includes elements that will not be subject to further section 7 consultation and elements that will be subject to future consultation). Therefore, consistent

with our regulations at 50 CFR 402.14(i)(7), this ITS only covers those standard consultation elements of the PA for which incidental take is reasonably certain to occur. This amended incidental take statement is effective only upon issuance by Reclamation of a record of decision adopting the operations described in the 2025 Operation Plan.

The prohibitions against taking the northwestern pond turtle found in section 9 of the Act do not apply until the species is listed. However, the Service advises Reclamation and DWR to consider implementing the following Reasonable and Prudent Measures. If this conference opinion is adopted as a biological opinion following a listing, the Reasonable and Prudent Measures, with their implementing Terms and Conditions, will be non-discretionary.

a. Amount or Extent of Take

Surrogate Approach

In accordance with 50 CFR 402.14(i)(1)(i), a surrogate may be used to express the amount or extent of anticipated incidental take if the BiOp or ITS describes the causal link between the surrogate and anticipated take, explains why it is not practical to express the amount or extent of anticipated take or to monitor take-related impacts in terms of individuals, and sets a clear standard for determining when the level of anticipated take has been exceeded.

Surrogates are used for this ITS because, as described throughout this BiOp, it is impossible to accurately quantify and monitor the amount or number of individuals that are expected to be incidentally taken as a result of the PA. Large fractions of the incidental take of delta smelt and longfin smelt are not detected, for instance when individuals are eaten by predators in route to the Skinner and Tracy fish facilities, or when they die from predation or other food web-related mechanisms in the low-salinity zone when the projects change Delta outflow. Therefore, using detection in monitoring programs like fish salvage or IEP trawl surveys to quantify the specific anticipated level of incidental take is not a reliable measure. Other relevant factors include the variability associated with the effects of the PA, the relatively low population size of these species, difficulty in detecting individuals

entrained or impinged (of delta smelt and longfin smelt), annual variations in the timing of various parts of the species' life cycles, sheer amount and dispersed nature of the habitat (for croplands utilized by giant garter snake), and variation in how individual animals utilize habitat within the Action Area.

Therefore, the Service is using the ecological conditions associated with take described below as the incidental take surrogates for individual delta smelt, longfin smelt, and giant garter snake.

In the BiOp, the Service has determined that incidental take is reasonably certain to occur as follows:

Delta Smelt and Longfin Smelt

The Service anticipates that the PA will result in the incidental take of individual delta smelt and longfin smelt due to hydrodynamic changes caused by the operation of the CVP and SWP. This includes effects from Delta outflow, the Banks and Jones pumping plants, the Skinner and Tracy fish facilities, and other CVP or SWP water diversion and water distribution systems in the Delta and Suisun Marsh. Regarding the CVP and SWP export of water from the Delta, the Service anticipates take in the form of kill or harm of all delta smelt and longfin smelt within the South Delta affected by water operations and other areas of the Delta where habitat quality is affected by Delta outflow.

Incidental take associated with this action is expected in the following forms: mortality and harm of delta smelt and longfin smelt adults, juveniles, and larvae. It is difficult to determine the number of individuals that could be injured or killed (including harm as a result of significant habitat modification) because free-swimming aquatic animals are difficult to observe in large water bodies and because delta smelt and longfin smelt are relatively rare. The methods used to track these species' status and trends can do so but have considerable statistical uncertainty when it comes to estimates of particular sources of loss like entrainment (Smith 2019; Smith et al. 2020) or flow-related survival (Polansky et al. 2021; Kimmerer and Gross 2022). The Service anticipates injury and mortality of

individual delta smelt and longfin smelt will occur as a result of entrainment and whenever habitat conditions do not support the successful completion of the species' full life cycles.

Take from South Delta Entrainment

The OMR index is an indicator for how export pumping at Banks and Jones Pumping Plants influence hydrodynamics in the South Delta. The Service has determined for the purposes of this BiOp that delta smelt and longfin smelt that enter the Old and Middle river corridors are entrained whether or not they survive long enough to reach the Banks and Jones pumping plants or other South Delta facilities including the fish collection facilities, Clifton Court Forebay, agricultural barriers, and the Rock Slough intake. Adult delta smelt and longfin smelt have substantial capacity to control their distribution in the Bay-Delta. Thus, some adult delta smelt and longfin smelt may 'entrain' themselves during their winter dispersal by cueing on hydrodynamics resulting from the export of water by Banks and Jones Pumping Plants while moving up the San Joaquin River (Gross *et al.* 2021). Delta smelt and longfin smelt larvae have some ability to control their distribution but less than older, more competently swimming life stages, making them more vulnerable to tidal currents and the net displacement (or flow) of water over multiple tidal cycles. Delta smelt and longfin smelt are attracted to turbidity in open-water habitats. The hydrodynamic conditions indexed by net negative flow in Old and Middle rivers can affect the dispersal of turbidity into and through the South Delta. During winter dispersal and spring spawning, when turbidity of more than 12 FNU is present in Old and Middle rivers, adult delta smelt may be more likely to move into these channels, become entrained, and become subject to the reduced quality habitat in the channels, adjoining canals, and associated flooded islands (e.g., Mildred Island) due to operations, or be injured or killed as a result of entering the export facilities. Adult longfin smelt are proportionally less likely than delta smelt to migrate far enough into the South Delta to be entrained. Additionally, entrained adult delta smelt and longfin smelt may spawn in areas where their progeny will be lost to the population due to some unquantifiable combination of predation loss associated with submerged vegetation or eventual transport to the CVP and SWP facilities. The number of

longfin smelt subject to these forms of take is likely to be relatively low given that most individuals spawn in the low-salinity zone.

The conditions in the South Delta that result from net negative flows and elevated turbidity cue movement of adult delta smelt and longfin smelt into the area and can be causally linked to the level of incidental take of individuals and some of their offspring due to entrainment caused by operations. These conditions encompass all areas influenced by the hydrodynamic effects of export pumping at Banks and Jones Pumping Plants, including the other South Delta facilities that do not factor into the OMR index calculation.

As described in the 2025 Operation Plan Section 5.3, the flow at Jersey Point (JPF) provides an indicator of net flows at that location on the San Joaquin River that modify the risk of delta smelt and longfin smelt entrainment regardless of the OMR index. Given a specific OMR index value like -5000 cfs, when the JPF is positive, predicted entrainment from many locations in the Delta is lower than when JPF is negative. The daily JPF net flow is estimated based on San Joaquin River Inflow at Vernalis, Consumnes River Inflow, Mokelumne River Inflow, Calaveras River Inflow, Sacramento River flow passing through the DCC and Georgiana Slough, 65% of in-Delta precipitation, -65% of in-Delta diversions, and -Export Pumping at (Banks + Jones).

Proposed OMR protective measures minimize, but do not eliminate, the likelihood of entrainment. The following thresholds are directly related to the specific ecological conditions in the South Delta that reflect the conditions commensurate with the level of incidental take through entrainment that is anticipated in this BiOp.

The incidental take of delta smelt and longfin smelt will be exceeded if:

- The 14-day average OMR index is more negative than -5,000 cfs and if one of the following measures has been triggered: First Flush Conditions, Longfin Smelt Adult, or Winter-Run Chinook Salmon (per 2025 Operation Plan Section 5.3.1), through the

date that the 3-day average water temperature at Clifton Court Forebay is 77°F (25°C) or June 30, whichever occurs first;

- OR the 14-day average OMR index is more negative than -2,000 cfs for any of the 14 consecutive days (or other magnitude or duration determined through Governance) of the First Flush Action, if triggered (per 2025 Operation Plan Section 5.3.1);
- OR the 14-day average OMR index is more negative than -6,500 cfs during a storm flex operation as described in 2025 Operation Plan Section 5.3.3;
- OR the average OMR index is more negative than -3,500 for any of the 7 days after JPF is < 0 cfs and an assessment indicates adult longfin smelt salvage is on a trajectory to exceed 5% of estimated population abundance and reduced exports will reduce entrainment into the South Delta (per 2025 Operation Plan Section 5.3.2);
- OR the average OMR index is more negative than -3,500 for any of the 7 days after JPF is < 0 cfs and a longfin smelt population model demonstrates a need to reduce entrainment to avoid population decline (per 2025 Operation Plan Section 5.3.2);
- OR the average OMR index is more negative than -3,500 cfs for any of the 7 days after JPF is < 0 cfs, daily average turbidity is ≥ 12 FNU in the OMR corridor, and average water temperatures at Jersey Point or Rio Vista have not exceeded 53.6°F (12°C) consecutively for 3 days (per 2025 Operation Plan Section 5.3.2);
- OR the average OMR index is more negative than -3,500 cfs for any of the 7 days after the onset of delta smelt larval and juvenile spawning, when JPF is < 0 cfs, turbidity is ≥ 12 FNU in the south Delta, and particle tracking modeling indicates that the action would avoid $\geq 5\%$ entrainment of the Delta smelt population at facilities after 30 days;

- The conditions identified as commensurate with the anticipated level of incidental take will be maintained unless postponed or offramped in accordance with Governance procedures described in the 2025 Operation Plan Section 11. If postponed or offramped, the conditions that result will be the ecological condition commensurate with the level of incidental take through entrainment. If the thresholds described above or other thresholds resulting from the Governance procedures described in the PA are met, the amount or extent of the anticipated level of incidental take will be considered exceeded and reinitiation will be required pursuant to 50 CFR 402.16.

Take from North Delta SWP Diversions

The operation of the Barker Slough Pumping Plant can result in predicted entrainment from within Barker and Lindsey sloughs but the hydraulic draw of water from outside of Lindsey Slough is too small or too slow to result in likely fish entrainment. The hydrodynamic conditions created by the Barker Slough Pumping Plant are therefore anticipated to entrain all larval delta smelt and longfin smelt that were spawned only in Barker and Lindsey sloughs. The Service anticipates that incidental take of delta smelt and longfin smelt larvae will occur at the Barker Slough Pumping Plant (BSPP). Incidental take is expected to be low to zero for post-larval life stages since BSPP has positive barrier fish screens making injury or death of adult and juvenile delta smelt and longfin smelt unlikely. However, a small number of larval delta smelt and longfin smelt may be killed through impingement, entrainment, or sediment and aquatic weed removal.

Hydrodynamic conditions related to the rate of diversion at the BSPP influence the likelihood of delta smelt and longfin smelt being drawn into the BSPP. As the diversion rate increases, the likelihood of entrainment into BSPP instead of local agricultural diversions increases. Therefore, the diversion of water at BSPP can be causally linked to the level of incidental take of delta smelt and longfin smelt due to entrainment, impingement, or during sediment and aquatic weed removal caused by operations of the BSPP. The following

thresholds are directly related to the conditions associated with water diversion at BSPP that are commensurate with the maximum level of incidental take anticipated in this BiOp.

The incidental take of longfin smelt will be exceeded if pumping at Barker Slough Pumping Plant exceeds a 7-day average diversion rate of 100 cfs in a Critical or Dry year from January 1 through March 31 (per 2025 Operation Plan Section 5.4).

The incidental take of delta smelt will be exceeded if:

- pumping at Barker Slough Pumping Plant exceeds a 7-day average diversion rate of 100 cfs in a Critical or Dry year from May 1 through June 30 once a 20-mm Survey catch trigger has been met or exceeded (per 2025 Operation Plan Section 5.4);
- OR pumping at Barker Slough Pumping Plant exceeds a 7-day average diversion rate of 60 cfs in a Critical or Dry year from March 1 through April 30 once a 20-mm Survey catch trigger has been met or exceeded (per 2025 Operation Plan Section 5.4).

If the thresholds described above are met, the amount or extent of the anticipated level of incidental take will be considered exceeded and reinitiation will be required pursuant to 50 CFR 402.16.

It is anticipated that the PA will increase the use of Suisun Marsh by delta smelt via the Summer and Fall Suisun Marsh Salinity Control Gate Operation Action, but delta smelt and longfin smelt frequently reside in the larger sloughs of Suisun Marsh and less frequently reside in the marsh's smaller sloughs. The Roaring River Distribution System (RRDS) and the Morrow Island Distribution System (MIDS) are used to deliver fresh water flowing into Montezuma and Suisun sloughs to adjacent wetlands and to drain water off of these wetlands. The use of these distribution systems entrains fish. Thus, the Service anticipates that incidental take of delta smelt and longfin smelt larvae will occur at the RRDS and take of delta smelt and longfin smelt larvae, juveniles, and adults will occur at the MIDS, which is

unscreened. Incidental take for both species is expected to be low. The RRDS intake has positive barrier fish screens which limit fish loss and the approach velocity toward these screens is generally low. Therefore, the presence of the screen and approach velocities maintained can be causally linked to incidental take from operation of the RRDS. The MIDS is unscreened, and because of that approach velocities vary more than at RRDS. The diversion of water into MIDS and the distribution of that water onto adjacent wetlands can be causally linked to take of delta smelt and longfin smelt due to entrainment and subsequent stranding into canals and shallow wetlands where the chance of survival is much lower. The RRDS has not been considered a major source of fish loss since it was screened and the MIDS is likewise not known to be a major source of smelt entrainment. There has been no proposed change to the use of either RRDS or MIDS which have been in operation since 1979 or 1980.

The following specific ecological conditions reflect the conditions commensurate with the level of incidental take through operation of RRDS and MIDS that is anticipated in this BiOp.

- Approach velocity at the screens is limited to 0.2 ft/second except during mid-September – mid-October, when RRDS diversion rates are controlled to maintain a maximum approach velocity of 0.7 ft/second for fall flood up operations.
- There will be no change to the general timing and quantities of water diverted into and through MIDS.

If the conditions described above are not maintained, the amount or extent of the anticipated level of incidental take will be considered exceeded and reinitiation will be required pursuant to 50 CFR 402.16.

Take from Far-field Effects of Operations

There will be areas outside of the influence of entrainment in the range of delta smelt and longfin smelt that will be affected by reduced habitat quality resulting from operations of

the CVP and SWP. The ecological conditions resulting from the hydrodynamic effects of the operations and diversion of freshwater flows include reduced size and extent of low-salinity habitat in the spring and summer. Implementation of the Summer and Fall Suisun Marsh Salinity Control Gate Operation Action, which includes operations of the SMSCG in the summer and maintaining X2 at 80 km in the fall (per BA Section 3.7.6), will result in an ecological condition that includes improved habitat quality and quantity in the area of low-salinity habitat. Additional studies as proposed under adaptive management for the Summer-Fall Habitat Action will be implemented and may result in operational changes that maintain or improve the habitat conditions in low-salinity habitat that would be expected from implementing the Summer-Fall Habitat Action as described in BA section 3.7.6. Injury and mortality of sub-adult delta smelt and longfin smelt are anticipated to be minimized by these measures as described in the PA. Although some longfin smelt are likely to reside near the low-salinity zone in the summer and fall, many are expected to reside more seaward given their increased tolerance to salinity as compared to delta smelt. Therefore, the number of longfin smelt subject to injury or mortality from reduced habitat quality and quantity is expected to be relatively low.

If the SMSCG are not operated as described in the 2025 Operation Plan Section 5.10, the amount or extent of the anticipated level of incidental take will be considered exceeded and reinitiation will be required pursuant to 50 CFR 402.16.

Giant Garter Snake

The Service anticipates incidental take of GGS is reasonably certain to occur. The Service is unable to quantify the exact number of snakes that could be affected as a result of the PA. The Action Area with regard to GGS is thousands of acres and it would be impossible to know when and where or how many GGS would be present within the Action Area when water reductions are implemented. GGS are secretive, cryptic, and highly sensitive to human activity. They are extremely difficult to detect unless observed undisturbed at a distance. In instances in which the total number of individuals anticipated to be taken cannot be determined, the Service may use the amount of habitat impacted as a surrogate.

Since take is expected from effects to habitat through cropland idling/shifting resulting in less water in aquatic habits for the GGS to utilize for their essential behaviors such as feeding, breeding, and sheltering, the quantification of amount of habitat affected becomes a direct surrogate for all the individual GGS within that habitat.

The Service anticipates that an annual maximum amount of rice acreage to be fallowed will be 83,333 acres during the first ten years of water reductions caused by implementation of the Shasta Framework (2025-2035) and 16,667 acres during the following ten years (2035-2045). The total number of actual acres of croplands that would be idled/shifted is unquantifiable based on the information that Reclamation provided. Not all of the habitat within the Action Area are occupied nor do all of the properties subject to water reductions have known GGS occurrences within or near their properties. GGS also use the linear features of irrigation canals primarily as their preferred habitat as opposed to the large open acreages of the shallow water environment of a rice field. The Service anticipates that only a fraction of the total acreages that may be fallowed would result in effects to GGS. These water reduction actions will only occur in critical water year types, so not all years will be affected by crop idling/shifting. The action will result in the loss of an undetermined number of individual snakes through increased mortality levels of adults and juveniles due to decreased prey availability, reduced reproduction by snakes, and/or mortality of snakes due to predation as they may move out of areas subject to cropland idling/shifting. This level of incidental take will be considered exceeded, and reinitiation will be required pursuant to 50 CFR 402.16, if the amount of rice acreage fallowed as a result of implementation of water reductions under the Shasta Framework exceeds 83,333 acres in any year between 2025-2035, and/or if the amount of rice acreage fallowed exceeds 16,667 acres in any year between 2035-2045.

Northwestern Pond Turtle

The Service anticipates that incidental take of the northwestern pond turtle will be difficult to detect because of their life history. Northwestern pond turtles can be difficult to locate due to their cryptic appearance. Finding a dead or injured individual is unlikely due to not

being able to access locations where carcasses may end up, and scavengers eating the carcasses. Losses of northwestern pond turtles may also be difficult to quantify due to the lack of information on how they are affected by the PA, random environmental events, changes in hydrology, and/or additional environmental disturbances. However, while it will not be possible to detect all turtles taken, we expect that monitoring during implementation of activities within northwestern pond turtle habitat will result in detection of some individuals that can be moved from harm's way and some individuals that are killed or injured. Turtles that are relocated will be subject to sublethal and potentially lethal take associated with capture. Therefore, the Service anticipates that all northwestern pond turtles within the Action Area may be subject to incidental take in the form of harassment. In addition, the Service anticipates that no more than ten (10) northwestern pond turtles will be subject to incidental take in the form of death, injury, or harm each calendar year, and not more than fifty (50) every 10 years.

Given the difficulty in detecting dead or injured individuals, if more than two (2) dead or injured northwestern pond turtles are reported in a calendar year, or if more than ten (10) dead or injured northwestern pond turtles are reported over 10 years, the anticipated level of incidental take will be considered exceeded and reinitiation will be required pursuant to 50 CFR 402.16.

1. Effect of the take

In the accompanying biological opinion, the Service determined that the level of anticipated take is not likely to result in jeopardy to the delta smelt, longfin smelt DPS, northwestern pond turtle, and giant garter snake.

2. Reasonable and Prudent Measures

The Service has determined that the following reasonable and prudent measures are necessary and appropriate for the delta smelt, longfin smelt, northwestern pond turtle, and giant garter snake:

1. Reclamation and DWR shall minimize the impact of incidental take of delta smelt and longfin smelt from operations of the CVP and SWP.
2. Reclamation and DWR shall minimize the impact of the of incidental take of delta smelt from operations of the Bay-Delta Division.
3. Reclamation and DWR shall minimize the impact of the incidental take of northwestern pond turtles from operations of the CVP and SWP.
4. Reclamation shall minimize the impact of incidental take of giant garter snakes from operations of the Shasta Division.
5. Reclamation and DWR shall monitor and report the amount and extent of take of delta smelt, longfin smelt, and northwestern pond turtle to the Service. Reclamation shall monitor and report the amount and extent of take of giant garter snake to the Service.

3. Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, Reclamation and DWR shall comply with the following terms and conditions, which implement the reasonable and prudent measures described above and include required reporting/monitoring requirements. These terms and conditions are nondiscretionary.

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

- a. Reclamation and DWR shall implement the proposed operational measures as described in the PA.
- b. Reclamation shall document and report operational decisions to the Service prior to implementation that are determined through the Governance process in the 2025 Operation Plan. The documentation shall include any assessments prepared, supporting

data, environmental and biological rationale, and a description of the timeframe and the OMR index that would occur.

- c. DWR, in coordination with Reclamation, the Service, NMFS, and CDFW shall develop a Standard Operating Procedures document for the operation of diversions into the Roaring River Distribution System. This document shall demonstrate how RRDS is operated to maintain specified approach velocities. This document shall be finalized before the 2025 fall flood up season.

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

- a. Reclamation shall continue to support development of the Delta Smelt Supplementation Program. This support includes:
 - i. Assisting the Service in development of a Hatchery and Genetic Management Plan (HGMP) that will provide a detailed overview of the Delta Smelt Supplementation Program's operational components for each stock captively reared at a facility. Final review and approval of the initial HGMP will be completed by the Service. The HGMP is intended to be a "living document" that will guide sound hatchery management activities for delta smelt supplementation ensuring the well-being and caretaking of the captive delta smelt broodstock. The HGMP will document the actions being taken such as husbandry techniques, fish health, nutrition, spawning methods, behavior, handling, and transport and release strategies. Revisions to the HGMP will be coordinated with the Service and informed by the Culture and Supplementation of Smelt (CASS) group to review program success and critical actions that require undertaking including: production numbers, genetically sound management, revealing new information from monitoring and research that lead to improving hatchery practices, review of previous propagation efforts, direction of the program into new locations and/or continued releases in current

planting areas, and other monitoring results. Effort will be put into rebuilding the natural population through the broodstock collections and taking a safeguard against extinction approach to build population numbers, genetically link broodstock to the wild population, and guard against catastrophic failure.

- ii. Minimizing impacts to delta smelt during the capture, transport, spawning, rearing, and release phases of the broodstock development process.
- iii. Continuing to support studies that evaluate post-release survival and recruitment which are critical to understanding the success of the Delta Smelt Supplementation program to offset loss of individuals from operations of the SWP and CVP.
- iv. Working with the Service to identify and design compliance and effectiveness monitoring tools, which may include life cycle models and the more traditional in-water monitoring methodologies, to evaluate the Delta Smelt Supplementation Program accomplishments that are expected to occur.
- v. Preparing reports in collaboration with the Service, and other CASS members, on an annual frequency regarding Delta Smelt Supplementation Program evaluations, upcoming activities, accomplishments, lessons learned, and areas to adaptively manage to further achieve the goals and objectives of the program. All final reports shall be provided in electronic format to the Service.
- vi. In a coordinated manner with the Service, securing additional infrastructure (space, tanks, laboratory supplies and equipment, etc.) as

necessary, to ensure the broodstock program can be maintained securely and successfully to meet production targets identified in the PA.

- b. Reclamation and DWR shall report to the Service annually on the status of the construction, protection, and management of the 8,000 acres of tidal habitat restoration projects implemented in the Delta to reduce the food availability stressor for the benefitted listed fishes, including delta smelt.

The following terms and conditions implement reasonable and prudent measure 3:

- a. Reclamation and DWR will report any northwestern pond turtles identified in the Action Area to the Service within 72 hours and reported to CNDDDB.
- b. If northwestern pond turtle is observed to be in harm's way within the Action Area, qualified Reclamation or DWR staff may move the turtle to the nearest aquatic habitat and notify the USFWS within 72 hours of event.
- c. Reclamation and DWR will report any turtle carcasses found in and around the CVP and SWP facilities, as well as location of the remains to the Service for identification within 72 hours to better understand the interaction of the PA with northwestern pond turtle.
- d. Reclamation and DWR staff will observe posted speed limits on roads used to access facilities to reduce the likelihood of vehicle strikes.

The following terms and conditions implement reasonable and prudent measure 4:

- a. Reclamation will monitor the GGS response to crop idling/shifting which will include annual sampling of GGS within the Action Area with focuses on GGS occupancy and distribution. Measures should be comparable to research that has been ongoing since 2015. Reclamation will provide the results of the proposed monitoring and snake detections to the Service on an annual basis.

The following terms and conditions implement reasonable and prudent measure 5:

- a. Reclamation will provide a report annually to the Service which describes implementation of real-time operations of Old and Middle River Management/Seasonal Operations. This report shall include information on environmental conditions, flows, temperature, salinity, turbidity, fish and other biotic monitoring, species distribution, delta smelt and longfin smelt salvage, fish genetic identification, fish condition, and other parameters as agreed to in coordination with the Service. This report will describe implementation and/or non-implementation of the proposed OMR protection measures. If any measures were not implemented as described in the PA, a description of why the measure was modified or not implemented will be provided in the report.
- b. Reclamation and DWR shall report to the Service on the results of the planning, structured decision making, and implementation of the Summer and Fall Suisun Marsh Salinity Control Gate Operation Action. This reporting shall include details regarding how and if the SMSCG were operated. This report shall be submitted to the Service annually no later than July 31 of the following year.
- c. For all lands subject to cropland idling/shifting due to water reductions caused by implementation of the Shasta Framework, Reclamation will request from the Sacramento River Settlement Contractors information about acreages and locations that were fallowed as a result of water reductions. If this information is provided, Reclamation will submit the information to the Service.

Reporting Requirements

In order to monitor whether the amount or extent of incidental take anticipated from implementation of the PA is approached or exceeded, Reclamation shall adhere to the following reporting requirements. Should the anticipated amount or extent of incidental take be exceeded, Reclamation must reinitiate formal consultation in accordance with 50 CFR 402.16.

1. Comply with reporting requirements included in the above Terms and Conditions.
2. The Service must be notified within 24 hours of the finding of any injured or dead delta smelt, longfin smelt, northwestern pond turtle, or giant garter snake or any unanticipated damage to its habitat associated with the PA. Notification will be made to the contact below and must include the date, time, and precise location of the individual/incident clearly indicated on a U.S. Geological Survey 7.5 minute quadrangle or other maps at a finer scale, as requested by the Service, and any other pertinent information. When an injured or dead individual is found, Reclamation (for delta smelt, longfin smelt, northwestern pond turtle or giant garter snake) and DWR (for delta smelt, longfin smelt, or northwestern pond turtle) shall follow the steps outlined in the Disposition of Individuals Taken section below.
3. Sightings of any listed or sensitive animal species shall be reported to the Service and CNDDDB (<https://www.wildlife.ca.gov/Data/BIOS>).

Disposition of Individuals Taken

Injured or dead delta smelt or longfin smelt observed in salvage should be preserved in a container of at least 70% Ethanol containing a paper with the date and time when the animal was found, fork length, the location where it was found, and the name of the person who collected the specimen. The preserved specimens are then to be evaluated by an onsite Service-approved biologist who verifies species identification and examines the fish for reproduction maturity and stage. A second fish identification verification is provided by staff of the CDFW or alternatively DWR or Reclamation staff, if needed. Fish specimens confirmed as delta smelt or longfin smelt must be stored until custody is transferred to the CDFW for archiving. Annually, a catalog of archived samples transferred from Reclamation and DWR salvage facilities will be reported.

Injured listed species must be cared for by a licensed veterinarian or other qualified

person(s), such as a Service-approved biologist. Dead individuals must be sealed in a resealable plastic bag containing a paper with the date and time when the animal was found, the location where it was found, and the name of the person who found it, and the bag containing the specimen frozen in a freezer located in a secure site, until instructions are received from the Service regarding the disposition of the dead specimen. The Service contact person is the Assistant Field Supervisor of the Endangered Species Division at (916) 930-2664.

For all required reporting outlined above, reports will be provided to the Service's San Francisco Bay-Delta Fish and Wildlife Office. Reports will be provided electronically to the Assistant Field Supervisor of the Endangered Species Division unless directed otherwise.

Attachment 9 – Essential Fish Habitat Consultation

Record of Decision

**Long-Term Operation of the Central Valley Project and
State Water Project**

Long-Term Operation – Essential Fish Habitat

Essential Fish Habitat

Central Valley Project, California

Interior Region 10 – California-Great Basin



ESSENTIAL FISH HABITAT ASSESSMENT

1 Introduction and Background

Essential Fish Habitat (EFH) is designated for commercially fished species under the Magnuson-Stevens Fishery Conservation and Management Act Public Law 94-265 as amended by the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act (P.L. 109-479) (Magnuson-Stevens Act). The Magnuson-Stevens Act requires federal Fishery Management Plans (FMP), developed by National Oceanic Atmospheric Administration's National Marine Fisheries Service (NMFS) and the Pacific Southwest Fisheries Management Council, to describe the habitat essential to the fish being managed and to describe threats to that habitat from both fishing and non-fishing activities. Pursuant to section 305(b) of the Magnuson-Stevens Act (16 U.S.C. 1855(b)), federal agencies are required to consult with NMFS on actions that may adversely affect EFH for species managed under the FMPs. This section also describes NMFS' role to recommend measures that can be taken by the action agency to conserve EFH in the action area.

The action area (Figure 1) for this consultation includes: (1) Shasta and Keswick reservoirs, and the Sacramento River from Keswick Reservoir downstream to and including the Sacramento–San Joaquin Delta (Delta); (2) Whiskeytown Reservoir, and Clear Creek from Whiskeytown Reservoir to its confluence with the Sacramento River; (3) Folsom Reservoir, Lake Natoma, and the American River from Lake Natoma downstream to its confluence with the Sacramento River; (4) New Melones Reservoir, and the Stanislaus River from New Melones Reservoir to its confluence with the San Joaquin River; (5) San Joaquin River from the confluence of the Stanislaus River downstream to and including the Delta; and (6) San Francisco Bay and Suisun Marsh.

The action area encompasses designated management units and FMPs on EFH for Pacific Coast Salmon (Figure 2), Coastal Pelagic Species (Figure 3), and Pacific Coast Groundfish (Figures 4). For Pacific Coast Salmon, the analysis is informed by the species and critical habitat analyses for listed salmon.

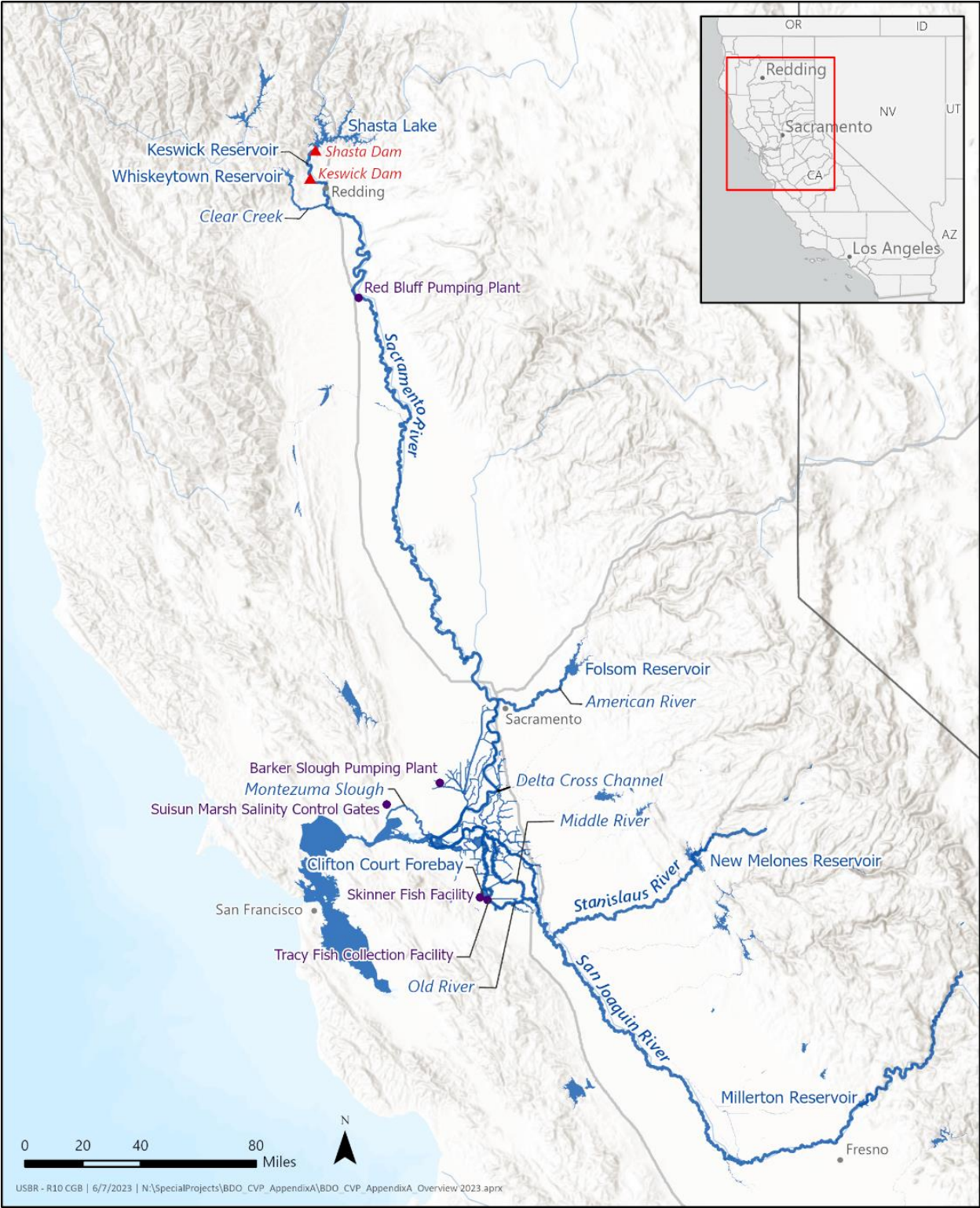
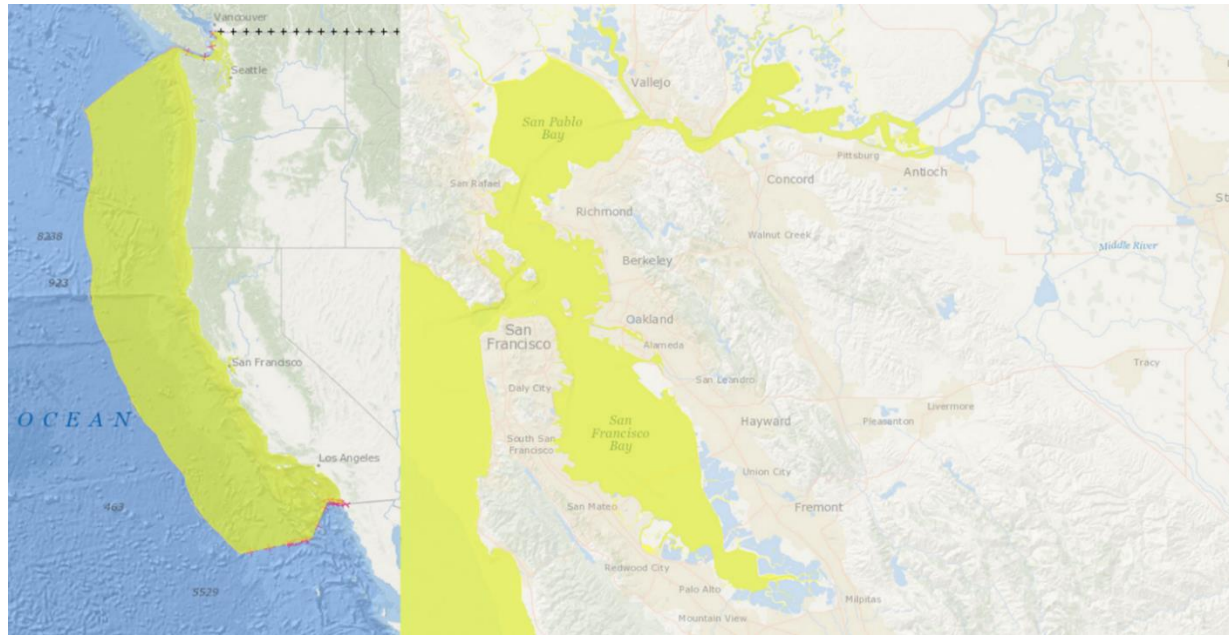


Figure 1. Action Area for Long-Term Operation of the Central Valley Project and State Water Project.

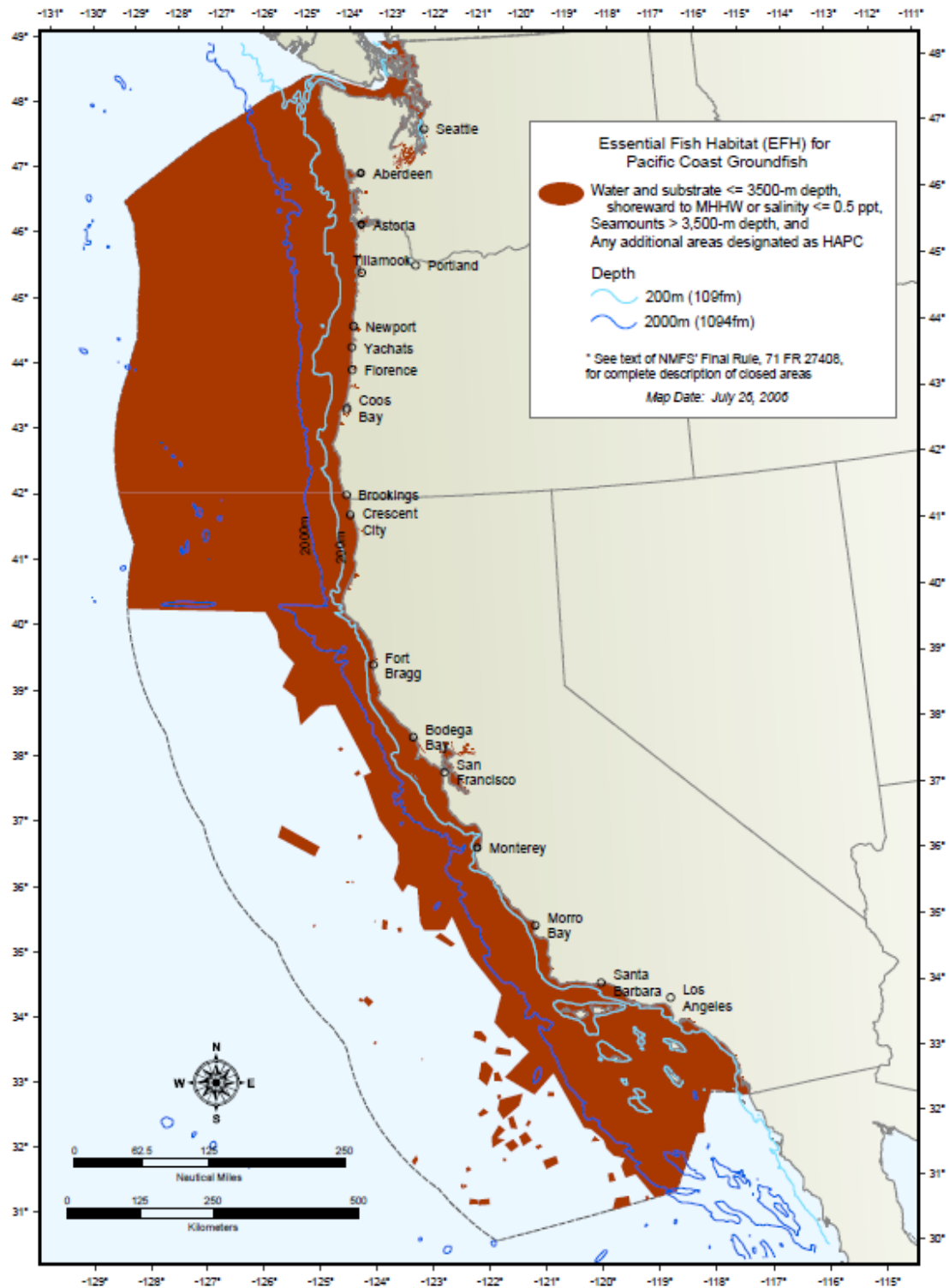


Figure 2. Essential Fish Habitat for Pacific Coast Salmon



Source: <https://www.habitat.noaa.gov/protection/efh/efhmapper/> Accessed: December 20, 2018. Note: Left map shows full extent of Coastal Pelagic Species EFH; right map includes main portion of EFH in the San Francisco Bay-Delta (there is no EFH in the Lower Klamath River, so that area is not included).

Figure 3. Essential Fish Habitat for Coastal Pelagic Species in the vicinity of the Action Area



Source: https://www.westcoast.fisheries.noaa.gov/publications/gis_maps/maps/groundfish/map-gfish-efh.pdf
 Accessed: December 19, 2018.

Figure 4. Essential Fish Habitat for Pacific Coast Groundfish

There are a number of species included in the management units that could be present in the

action area. The analyses below focus on species in the action area that could be affected by the Proposed Action, including: (1) Pacific Coast Salmon: Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon and fall-run/late fall-run Chinook salmon; (2) Coastal Pelagic Species: Northern anchovy; and (3) Pacific Coast Groundfish: starry flounder.

Each management unit has an FMP. Pacific Coast Salmon EFH includes the entire action area. Coastal Pelagic Species EFH includes the action area upstream to the western Delta (lower Sacramento and San Joaquin rivers) (Figure 3). Pacific Coast Groundfish EFH includes San Francisco Bay and Suisun Bay, but not the legal Delta (Figure 4).

The objective of this EFH assessment is to determine whether the operations of Reclamation's Project under the Proposed Action may adversely affect designated EFH for Pacific Coast Salmon, Coastal Pelagic Species, and Pacific Coast Groundfish. Adverse effect means any impact that reduces quality and/or quantity of EFH. Adverse effects may include direct or indirect physical, chemical, or biological alterations 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 and/or quantity of EFH.

1.1 Essential Fish Habitat

The Magnuson-Stevens Act clarifies that EFH *means* those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (50 CFR part 600). For the purpose of interpreting the definition of EFH, "waters" include aquatic areas and their associated physical, chemical, and biological properties that are used by fish, and may include areas historically used by fish where appropriate; "substrate" includes sediment, hard bottom, structures underlying the waters, and associated biological communities; "necessary" means habitat required to support a sustainable fishery and a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers a species full life cycle. The following components of EFH must be adequate for spawning, rearing, and migration:

- Substrate composition
- Water quality
- Water quantity,
- Depth and Velocity
- Channel gradient and stability
- Food
- Cover and habitat complexity
- Space
- Access and passage
- Habitat connectivity

1.1.1 Essential Fish Habitat Analytical Approach

The analysis of EFH focuses on three management units represented by FMPs (NMFS 2017): Pacific Coast Salmon, Coastal Pelagic Species, and Pacific Coast Groundfish. The analyses below focuses on species that are likely to be abundant (relative to other species within the management unit) in the main portion of the action area that could be affected by the Proposed Action: (1) Sacramento River winter-run Chinook salmon; (2) Central Valley spring-run Chinook salmon; (3) fall-run/late fall-run Chinook salmon; 4) Northern anchovy; and (5)

starry flounder.

For Pacific Coast Salmon, the analysis is informed by the species and critical habitat analyses for listed salmon and is augmented by analysis of potential effects to unlisted Central Valley fall-run/late fall-run Chinook salmon ESU. The analysis of potential effects to Coastal Pelagic Species focuses on Northern anchovy as it is the main representative of that group that could be affected by the Proposed Action. Similarly, the analysis of potential effects to Pacific coast groundfish focuses on starry flounder.

Within the areas designated as EFH, there are concentrated habitats that provide important ecological functions called Habitat Areas of Particular Concern (HAPC). The Fisheries Management Councils may designate a specific habitat based on one or more of the following criteria: importance of the ecological function provided by the habitat; extent to which the habitat is sensitive to human-induced environmental degradation; whether, and to what extent, development activities are, or will be, stressing the habitat type; and rarity of the habitat type.

The HAPC designation does not necessarily confer additional protection or restrictions upon an area but helps prioritize and focus conservation efforts. Although these habitats are particularly important for healthy fish populations, other EFH areas that provide suitable habitat functions are also necessary to support and maintain sustainable fisheries and a healthy ecosystem. HAPC can be geographically grouped by managed species to better describe needs/uses of these sensitive habitats.

Potential effects of the Proposed Action to designated HAPC are also considered, namely complex channels and floodplain habitats, thermal refugia, spawning habitat, estuaries, and marine and estuarine submerged aquatic vegetation (NMFS 2017, p.1210).

1.1.2 Pacific Coast Salmon Habitat Requirements for Essential Fish Habitat

All evolutionarily significant units of Chinook salmon in the Central Valley (Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, and fall-run/late fall-run Chinook salmon) are managed under the Pacific Coast Salmon FMP, and all occur within the action area. Pacific Coast Salmon, requirements for EFH in the action area are informed by the listed species and critical habitat analyses for winter-run and spring-run Chinook salmon and is augmented by analysis of potential effects to unlisted Central Valley fall-run/late fall-run Chinook salmon ESU.

The FMP for Pacific Coast Salmon identifies the anadromous rivers of the Central Valley and the Delta and Bay as EFH, which consists of four major components: (1) spawning and incubation habitat; (2) juvenile rearing habitat; (3) juvenile migration corridors; and (4) adult migration corridors and adult holding habitat (Pacific Fishery Management Council 2014). Additionally, the action area contains the following designated HAPC: (1) Complex Channels and Floodplain Habitats – habitat degraded from historical conditions; (2) Thermal Refugia – habitat below the dams is dependent on cold water releases from reservoirs for listed anadromous fish; and (3) Spawning Habitat – habitat below the dams are dependent on injected gravel to provide for blocked gravel recruitment (4) Estuaries – flow and salinity patterns affected, and (5) Marine and Estuarine- Submerged Aquatic Vegetation.

Chinook salmon EFH for freshwater habitats consists of four major components: (1) spawning and incubation; (2) juvenile rearing; (3) juvenile migration corridors; and (4) adult migration

corridors and holding habitat. The freshwater EFH depends on lateral (e.g., floodplain, riparian), vertical (e.g., hyporheic) and longitudinal connectivity to create habitat conditions for spawning, rearing, and migration including: (1) water quality (e.g., dissolved oxygen, nutrients, temperature, etc.); (2) water quantity, depth, and velocity; (3) riparian-stream-marine energy exchanges; (4) channel gradient and stability; (5) prey availability; (6) cover and habitat complexity (e.g., large woody debris and aquatic and terrestrial vegetation, etc.); (7) space; (8) habitat connectivity from headwaters to the ocean (e.g., dispersal corridors, floodplain connectivity); (9) groundwater-stream interactions; and (10) substrate composition.

The important elements of Chinook salmon estuarine and marine EFH factors are: (1) estuarine rearing; (2) ocean rearing; and (3) juvenile and adult migration. The critical features of these habitats are good water quality, cool water temperatures, abundant prey species and forage base, 4) connectivity with terrestrial ecosystems and 5 adequate depth and habitat complexity including marine vegetation and algae in estuarine and near-shore habitats (Pacific Fishery Management Council 2014). Overall, Chinook salmon marine distributions are extensive and vary seasonally and interannually (Figure 5).

Stage - EFH Data Level ¹	Duration or Age	Diet/Prey	Season/Time	Location	Water Column	Bottom Type	Oceanographic Features	Other
Eggs EFH Data Level 0-4	50-130 d	Non-feeding stage; eggs consumed by birds, fish, and mammals.	Late summer, fall, and winter	Intragravel in stream beds	20-80 cm gravel depth; 15-700 cm water depth	Medium to coarse gravel	NA	DO < 2 mg/l lethal, optimum > 8 mg/l; Temperature 0-17 °C, optimum 5-14 °C; Water velocity 15-190 cm/s
Larvae (alevins) EFH Data Level 0-4	50-125 d until fry emerge from gravel	Non-feeding stage; Alevins consumed by birds, fish and mammals	Fall, winter, and early spring	Intragravel until fry emergence	20-80 cm gravel depth; 15-700 cm water depth	Medium to coarse gravel	NA	DO < 2 mg/l lethal, optimum > 8 mg/l; Temperature 0-17 °C, optimum 5-14 °C; Water velocity 15-190 cm/s
Juveniles (freshwater) EFH Data level 0-4	days-yrs	Insect larvae and adults, plankton (e.g., Daphnia)	Year-round, depending on race	Streams, lakes, sloughs, rivers	0-120 cm	Varied	NA	DO lethal at <2 mg/l, optimum at saturation; Temperature 0-25 °C, optimum 12-14 °C; Salinity < 29 ppt
Juveniles (estuary and oceanic) EFH Data Level 0-3	6-months to 2 yrs	Estuary: insects, copepods, polychaetes euphausiids, amphipods decapod larvae, fish, squid, crabs,	Estuary and Ocean: year-round	BCH BAY, IP, ICS, OCS	P, N, SD/SP 30-80 m preferred depth	All bottom types	Estuarine, littoral then more open water, UP, F, CL, G	DO lethal at <2 mg/l, optimum at saturation; Temperature 0-26 °C, optimum 12-14 °C; Salinity sea water
Adults EFH Data Level 0-2	2-8 yrs of age from egg to mature adult	Fish, squid, euphausiids, amphipods, and copepods, decapods	Spawning: July-Feb. Non-spawning: Year round	Oceanic to nearshore migrations, spawn in freshwater	P, N, SD/SP	NA	Different stock groups have specific oceanic migratory patterns	DO Preferred >5 mg/l, optimum at saturation; Temperature 0-26 °C; optimum <14 °C

Primary sources: Healey 1991. Bjorn and Reiser 1991. Myers *et al.* 1998. NOAA 1990. Fisher and Pearcy 1995. Spence *et al.* 1996. Aitkin 1998. McCullough *et al.* 2001; Kaeriyama *et al.* 2004. Beamer *et al.* 2005. Brennan *et al.* 2004. Sweeting *et al.* 2007. Daly *et al.* 2009. Duffy *et al.* 2010.

Figure 5. Chinook salmon habitat use by life-history stage.

1.1.3 Coastal Pelagic Species Habitat Requirements for Essential Fish Habitat

EFH for coastal pelagic species is described in Amendment 8 to the Coastal Pelagic Species FMP and explains the habitat requirements of five pelagic species: Northern anchovy, Pacific sardine, Pacific (chub) mackerel, jack mackerel and market squid. These four finfish and market squid are treated as a single species complex because of similarities in their life histories and habitat requirements.

The overall extent of coastal pelagic EFH is based on a thermal range bordered by the geographic area where coastal pelagic species occur at any life stage, where coastal pelagic species have occurred historically during periods of similar environmental conditions, or where environmental conditions do not preclude colonization by coastal pelagic species. Species diversity and abundance declines on an upstream gradient as determined by the tolerance of individual species for low and variable salinity conditions.

Coastal pelagic species (Northern anchovy, sardines, and jack mackerel) EFH within the action area is found between Chipps Island in the west Delta and the Golden Gate Bridge. The Northern anchovy are the most widespread coastal pelagic species in the action area, occurring in all estuarine and marine habitats between Chipps Island and the Golden Gate Bridge. With the exception of active spawning and egg incubation in the Suisun Bay and Carquinez Strait, all life history stages are likely to occur throughout this component of the action area. In contrast, sardines and jack mackerel are known to occur in the action area but are present only as mature juveniles and adults at relatively low abundance and are restricted to habitats with higher salinity.

1.1.4 Pacific Coast Groundfish Habitat Requirements for EFH

Pacific coast groundfish EFH in the action area includes San Francisco Bay and Suisun Bay, but not the legal Delta. Pacific coast groundfish species occur primarily in higher salinity areas. Species abundance and diversity declines on an upstream gradient as salinity levels decrease, restricting the upstream distribution of most Pacific coast groundfish species to San Pablo and Central Bays (Baxter et al 1999). A handful of Pacific coast groundfish species, including starry flounder, English sole, and brown rockfish, are tolerant of lower and more variable salinity conditions as juveniles and adults. Those species are known to occur at least as far upstream as Suisun Bay and Carquinez Strait. The overall extent of Pacific coast groundfish EFH includes all water and substrate in depths that are less than or equal to 11,483 feet (3,500 meters or 1,914 fathoms) to the mean higher high water level or the upriver extent of saltwater intrusion (upstream area and landward where waters have salinities less than 0.5 ppt), known spawning habitat and thermal refugia, complex channels and floodplains and areas containing estuarine and marine submerged aquatic vegetation.

Pacific coast groundfish EFH in the action area is known to support one species, the starry flounder, which occurs within the designated Estuaries HAPC, either in the water column (as eggs) or over/on gravel, mud, sand, or mixed mud/sand substrates as juveniles/adults (Appendix B.3 of the Groundfish Fishery Management Plan; Pacific Fishery Management Council 2016).

2 Proposed Action

The following Proposed Action does not differ from the Proposed Action in the 2024 Reclamation Biological Assessment. Please refer to Chapter 3 *Proposed Action* of the Long-Term Operation of the Central Valley Project and State Water Project Biological Assessment (Reclamation BA 2024) for all referenced information included in this chapter.

The United States Department of the Interior, Bureau of Reclamation (Reclamation) operates the Central Valley Project (CVP) for the congressionally authorized purposes of (1) river regulation, improvement of navigation, and flood control; (2) irrigation and domestic uses, and fish and wildlife mitigation, protection, and restoration; and (3) power, and fish and wildlife enhancement. The California Department of Water Resources (DWR) operates the State Water Project (SWP) for the primary purpose of water supply deliveries and flood control, and the SWP provides additional benefits including power generation and environmental stewardship. Public Law 99-546 authorized the 1986 Coordinated Operation Agreement (COA), which sets procedures for Reclamation and DWR to share joint responsibilities for meeting Delta standards and other legal uses. Operation of the CVP and SWP also provides recreation and water quality benefits.

The Proposed Action covers CVP service areas and the operation of CVP dams, power plants, diversions, canals, gates, and related Federal facilities located on the watersheds of Clear Creek; the Sacramento, American, Stanislaus, and San Joaquin rivers; and CVP and SWP facilities in the Sacramento–San Joaquin Delta (Delta) and Suisun Marsh and Bay. Figure 6 shows a simplified hydrologic topology and the facilities operated in the Proposed Action.

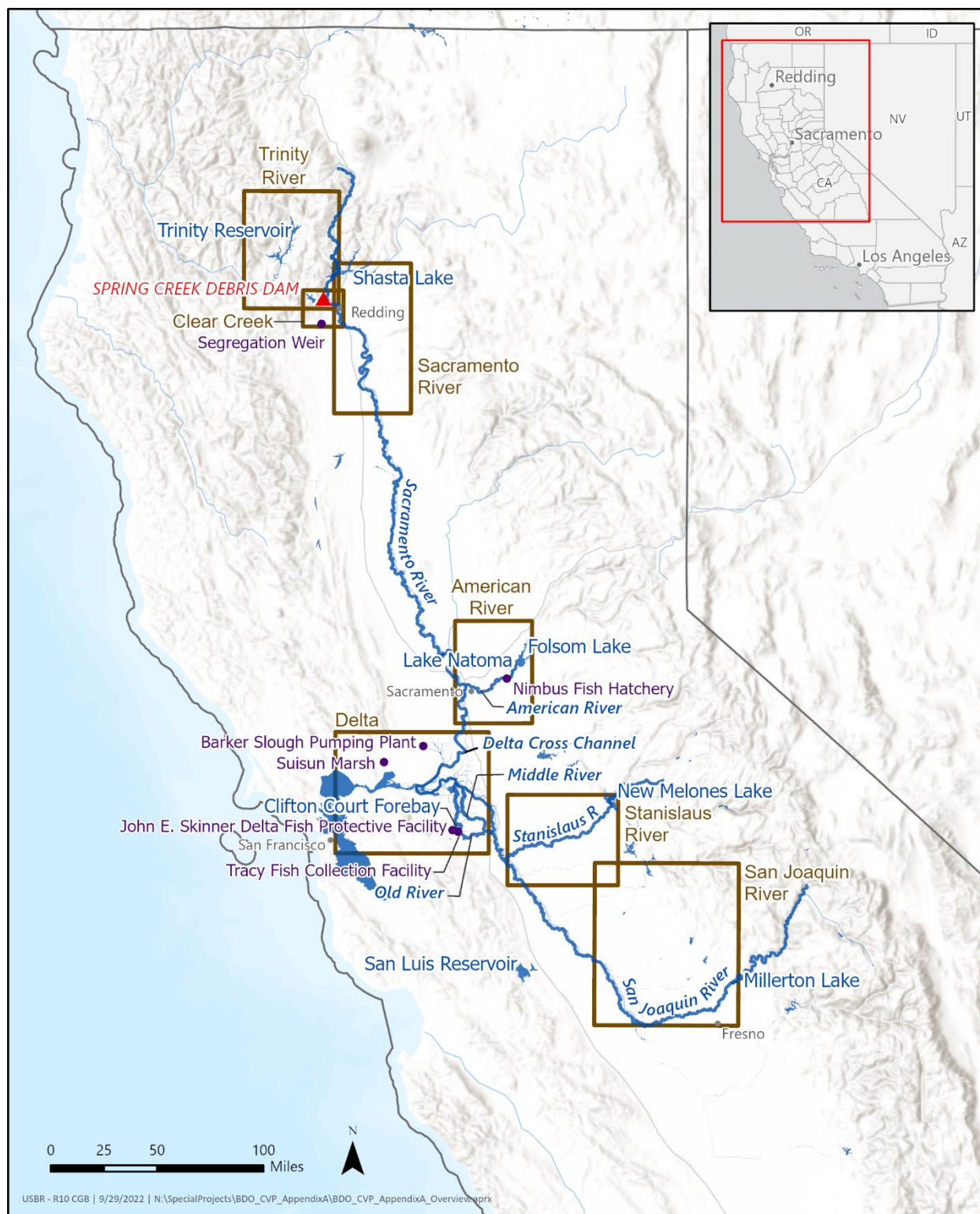


Figure 6. Overview of the Facilities Operated in the Proposed Action

Reclamation plans the operation of the CVP by projecting monthly, on a 12-month lookahead cycle, an “operations outlook” for how available water resources can best meet regulatory requirements and water supply purposes, including considerations for public health and safety, wildlife refuges, senior water rights, water quality, fishery needs, other environmental

requirements, and water service or repayment contracts. In most years, the combination of storage and runoff into CVP reservoirs and the Central Valley, after meeting statutory requirements, is not enough to fully meet CVP water service contractor demands and shortages occur. The water available for delivery to CVP water service contractors is determined by an administrative process, referred to as “allocations,” that considers storage, forecasted inflow, system accretions and depletions, facility limitations, and project requirements under the operations outlook. The estimate of available water supply in the north of Delta system, along with the anticipated quantity of water needed to meet requirements throughout the year (such as State Water Resources Control Board (State Water Board) Water Right Decision 1641 [D-1641]), determine the north of Delta allocations. The estimate of water supply upstream, previously stored water south of the Delta (in San Luis Reservoir), and the potential conveyance capability through the Delta determine south-of-Delta allocations. The Municipal and Industrial (M&I) Water Shortage Policy determines the quantity of water during shortages for M&I and agricultural uses, for those water service and repayment contractors that reference the policy.

No later than February 15, Reclamation makes “Critical Year” determinations for Central Valley Project Improvement Act (CVPIA) wildlife refuges under Refuge Water Supply Agreements and senior water right holders under Sacramento River Settlement Contracts, the San Joaquin River Exchange Contract, and San Joaquin River Settlement Contracts, as described by those contracts and agreements. Depending upon hydrologic conditions, the determination may be updated.

On or about February 20 of each year, Reclamation provides an initial declaration of the water made available under water service contracts, an “Initial Allocation.” Water service contracts generally run from March through February. Beginning in February, Reclamation prepares forecasts of water year runoff using precipitation to date, runoff to date, and snow water content accumulation. Reclamation typically updates forecasts of runoff and operations plans at least monthly through May. If the water initially anticipated to be available is no longer likely to be available, Reclamation provides a reduced allocation and notifies the water service contractors that less water will be available for delivery. This approach is generally based on a 90% forecast and is intended to minimize the frequency of drier or warmer conditions than forecasted and avoid situations where a previous allocation for fisheries and agriculture cannot be supported. Reclamation may execute temporary contracts, not to exceed one year, for delivery of an unusually large water supply not otherwise storable or infrequent and otherwise unmanaged flood flows¹. Reclamation may make water available under the water service or repayment contracts in addition to the allocation and consistent with legal obligations². Under the Accelerated Water Transfer Program, Reclamation may transfer water within counties, watersheds, or other areas of origin without showing it as having been consumptively used or irretrievably lost. Actions to make water available are described in the Seasonal Operations sections for each CVP and SWP facility and modelled to identify changes in river flows.

DWR similarly plans the operations of the SWP by projecting monthly on a 12-month look-ahead cycle. The initial allocation for SWP deliveries is made by December 1 of each year with a conservative assumption of future precipitation to avoid over-allocating water before the hydrologic conditions are well defined for the year. As the water year unfolds, Central Valley

¹ Section 215 of the Reclamation Act

² Paragraph 3(f) of Water Service and Repayment Contracts

hydrology and water supply delivery estimates (Table A Deliveries) are updated using known information and conservative forecasts of future hydrology. DWR may deliver water that is surplus to Table A Deliveries (Article 21 water). Feather River Service Area contracts provide the terms for DWR to avoid interference with claimed senior water rights on the Feather River.

The Fish and Wildlife Coordination Act and the CVPIA, among others, authorize Reclamation to operate, in part, for fish and wildlife project purposes, undertake projects for habitat restoration and facility improvements, and to improve scientific understanding through developing models and supporting data. Following the 1995 Bay-Delta Accord, Reclamation and DWR operate the CVP and SWP to meet certain water quality control plan objectives for Delta outflow and salinity under D-1641. The responsibilities of DWR and Reclamation for senior water rights on the Sacramento River, Feather River, and in the Delta, as well as other regulatory requirements are addressed in the 2018 amended COA.

The Proposed Action is organized as follows:

- **Watersheds:** basin-by-basin description of facilities and the proposed operation for fish and wildlife, water supply, and power generation including proposed conservation measures to promote the recovery and/or to minimize or compensate for adverse effects of operation on federally listed species.
- **Monitoring:** the long-term evaluation of performance to assess overall effectiveness over time. Although each watershed has unique requirements, Reclamation and DWR integrate monitoring across watersheds; therefore, monitoring is organized in a single section.
- **Special Studies:** science-based efforts to address uncertainties in the Proposed Action that affect a reasonable balance among competing demands for water, including the requirements of fish and wildlife, agricultural, municipal, and industrial uses of water, and power contractors to inform subsequent decision making.
- **Drought:** actions to recognize extreme dry conditions may occur during operations. The boom-and-bust nature of California hydrology and the resulting effect on species warrants special consideration for operation during droughts. Although each drought is unique, contingency planning can facilitate a response.
- **Governance:** ongoing engagement by Reclamation and DWR with U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), California Department of Fish and Wildlife (CDFW), interested parties, and the public following completion of Biological Opinions and a Record of Decision.
- **Adaptive Management:** science and decision analytic-based approach to evaluate and improve actions, with the aim to reduce uncertainty over time and increase the likelihood of achieving and maintaining a desired management objective.

Each subsequent watershed section highlights authorizing legislation and requirements under the regulations, contracts, and agreements. Watershed sections identify ongoing efforts in the baseline that mitigate the effects of the operation of the CVP and SWP and for which Reclamation and DWR are not consulting nor reinitiating consultation on as part of this Proposed Action. These programs have existing environmental compliance, agreements, and/or contracts with severable utility. These activities are in the baseline and may mitigate the effects of the operation of the CVP and SWP, some of which have been described in previous

consultations and implemented.

2.1 Sacramento River

Reclamation operates and maintains the Shasta Division of the CVP for flood control and navigation, M&I and agricultural water supplies, fish and wildlife, hydroelectric power generation, Sacramento River water quality, and Delta water quality. Facilities include the Shasta Dam and Power Plant, Keswick Dam and Power Plant, and a Temperature Control Device (TCD) on the Upstream face of Shasta Dam. Flood control operations are based on regulating criteria developed by the U.S. Army Corps of Engineers (USACE) pursuant to the provisions of the Flood Control Act of 1944. Flood control requirements reserve up to 1.3 million acre-feet (MAF) of space (flood control pool) behind Shasta Dam, leaving 3.2 MAF of space (conservation pool) for storage management during the winter flood season. Reclamation generally maintains flows of at least 5,000 cubic feet per second (cfs) at Wilkins Slough year-round and these flows may be reduced in low-storage and/or drought years.

Major facilities in the Sacramento Division of the CVP include the Red Bluff Pumping Plant, Tehama-Colusa Canal, and Corning Canal (Figure 7). Agricultural deliveries provide for the irrigation of over 150,000 acres of land in Tehama, Glenn, Colusa, and Yolo Counties. The Red Bluff Pumping Plant is the intake for the Tehama-Colusa Canal and the Corning Canal. Water is diverted from the Sacramento River approximately 2 miles southeast of Red Bluff through the 2,500 cfs, screened Red Bluff Pumping Plant. In 2011, Reclamation permanently welded the Red Bluff Diversion Dam gates in the open position.

Imports from the Trinity River Basin (Trinity Division) are delivered to the Sacramento River for downstream needs via two pathways: released from Whiskeytown Reservoir to Clear Creek and joins the Sacramento River at the mouth of Clear Creek south of Redding or delivered to Keswick Reservoir through the Spring Creek Tunnel and Power Plant where water mixes with releases from Shasta Reservoir and is released from Keswick Dam.

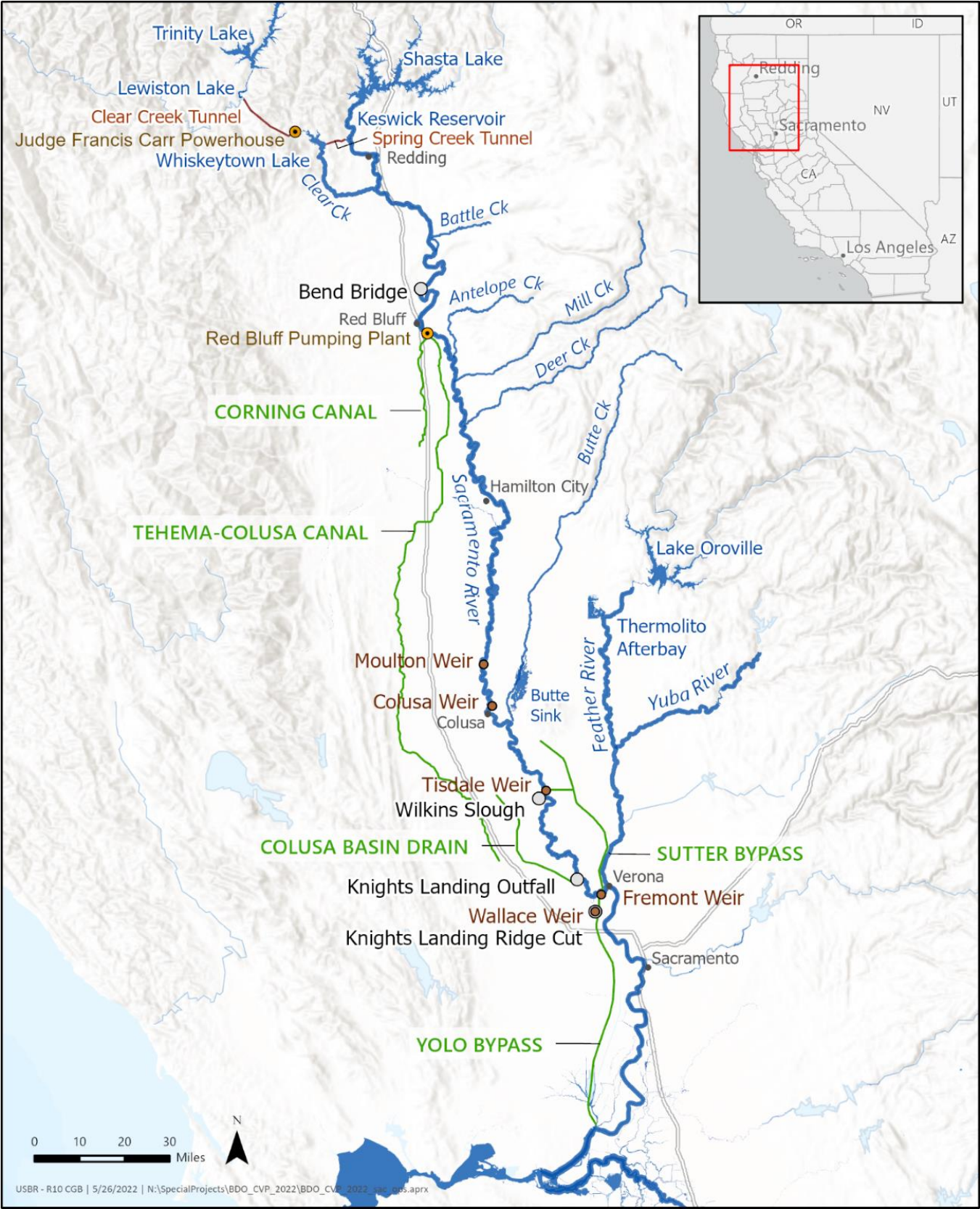


Figure 7. Sacramento River Facilities in the Shasta and Sacramento Divisions of the Central Valley Project and Flood Control Weirs and Bypasses

For more information on statutory, regulatory, and contractual requirements, see Appendix A, *Facilities Description*:

- Section 7 of the Flood Control Act of 1944
- Public Law 74-392 CVP Re-Authorization Act
- Public Law 81-839 Sacramento Valley Canals
- Central Valley Project Improvement Act (CVPIA)
- State Water Board Decision 990
- State Water Board Water Rights Order 90-5
- State Water Board Water Rights Order 91-1
- State Water Board D-1641
- Settlement Contracts
- Exchange Contracts
- Water Service Contracts

Programs in the environmental baseline to highlight:

- Spawning and Rearing Habitation Restoration

2.1.1 Seasonal Operations

Reclamation operates Shasta Dam in the winter primarily for flood control and minimum flows in the Sacramento River and in the Delta. With flashboards installed on top of the drum gates that raise the elevation to 1,067 feet, the maximum capacity of Shasta Reservoir is 4.552 MAF. For the flood season, USACE provides a flood control diagram that specifies by date a top of conservation pool storage. Flood operational criteria target flow rates below 100,000 cfs at Bend Bridge for the protection of downstream populations; therefore, reservoir elevations may temporarily exceed the top of the conservation pool and encroach into flood space in order to limit downstream flows. In the winter, when not releasing for flood control, Reclamation seeks to store inflows to Shasta Reservoir and releases the minimum flows necessary to meet downstream requirements. State Water Board Water Rights Order 90-5 provides a target for minimum releases from Keswick Reservoir from September through February, the 1937 Act includes consideration for navigation at Wilkins Slough, and State Water Board D-1641 provides flow standards in the Delta. Reclamation may make releases above the minimum to maintain fall-run Chinook salmon redds in wetter hydrologic year types when storage levels are higher in Shasta Reservoir.

In the spring, when not operating for flood control, Reclamation seeks to minimize releases and store inflow to optimize the filling of CVP reservoirs by the end of the flood control season (end of May). Higher storage improves the ability to meet downstream temperature objectives and increases the ability to make releases later in the year for water supply. Accretions (flows from non-project creeks into the Sacramento River below Shasta Dam) reduce the need for additional releases from Shasta Reservoir and help to meet both instream demands and Delta outflow requirements. Wetter years with high accretions may allow Reclamation to store water in the spring and operate mostly for flood control. Drier years with lower accretions may

require Reclamation to make releases from Shasta Reservoir for downstream requirements throughout the spring season. Toward the middle to end of spring, instream diversion demands increase on the mainstem Sacramento River and require releases above minimums at Keswick Reservoir. Reclamation operates to flow objectives at Wilkins Slough to support diversion by Sacramento River Settlement Contractors with a prior entitlement to water in the Sacramento River, for deliveries to CVPIA wildlife refuges, and for deliveries to CVP water service contractors at the Red Bluff Pumping Plant. The majority of these diversions typically occur mid-April through November with variations depending on hydrology.

Delta salinity and outflow requirements may necessitate additional releases from Shasta Reservoir. When system-wide demands require augmenting flows in the system, Reclamation coordinates imports from the Trinity Basin, releases by DWR from Oroville Reservoir, and releases from Folsom Reservoir. Each reservoir has factors to consider including instream requirements, amounts in storage, forecasted inflow, and refill potential. The 2018 COA describes the CVP portion of Delta outflow requirements. Reclamation balances releases for the CVP portion of Delta outflow requirements between Shasta and Folsom Reservoirs to maximize storage in each reservoir and minimize negative impacts between CVP tributaries. When increased releases are necessary to meet delta needs, Reclamation generally first adjusts exports, then releases from Folsom Reservoir while releases from Shasta Reservoir travel down the Sacramento River. Once releases from Shasta Reservoir arrive in the Delta (about 5 days' travel time), releases from Folsom Reservoir can be reduced to balance the demands on each reservoir. When Reclamation can export water from the Delta during periods of excess flow, Reclamation can store more water in San Luis Reservoir south of the Delta. Maximizing exports in the spring reduces the reliance on stored water later in the year for meeting late season demands.

Summer operational considerations include releases for temperature control, to support essential features of designated critical habitat, instream diversion demands, Delta outflows, Delta salinity, and exports. In-river temperatures downstream of Keswick Dam can be controlled via two methods. The first is thermal mass, by changing release volume or shifting releases between Trinity imports and Shasta Reservoir, and the second is selective withdrawal of colder water through the TCD. Determination of which method to use is made daily as operators balance releases from multiple reservoirs to meet downstream needs. Releases in the summer meet temperature objectives, support essential features of critical habitat and support water supply deliveries. Releases from Shasta Reservoir typically begin increasing in April as storm frequency decreases, air temperatures increase and system-wide demands increase. Peak releases from Shasta Reservoir typically occur June through August and begin to decrease from the peak sometime in August or September. Occasionally, in wetter years, high storage levels through the summer may result in a need to release higher than normal flows in early fall to meet flood control requirements for the next water year. Consideration of fall conditions may also warrant measures for drought protection and rebalancing of storage between reservoirs.

In the fall, Reclamation's objective is to reduce Keswick Dam releases and rebuild storage in Shasta Reservoir. Reclamation balances fall operations based on highly variable conditions: temperature control (dependent on winter-run Chinook salmon emergence timing), maintenance of winter-run redds (dependent on spawning depths), instream diversion demands on the mainstem of the Sacramento River upstream and downstream of Wilkins Slough (dependent on seasonal planting and wildlife refuges), minimizing fall-run Chinook salmon

redd dewatering (dependent on late-summer flows and fall spawning timing), and stabilizing releases through fall-run Chinook salmon egg and alevin incubation. The remaining coldwater pool in Shasta Reservoir is usually limited in the fall at the end of the temperature management season. Release reductions from Shasta Reservoir early in the fall consider that some winter-run Chinook salmon eggs and alevin are still incubating, significant instream diversion demands (e.g., rice decomposition) remain on the mainstem of the Sacramento River between Keswick Dam and Wilkins Slough and, depending on conditions, Delta requirements may require upstream reservoir releases for Delta outflow under requirements from the State Water Board or for Delta smelt habitat. If early fall flows drop substantially after fall-run Chinook salmon spawn at high river stages, their redds may be dewatered when flows are later reduced to rebuild storage.

Seasonal Operations will be managed by Reclamation in coordination with the Shasta Operations Team (SHOT), following the monthly SHOT Planning and Actions.

2.1.2 Sacramento River and Shasta Reservoir Coordination Forums

Governance is described in detail below in *Ramping Rates*, which includes group members, protocols, meeting frequencies, decision making approaches and other details. For the Sacramento River and Shasta Reservoir, three main coordination forums will meet regularly to discuss seasonal and real-time operations. These include the Winter-run JPE SubTeam, Sacramento River Group (SRG) and the SHOT. The Winter-run JPE SubTeam is a technical group tasked with development of the winter-run juvenile production estimate (JPE) each year and the winter-run broodstock assessment. It is composed of technical staff from Reclamation, DWR, NMFS, USFWS, and CDFW. The SRG is a technical group to discuss pulse flow shaping, temperature management, fall flow smoothing and fall/winter base flows. It is composed of technical staff from Reclamation, DWR, NMFS, USFWS, CDFW, Sacramento River Settlement Contractors (SRSCs), WAPA, the State Water Board, and Native Tribes. The SHOT is a policy level group that discusses the actions described in this Proposed Action when implementation may have biological, system conditions or water supply impacts or tradeoffs. It is composed of management and policy staff from key management agencies including the SRSCs. Generally, topics will be discussed at a technical level through SRG with agency feedback provided prior to being discussed at the SHOT. Each action below briefly describes the coordination process within these two groups prior to Reclamation making decisions that have risks, impacts and tradeoffs. For the matters listed below, Reclamation requests NMFS, USFWS and CDFW provide technical assistance along with the other members through these groups.

2.1.3 Ramping Rates

Rapid changes in river elevation from ramping reservoir releases up or down can impact aquatic biota. Sudden flow decreases can strand fishes and macroinvertebrates. Ramping rates to limit how quick releases are reduced can lessen or minimize these impacts. Under Order 90-5, the release rate (ramping) from Keswick Dam from September through February shall not decrease more than the following rates to minimize stranding of salmon.

- Releases shall not be decreased more than 15% in a 12-hour period
- Releases shall not be decreased more than 2.5% in a 1-hour period

In addition to the requirements under Order 90-5, ramping rates for Keswick Dam between July 1 and March 31 would be reduced between sunset and sunrise.

- Keswick Dam releases >6,000 cfs, reductions in releases may not exceed 15% per night, and no more than 2.5% per hour
- Keswick Dam releases 4,000 cfs to 5,999 cfs reductions in releases may not exceed 200 cfs per night, or 100 cfs per hour
- Keswick Dam releases between 3,250 cfs and 3,999 cfs; reductions in releases may not exceed 100 cfs per night

Reclamation after coordination through the SHOT, may make deviations from this ramping rate to provide incremental benefits to fish species. Such deviations would be initially discussed through the SRG prior to coordination through the SHOT.

Fall and Winter Baseflows for Shasta Refill and Redd Maintenance

Fall and winter base flows support fall- and spring-run Chinook salmon, address winter-run Chinook salmon redd dewatering stressors, and support cold water pool management.

Reclamation will operate to a consistent fall and winter baseflow between December and February unless additional releases are necessary for meeting downstream purposes. Consistent minimum flows are intended to avoid unintentional dewatering, support aquatic habitat, and avoid other impacts from regular flow fluctuations. Targets for fall and winter base flows (December 1 through the end of February) from Keswick would be set in October based on Shasta Reservoir end-of-September storage and the current hydrology. Base flows will range from 3,250 cfs to 5,000 cfs (Table 1). Each year, the base flow will be set to balance between the risk of required storage management or flood control releases in the coming fall and winter with supporting refill capabilities for Shasta Reservoir to build cold water pool for the following year.

Table 1. Keswick Dam December through February Default Release Schedule determined by End-of-September Storage

Keswick Release (cfs)	Shasta End-of-September Storage (MAF)
3,250	≤ 2.4
4,000	≤ 2.8
4,500	≤ 3.2
5,000	> 3.2

cfs = cubic feet per second; MAF = million acre-feet

Reclamation, after coordination through the SRG and SHOT, will determine the schedule for release reductions as well as any deviations from this default table by developing a risk analysis that relies on real-time fish monitoring data, winter-run redds remaining in the river, fall-run returns, expected fall water deliveries and transfers. Based on this analysis and the coordination through SRG and SHOT, Reclamation may delay or extend the ramp down to minimum fall and winter flows for the benefit of the fish populations. Such a delay will be coordinated through SRG and SHOT in light of the expected tradeoffs between minimizing winter-run redd dewatering, building storage for the next water year for temperature management and minimizing fall-run stranding and redd dewatering later in the fall. When higher storage exists at the end of September, but the fall hydrology is dry (generally defined as below 90% exceedance of historical hydrology), Reclamation, after coordination through the

SRG and SHOT, may reduce flows below those described in the table (or as modified by the risk analysis), if beneficial for fish populations and to building storage for the following year.

This approach to selecting fall, winter, and spring minimum flows allows Reclamation to build and conserve storage for supporting cold water pool management and summer demands. Data indicating that the flood control curve will be reached in December may result in flood control releases over the minimum flows, typically in the December through May period. Low minimum flows in the fall and winter period directly increases the likelihood and magnitude of the flood control releases in the winter and spring months.

In order to minimize the risk of juvenile stranding and redd dewatering during the fall season, to the extent possible given Reclamation's other legal and contractual obligations, Reclamation will coordinate with the SRG to consider planned summer flows that are smoothed out to minimize the net difference between the flow at spawning versus emergence.

2.1.4 Minimum Instream Flows

Under certain hydrologic circumstances during fall and winter months, side flows from creeks within and around the City of Redding may experience short term periods of high flows in response to major storm events. Reclamation, after coordination through the SRG and SHOT, and also through adaptive management, may temporarily reduce Keswick Dam releases below 3,250 cfs to preserve storage, as long as flows at the SAC CDEC gage maintain a minimum 3,250 cfs throughout that Keswick Dam flow reduction.

2.1.5 Rice Decomposition Smoothing

Rice decomposition smoothing could minimize impacts to fall-run Chinook salmon by minimizing fry stranding and redd dewatering as flows drop in the winter. Reclamation will release flows based on Sacramento Valley Water Service Contractors demand and Sacramento River Settlement Contractors coordinated rice decomposition smoothing diversion schedule. Sacramento River Settlement Contractors and CVP Water Service Contractors will synchronize their diversions to lower peak rice decomposition demand. Starting in August, Reclamation and the Sacramento River Settlement Contractors, through the SRG, will develop a delivery schedule based on dewatering risk for winter-run redd locations. The delivery schedule will be updated as conditions warrant.

2.1.6 Sacramento River Pulse Flows

To increase outmigration survival of Chinook salmon, Reclamation would release up to 150 thousand acre-feet (TAF) in pulse flow(s) each water year, typically in the spring, to benefit Chinook salmon in the Sacramento River watershed when the pulse does not interfere with the ability to meet temperature objectives or other anticipated operations of the reservoir. Reclamation will schedule this pulse after coordination through the SRG and SHOT and may include coordinating timing with natural flow events, potential storage management operations and/or pulse flows in tributaries.

The timing, magnitude, duration, and frequency of the pulse flows will be refined through the SRG to maximize multi-species benefits, which may include coordinating timing with natural flow events, potential storage management operations, potential SRSC demands and infrastructure limitations, and/or pulse flows in tributaries or reducing the volume of the pulse flow. The pulse flow volume and schedule will be developed through the SRG and provided to the SHOT. Reclamation, through the SHOT, will discuss the plan and make any appropriate and/or necessary refinements prior to implementation.

The VA flow assets may contribute to augmenting a pulse flow. Under conditions when the pulse flow is reduced or not released due to potential impacts on temperature management or other project purposes, the VA flow assets may be used to meet part or all of the pulse flow action. In certain cases, it may be most beneficial to release both the pulse flow and the VA asset together to provide the best benefit to the species.

2.1.7 Adult Migration and Holding Temperature Objectives

Spring temperatures can impact winter-run adults in multiple ways (gamete viability, spawning initiation, temperature shock, adult migration, disease risk, interaction with thiamine deficiency) as well as Late fall-run (impacts to redds). Water temperatures in the March through May period (prior to the start of the typical temperature management season) are typically well under any thresholds of concern for adult migration and adult holding. It is possible that high air temperatures and/or an intentional warm-water power bypass could cause warmer temperatures than normal and may require additional protective measures. Under a circumstance where these conditions may cause water temperatures to rise to concerning levels prior to the final temperature management plan, Reclamation will begin temperature management as early as March 1st to target water temperatures of 58.0° F daily average at the Sacramento River above Clear Creek gage (CCR).

Reclamation, through the SRG and SHOT, may propose a different temperature based on potential impacts to winter-run Chinook salmon spawning and egg incubation in the developing temperature management plan. The section on *Adaptive Management* includes a proposal to look more closely at these pre-spawning temperature objectives and may eventually refine the standard. Additional details on a potential warm-water power bypass to aid in temperature management are included in the drought tool kit and described further in the drought operations priority framework.

2.1.8 Water Temperature and Storage Management

Shasta Reservoir is the largest reservoir in the CVP and the State of California. It is relied upon for meeting multiple and often competing objectives throughout the State but with limited ability to meet these objectives in drought years. In general, the approach to managing Shasta, as with all CVP reservoirs, is to best meet all the authorized purposes of the reservoir while limiting high flow, or flood control, releases where possible to maximize the beneficial use of inflow and provide flood protection for the Sacramento River and surrounding area. As climate change has been affecting the hydrology and meteorology, the drought periods have become more severe with significantly less inflow as in previous droughts, higher evaporation and evapotranspiration due to increased temperature and more extreme hydrological and meteorological events. In addition, the viability of critically endangered species and other salmon populations that rely on the Sacramento River are not improving due to multiple stressors and are being significantly impacted by these extreme events, particularly the lack of available water (including cold water) in droughts and high air temperatures.

In order to recognize and adapt to these significant changes to the system as a whole, Reclamation is proposing a new approach to managing Shasta which changes the balance between risks of flood control releases (aka spills) and maintaining water in storage for future drought protection and temperature management. This approach, described below, places a higher priority on maintaining storage for drought protection for all project purposes while limiting the frequency of spilling water due to flood control limitations. Reclamation is committed to support a separate Winter-Run Action Plan with NMFS, FWS, CDFW, DWR and

SRSCs to pursue a science and monitoring plan, winter-run habitat and infrastructure actions, and water operations. For this Proposed Action, Reclamation is consulting on the water operations of CVP facilities in the Shasta and Sacramento Division of the CVP.

The following sections describe the management framework for the *Plan for Shasta Reservoir Management* (Shasta Management Plan) and drought protection; an annual winter-run broodyear assessment that influences Livingston Stone National Fish Hatchery (LSNFH) decision making, the monthly actions that will be considered by the SHOT; the temperature objectives for winter-run Chinook salmon holding, spawning, egg development and early rearing downstream from Shasta and Keswick Reservoirs; and the process for developing an annual temperature management plan.

2.1.9 Water Temperature and Storage Framework

The goals of the Shasta Management Plan are to provide increased drought protection and maximize suitable temperature regimes for the critically endangered Sacramento River Winter-run Chinook salmon. The Shasta Management Plan considers drought protection actions in nearly every year and identifies actions that will protect storage for multiple project purposes including temperature management. A key principle of the Shasta Management Plan is that drought protection and fish protections are linked. The strategy is framed around an objectives-based management framework adapted from the multi-year drought sequence experienced in Victoria, Australia (Mount et al. 2016, “Victorian Objectives”) that establishes different objectives depending on hydrologic conditions and identifies actions that can be taken for fishery management and drought protection. The general premise is that when hydrologic conditions are good and water resources are available to meet demands they are managed to improve species conditions, which follows the ENHANCE category in Mount et al. 2016, when hydrologic conditions are moderately limited and not available to meet all demands they are managed to RECOVER and MAINTAIN species conditions, and when hydrologic conditions are constrained and the system is stressed they are managed to PROTECT species conditions. The Shasta Management Plan proposes to integrate Sacramento Basin flow and non-flow measures that are part of the Voluntary Agreements (VAs) to update and implement the Bay-Delta Water Quality Control Plan. These measures are further described in the section on *Spring Delta Outflow*. The VAs offer a watershed-wide approach that includes new flows, habitat restoration, and a governance and science program that would be deployed adaptively. Specifically, under the VAs, flow and non-flow actions covered under this Proposed Action are not intended to conflict with the State Water Board’s Narrative Salmon Objective of the Narrative Viability Objective once adopted.

2.2 Framework Approach

The framework establishes management “Bins” to manage water temperature and storage to meet the Victorian Objectives described above. The framework includes three Bins that are each divided into two categories: standard (Bin A) and drought protection (Bin B). The Bin number (1, 2 or 3) is defined by the projected end of April storage which is primarily driven by hydrology. The letter of the Bin (A or B) is primarily driven by the expected demands on the reservoir which are a function of hydrology, meteorology, system-wide conditions, contractual requirements and other conditions. The A Bins are years when the expected demand from the reservoir is lower meaning it’s likely to result in better drought protection should the following year be dry. The B-bins are intended to increase the priority of storage conservation to address the risk that the ensuing year could be a drought. B-bins may be conditions where there is limited water supply in the Shasta system or the system as a whole is more stressed and

additional actions are necessary to reach the objectives of that bin. A stressed system is typically indicated by multiple reservoirs across the CVP and SWP having below average storage with below average hydrology either seasonally or in a particular month. Bin assignments will begin in February and will be updated monthly as needed through mid-April. Adjustments after April will be made as appropriate based on changes in hydrology and through coordination with the SHOT. The approach establishes biological objectives for each Bin and identifies potential actions based on forecasted End-of April (EOA) storage and forecasted End-of September (EOS) storage indicators.

Based on the outcome of the broodyear assessment prepared by the Winter-run JPE sub-team, Reclamation, NMFS, FWS and CDFW will convene appropriate technical staff to make recommendations if it is necessary to increase the production of winter-run Chinook salmon associated with the Integrated-Recovery Supplementation Program or take other actions to protect production of winter-run Chinook salmon at the LSNFH. FWS, through coordination with the SHOT, will implement measures as appropriate. The outcome of the broodyear assessment may also be considered in implementing actions within the Drought Toolkit as described in Section 3.12.

During any of the Bins described below, Reclamation may request that the Sacramento River Settlement contractors employ some of their voluntary actions identified in their resolution in Section 2.4, *Sacramento River Settlement Contractor Resolution*, to help improve temperature management and/or protect against winter-run redd dewatering and fall-run stranding. If requested, these actions would be implemented in a manner that does not impact the ability of the SRSC to divert per their contract and would be discussed through SHOT with final decision making by the SRSC. These actions include:

- Delaying or shifting spring diversions to maximize storage
- Shifting timing of delivery of transfer water
- Smoothing of fall rice decomp flows

In addition, the SRSCs are expected to have an action under the VA to make water available for the purposes of benefiting aquatic species in the upper Sacramento River and increasing delta outflow. This action may occur in any Bin and is more likely to occur in Bins 1 or 2. Decisions on Shasta-related VA flow assets would be managed through SHOT, as described in Governance in Section 2.13, *Governance*.

Reclamation recognizes that some years may indicate (using a conservative forecast) a 0% CVP north of delta agricultural allocation early in the year (primarily February and March) even though a non-zero allocation is expected in the coming months as the hydrology solidifies. This may be due to late precipitation, lower storage from the previous year or higher regulatory requirements. In some cases, this 0% early allocation could have detrimental impacts to agricultural lands due to the gap in available supplies between the previous contract year (which ends in February) and when transfer water may become available (in April). In consideration of these unique years, Reclamation will consider providing an allocation by mid-February for 3-30 TAF to avoid these significant agricultural impacts while also maintaining the goals of the Proposed Action and not risking a Bin 3 year. Whether or not this allocation maintains the goals of the Proposed Action will be determined through discussions with the SHOT. The SHOT may discuss the expected risks with the relevant contractors to determine the appropriate volume to evaluate and may choose to support an incremental allocation

between February and March as more information is received. Should the SHOT determine that even the minimum allocation of 3 TAF cannot be made while meeting the goals of the Proposed Action and/or risks the potential of a Bin 3 year, then the 0% allocation will remain.

2.2.1 Bin 1 – Enhance – ~80% of years

Under Bin 1, hydrologic conditions are generally good and water resources are available to meet demands. Generally, EOA Shasta Reservoir storage is forecasted to allow use of the upper gates of the temperature control device (TCD) to preserve the colder water for later in the season when air temperatures are much higher. This bin begins with an EOA storage forecasted at least 3.7 MAF with a possible storage increase in May and/or June. Bin 1 typically comes with a high confidence to meet cold water temperatures for winter-run Chinook salmon downstream from the Clear Creek gage and to meet drought protection objectives of at least 2.4 MAF EOS storage. In these years, the primary management objectives are to target 53.5F at a location downstream of CCR to maximize suitable habitat for winter-run Chinook salmon and to look for water supply neutral opportunities throughout the system to improve Shasta carryover storage for future year drought protection.

During Bin 1 years, Shasta may be operated to meet a variety of different demands. During the typical irrigation season (April through September), when Wilkins Slough is controlling and there is flexibility to have a Wilkins Slough flow below 5,000 cfs, Reclamation will discuss the appropriate minimum Wilkins Slough flow with the SHOT to ensure flows can both meet biological goals and objectives while also meeting obligations to senior water right holders under the Sacramento River Settlement Contracts. Expected monthly average Keswick and Wilkins Slough flows for these types of years are shown below for reference. October flows may vary due to demands, water transfer operations and protection of winter-run Chinook salmon redds and are likely to be in the 5,000-7,000 cfs range although higher flows may be necessary at times. Flows beyond these ranges will be discussed through the SHOT with a comparison of expected biological and storage tradeoffs including the potential for these higher flows to increase the likelihood of a bin 2 year the following year. Due to the higher storage that defines Bin 1, it is unlikely that higher releases would result in a Bin 3 year the following year.

- **Bin 1A**—Bin 1A is typically a result of a good water year where the system is not stressed, and additional water management actions are not necessary to achieve an EOS storage of at least 3.0 MAF. Bin 1A is defined as having an end of April storage at or above 3.7 MAF and a projected end of September storage of at least 3.0 MAF. In these years, the primary management goal is to target 53.5F at a location downstream of CCR to maximize suitable habitat for winter-run chinook salmon. The SHOT will discuss tradeoffs of establishing downstream temperature locations that support the biological goal of maximizing suitable habitat and the risk of running out of cold water. As discussed in previous sections, minimum fall and winter flows would be expected to be in the 4,000 – 5,000 cfs range to provide increased fall run habitat or higher if needed for storage management. Bin 1A is defined as having an end of April storage at or above 3.7 MAF and a projected end of September storage of at least 3.0 MAF. As discussed above, this EOA storage ensures good temperature management through providing access to using the upper gates of the TCD and the EOS storage provides a high likelihood of EOA storage greater than 3.7 MAF the following year. An EOS storage of 3.0 MAF along with the higher fall/winter minimum flows also limits the

high potential for fall/early winter flood control releases, although these releases are still expected to occur under wetter hydrology.

- **Bin 1B**—Bin 1B is typically a result of a good water year but the system may be slightly stressed, or the water supply may be less than what is seen under Bin 1A. Bin 1B is defined as having an end of April storage at or above 3.7 MAF and a projected end of September storage of at least 2.4 MAF. Consistent with Bin 1A years, this EOA storage ensures good temperature management through providing access to using the upper gates of the TCD. The EOS storage of 2.4 MAF provides a high likelihood of EOA storage greater than 2.8 MAF the following year which is a point at which biological impacts from higher temperatures start to increase significantly. An EOS storage of 2.4 MAF along with the higher fall/winter minimum flows also lessens the potential for fall/early winter flood control releases, although these releases are still expected to occur under wetter hydrology. Similar to Bin 1A, Reclamation, through coordination with SRG and the SHOT, will analyze tradeoffs of establishing downstream temperature locations that support the biological goal of maximizing suitable habitat and the risk of running out of cold water. Reclamation will consider light system tradeoffs for supporting higher Shasta storage (up to 3.0 MAF) with minimal impacts to other parts of the system during their monthly forecasting process. If there are tradeoffs with higher impacts that should be considered to meet the Bin 1 Shasta EOS storage range, Reclamation will consider these through coordination with the SHOT. Available actions primarily include rebalancing between other CVP reservoirs while maintaining all operational goals. If available actions result in storage of 2.4-3.0 MAF, then no further actions would be pursued. If available actions are not sufficient to result in a storage of at least 2.4 MAF, then this year would be reclassified as Bin 2A.
- **Operational Goals and Objectives**
 - Maintain sufficient storage for drought protection should the next year be dry
 - Limit early season October through December spill
 - Deliver available water while meeting regulatory requirements and obligations to senior water right holders under the Sacramento River Settlement Contracts
- **Biological Goals and Objectives**
 - Victorian objective: Enhance and Recover
 - Maximize species recruitment opportunities
 - Increase spatial diversity
 - Maximize floodplain linkages
 - Enhance ecological flows
 - Manage winter-run spawning habitat downstream from CCR to average daily water temperature of 53.5
 - Targeted Resulting Temperature Dependent Mortality to be $\leq 3\%$

- When necessary, manage adult holding temperatures to a daily average temperature no higher than 58°F to minimize pre-spawning mortality
- Increase available habitat for fall-run chinook salmon in the fall and winter months
- Appropriate reach-specific survival objectives will be developed through the Winter-Run Action Plan
- **Bin 1A Operational Goals and Indicators**
 - February, March and April forecasts project ≥ 3.7 MAF EOA storage based on 90% exceedance, or other conservative approach
 - February, March and April forecasts projects ≥ 3.0 MAF EOS storage based on 90% exceedance, or other conservative approach
- **Bin 1B Operational Goals and Indicators**
 - Hydrologic Goal: Initiate drought protection
 - February or March forecasts project ≥ 3.7 MAF EOA storage based on 90% exceedance
 - February or March forecasts project ≥ 2.4 MAF EOS storage based on 90% exceedance
 - The goal of actions is to increase projected EOS storage above 2.4 MAF. If this is not possible, shift to Bin 2A

2.2.2 Bin 2 – Recover and Maintain - ~11.5% of years:

Under Bin 2, hydrologic conditions are more limited than in Bin 1 and adequate water resources are not available to meet all demands. Generally, the upper end of the EOA storage is showing upper gates may be used temporarily and even when not, there is high confidence to meet cold water temperatures at the Clear Creek (CCR) gage for the critical development periods of the temperature management season and to meet some drought protection objectives that prevent critical storage levels at the end of September and in the subsequent year. Shasta management actions in this Bin would have light to moderate reductions in water supply or require light to moderate adjustments to system management.

During Bin 2 years, Shasta may be operated to meet a variety of different demands. During the typical irrigation season (April through September), when Wilkins Slough is controlling and there is flexibility to have a Wilkins Slough flow below 5,000 cfs, Reclamation, through coordination with the SRG and SHOT, will identify the appropriate minimum flow to ensure flows can both meet biological objectives while also meeting obligations to senior water right holders under the Sacramento River Settlement Contracts. Expected monthly average Keswick and Wilkins Slough flows for these types of years are shown below for reference. October flows may vary due to demands, water transfer operations and protection of winter-run redds and are likely to be in the 5,000-7,000 cfs range although higher flows may be necessary at times. Reclamation expects to begin ramping down to the minimum flow of 3,250 cfs as described above in late October or early November. Reclamation, through coordination with the SRG and SHOT, will determine when to begin this ramp down after discussing the tradeoffs between storage, next year's temperature management, winter-run redd dewatering and fall run stranding and redd dewatering. Flows or timing outside all ranges described above

will be discussed through the SHOT with a comparison of expected biological and storage tradeoffs including the potential for these higher flows to increase the likelihood of a bin 2 or bin 3 year the following year. Should the following year be a Bin 3 year which, in part, was due to releases higher than these expected ranges, these higher flows may limit the available actions to conserve storage in that year.

- **Bin 2A**—Bin 2A is a drier water year and can be the start of a multi-year drought sequence or a single year within a multi-year drought sequence. Bin 2A is defined as having an end of April storage at or above 3.0 MAF and a projected end of September storage of at least 2.2 MAF. This EOA storage does not typically allow full use of the TCD, but, when combined with the EOS of 2.2 MAF, is expected to be adequate to provide sufficient temperatures during the majority of the winter-run spawning and egg incubation period to avoid high temperature-related biological impacts. An EOS storage of 2.2 MAF provides a high likelihood of exceeding an EOA storage of 3.0 MAF the following year and has a low potential for fall/early winter flood control releases, although these releases may still occur under wetter hydrology. In these years, the primary management goals are to target meeting 53.5F at CCR during the winter-run spawning and egg incubation period and to manage water supply to support a carryover that provides some drought protection. The temperature management objectives may be shaped through SRG and SHOT based on forecasted and/or real-time meteorologic and hydrologic conditions and best available science. Reclamation will consider water supply (CVP allocation) reductions and, through coordination with the SHOT, will identify moderate system-wide tradeoffs and potential transfer modifications with the goal of meeting both of these temperature and storage goals. Moderate system wide tradeoffs general include, but are not limited to, rebalancing between other CVP reservoirs with moderate impacts to other parts of the system. If available actions result in storage of 2.2-2.4 MAF, then no further actions would be pursued. If available actions are not sufficient to result in a storage of at least 2.2 MAF, then this year would be reclassified as Bin 2B.
- **Bin 2B**—Bin 2B is typically a drier water year and can be the start of a multi-year drought sequence or a single year within a multi-year drought sequence. Bin 2B is defined as having an end of April storage at or above 3.0 MAF and a projected end of September storage of at least 2.0 MAF. This EOA storage does not typically allow full use of the TCD, but, when combined with the EOS of 2.0 MAF, is expected to be adequate to provide sufficient temperatures during the majority of the winter-run spawning and egg incubation period to avoid high temperature-related biological impacts. An EOS storage of 2.0 MAF provides a high likelihood of exceeding an EOA storage of 2.8 MAF the following year and has a low potential for fall/early winter flood control releases, although these releases may still occur under wetter hydrology. In these years, the primary management goals are to target meeting 53.5F at CCR during the winter-run spawning and egg incubation period and to manage water supply to support a carryover that provides some drought protection. The temperature management objectives may be shaped through coordination with SRG and SHOT based on forecasted and/or real-time meteorologic and hydrologic conditions and best available science. Reclamation will consider water supply (CVP allocation) reductions and, through coordination with the SHOT, will identify moderate system-wide tradeoffs and potential transfer modifications and with the goal of meeting both of these goals. Moderate system wide tradeoffs generally include, but are not limited to, rebalancing

between other CVP reservoirs with moderate impacts to other parts of the system, transfer timing modifications, situation-specific adjustments to Delta water quality standards under D-1641 to address developing drought conditions and other actions from the Drought Toolkit. If available actions result in an EOS storage of 2.0-2.2 MAF, then no further actions would be pursued. If available actions are not sufficient to result in an EOS storage of at least 2.0 MAF, then this year would be reclassified as Bin 3.

- **Operational Goals and Objectives**

- Maintain sufficient storage for drought protection should the next year be dry
- Limit early season October through December spill to the extent possible
- Deliver available water while meeting regulatory requirements and obligations to senior water right holders under the Sacramento River Settlement Contracts

- **Biological Objectives**

- Victorian objectives: Recover (Bin 2a) and Maintain (Bin 2b)
- Maintain or maximize species recruitment opportunities with some reduction in spawning habitat compared to Bin 1
- Maintain or restore river function and key floodplain linkages
- Restore key ecological flows
- Manage the majority of winter-run spawning habitat at CCR to average daily water temperature of 53.5° F
- Targeted Resulting Temperature Dependent Mortality to be $\leq 3\%$
- Manage adult holding temperatures to 58° F to minimize pre-spawning mortality
- Appropriate reach-specific survival objectives will be developed through the Winter-Run Action Plan

- **Bin 2A Operational Goals and Indicators**

- February or March forecasts project 3.0-3.7 MAF EOA storage based on 90% exceedance or other conservative approach
- February or March forecasts project 2.2-2.4 MAF EOS storage based on 90% exceedance or other conservative approach
- The goal of actions is to increase projected EOS storage above 2.2 MAF. If this is not possible, shift into Bin 2B

- **Bin 2B Operational Goals and Indicators**

- Hydrologic Goal: Increase drought protection
- February or March forecasts project 3.0-3.7 MAF EOA storage based on 90% exceedance or other conservative approach

- February or March forecasts project 2.0-2.2 MAF EOS storage based on 90% exceedance or other conservative approach
- The goal of actions is to increase projected EOS storage above 2.0 MAF. If this is not possible, shift into Bin 3A

2.2.3 Bin 3 – Protect - ~8.5% of years

Under Bin 3, critically dry conditions exist, the system is stressed, and water resources are not available to meet all demands. There is low confidence to meet sufficient temperatures at the Clear Creek gage and future drought protection is at risk. The main biological objective is to protect winter-run Chinook salmon against decline. This Bin includes the widest array of potential water supply and fishery management actions to protect winter-run Chinook salmon from significant impacts and to protect against future drought risks.

During Bin 3 years, Shasta is expected to be operated primarily for meeting public health and safety (including salinity management in the Delta), obligations to senior water right holders under the Sacramento River Settlement Contracts and minimum instream flows. The extent to which Shasta is relied upon to meet these demands depends on both hydrology and available water in other parts of the system. During the typical irrigation season (April through September), when Wilkins Slough is controlling releases from Keswick, Reclamation, through coordination with the SHOT, will identify the appropriate minimum Wilkins Slough flow to ensure flows can both meet biological goals and objectives while also meeting obligations to senior water right holders under the Sacramento River Settlement Contracts. As a default, Reclamation will target a minimum flow of 3,400 cfs under these conditions. October flows may vary due to demands, water transfer operations and protection of winter-run redds and are likely to be in the 3,250 – 5,000 cfs range although higher flows may be necessary at times. After the irrigation season, Reclamation expects to begin ramping down to the minimum flow of 3,250 cfs as soon as possible given deliveries, delta conditions and winter-run redd dewatering concerns. Reclamation, through coordination with the SHOT, will determine the appropriate ramp down date after evaluating tradeoffs between storage, next year's temperature management, winter-run redd dewatering and fall run stranding and redd dewatering. Should the following year be a Bin 3 year which, in part, was due to releases higher than these expected ranges, these higher flows may limit the available actions to conserve storage in that year.

- **Bin 3A**—Bin 3A is an unusual year type where the hydrology is generally drier, but with a wetter spring or heavy snowmelt based inflow with lower demands expected. Bin 3A is defined as having an end of April storage below 3.0 MAF and a projected end of September storage greater than 2.0 MAF. This EOA storage does not allow full use of the TCD and is unlikely to meet sufficient temperatures at CCR. In these years, the primary management goals are to conserve storage and operate the TCD to target 53.5 F upstream of CCR for the most critical period during the winter-run spawning and egg incubation period to avoid critical loss of winter-run population. Reclamation will reduce Shasta releases for water supply (CVP allocations) to conserve storage with the goal of meeting the EOS storage objective of 2.0-2.2. Reclamation, through coordination with the SHOT, will identify moderate system-wide tradeoffs and potential transfer modifications with the goal of conserving storage and meeting temperature objectives. Moderate system wide tradeoffs generally include, but are not limited to, rebalancing between other CVP reservoirs with moderate impacts to other

parts of the system, transfer timing modifications, situation-specific adjustments to Delta water quality standards under D-1641 to address developing drought conditions and other actions from the Drought Toolkit. If available actions result in storage of 2.0-2.2 MAF, then no further actions would be pursued. If available actions are not sufficient to result in a storage of at least 2.0 MAF, then this year would be reclassified as Bin 3B.

- **Bin 3B**—Bin 3B is typically a dry water year and is often within a series of drier years such as during a multi-year drought sequence. Bin 3B is defined as having an end of April storage below 3.0 MAF and a projected end of September storage less than 2.0 MAF. An EOA storage below 3.0 MAF combined with an EOS storage of below 2.0 MAF will make protective temperature management very challenging. In addition, carryover less than 2.0 MAF provides little drought protection if the following year continues to be dry. As a result, years which fall into bin 3B are intended to be an “all-hands-on-deck” year where all actions from the drought tool kit are considered to determine if they can help support increased Shasta storage. In addition, these years are likely to be ones where the entire system is stressed and many actions from the Drought Toolkit may be required to address the status of the entire system. It is likely that many drought actions considered in these years are not solely targeting Shasta storage but looking at system wide storage for meeting highest priority demands and providing some overall system wide drought protection should the following year be dry. There is confidence that a temperature management plan will include a strategy to provide winter-run Chinook spawning temperatures that avoid critical losses of egg and fry production, maintain key spawning refuges in upstream areas and avoid catastrophic impacts to the broodyear.

In these years, the primary management goals are to conserve storage and operate the TCD to target 53.5° F upstream of CCR for the most critical period during the winter-run spawning and egg incubation period to avoid critical loss of winter-run population. Reclamation will reduce Shasta releases for water supply (CVP allocations) to only that needed for meeting public health and safety demands, including minimum salinity levels in the Delta. Reclamation, through coordination with the SHOT, will identify moderate and heavy system-wide tradeoffs with the goal of conserving storage and meeting minimal temperature objectives. Moderate system wide tradeoffs generally include, but are not limited to, rebalancing between other CVP reservoirs with moderate impacts to other parts of the system, transfer timing modifications, situation-specific adjustments to Delta water quality standards under D-1641 to address developing drought conditions and other actions from the Drought Toolkit. Heavy system wide actions include requesting significant relaxations to D1641, limitations in water available under contract (see further description below) and other actions from the Drought Toolkit. In extremely dry years or in multi-year droughts, it is possible that these actions will not achieve an EOS storage above 2.0 MAF.

During Bin 3B years, defined as having an end of April storage below 3.0 MAF and a projected end of September storage less than 2.0 MAF, which are also designated as critical years under the SRSC’s contracts and have an October through April inflow of less than 2.5 MAF, available water supply for diversion under the SRSCs is limited to between 75% and 50% of total contract quantities, or approximately 1.5 - 1.1 MAF. The available water for diversion within this range depends on the water available to meet an expected end of September storage of 2.0 MAF using a conservative forecast (90%

exceedance or equivalent). This reduced volume of available water will be applied to all SRSCs collectively and individual contractor reductions may vary based on agreements and transfers between different SRSCs. In these years, previously described SRSC voluntary actions under their resolution may not be possible due to the very limited supply. It is also unlikely that VA water would be made available in these years as they are typically critical water year types. Should there be a request for a VA asset, the origin and use of that asset will be discussed through the appropriate governance teams. During these years, Reclamation will coordinate with FWS to maintain summer deliveries of Level 2 supplies to Sacramento Valley CVPIA refuges to provide essential dry year habitat for Giant Garter Snake, Western Pond Turtle, Tricolored blackbirds and migratory waterfowl in a manner consistent with refuge contracts and agreed upon operational priorities. If conditions remain dry through the fall Reclamation and FWS will coordinate on how to address instream flow objectives, lake levels and refuge needs. Reclamation will continue to utilize level 4 to supplement supplies for refuges in drier years when storage and coldwater pool are limited.

SRSCs will be asked to provide input through the SHOT on minimum Keswick and Wilkins Slough flows to meet obligations to senior water right holders under the Sacramento River Settlement Contracts while meeting biological objectives and other requirements such as public health and safety. In situations where appropriate fall and winter flows were discussed and tradeoffs were evaluated but there was not agreement on the implemented flow regime from the SRSCs, SRSCs propose alternative methods to meet obligations to senior water right holders under the Sacramento River Settlement Contracts with the SHOT should the following year be a 3B year. Should a similar disagreement occur during a Bin 3B year after the Bin has been designated, flows in disagreement will not affect the determination on volume of available water. Under these conditions, the likelihood of storage below 2.0 MAF will increase. Reclamation will coordinate through the SHOT with a goal of agreement on all release decisions in 3B years in order to avoid a disagreement on the use of critical and limited water supplies.

- **Operational Goals and Objectives**

- Maintain and conserve minimal storage to avoid catastrophic low storages should the next year also be dry
- Meet public health and safety demands including delta salinity
- Meet obligations to senior water right holders under the Sacramento River Settlement Contracts

- **Biological Objectives**

- Victorian objective: Protect
- Avoid critical loss of population
- Maintain key refuges of spawning and early rearing habitat
- Avoid catastrophic changes to habitat and impacts to the broodyear

- Manage winter-run spawning habitat upstream of CCR average daily water temperature of 53.5° F during the critical periods of the spawning and egg incubation period
- Targeted Resulting Temperature Dependent Mortality to be $\leq 30\%$
- Manage adult holding temperatures below 58 daily average to minimize pre-spawning mortality
- Appropriate reach-specific survival objectives will be developed through the Winter-Run Action Plan
- **Bin 3A Operational Goals and Indicators**
 - February or March forecasts project < 3.0 MAF end of April storage based on 90% exceedance or other conservative approach
 - February or March forecasts project > 2.0 MAF end of September storage based on 90% exceedance or other conservative approach
 - The goal of actions is to increase projected EOS storage to 2.2 MAF. If this is not possible to increase projected EOS storage above 2.0 MAF shift to Bin 3B
- **Bin 3B Operational Goals and Indicators**
 - Hydrologic Goal: Increase drought protection.
 - February forecasts projects < 3.0 MAF end of April storage based on 90% exceedance or other conservative approach.
 - February forecasts projects < 2.0 MAF end of September storage based on 90% exceedance or other conservative approach.
 - The goal of actions is to increase projected EOS storage above 2.0 MAF. If this is not possible identify system priorities and contingencies.

2.3 Egg Incubation and Emergence Temperature Objectives

Water temperature management generally occurs from May 15 through October 30th; however, start and end dates may be adjusted through coordination with the SRG and SHOT based on the winter-run Chinook salmon spawning and emergence. Water temperature management would target 53.5°F at locations identified in the Bins above. The application of Victorian Objectives will be applied to support a greater habitat extent, duration and frequency on the Sacramento River below Keswick Dam, when storage resources allow, water temperature management will expand habitat for early or later spawners, spawners further downstream, and juveniles rearing.

2.3.1 Temperature Management Plan

Reclamation will coordinate through the SRG to prepare a draft Temperature Management Plan (TMP) in April. The draft TMP will include: projected reservoir releases, assumed meteorological conditions, anticipated water temperatures and target locations, and temperature-dependent mortality (TDM) estimates for both Martin (2017) and Anderson (2022). Reclamation will finalize the TMP in May or later through coordination with the SRG and SHOT. Reclamation may update the TMP through coordination with the SRG and SHOT.

A final TMP after May is more likely in wetter years when the location of 53.5° F is expected to be downstream of CCR or in years when hydrologic conditions changed significantly after the draft TMP. For the final TMP, Reclamation will use conservative assumptions for determining the temperature management strategy, including relying on the actual May 1 storage, a conservative inflow forecast for inflow May through September, expected releases based on a conservative forecast and a conservative historical meteorology. Reclamation will utilize a forecast with 90% exceedance in the aggregate (when jointly considering multiple significant known uncertainties such as hydrology and meteorology) to develop conservative water temperature forecasts, although certain circumstances may lead Reclamation to use different exceedance levels to incorporate an appropriately more conservative approach.

Reclamation will operate the Shasta Dam Temperature Control Device to manage water temperatures below Keswick Dam according to the Temperature Management Plan and monitor the results. Reclamation will proactively monitor and manage water temperatures and make operational changes to maintain temperatures consistent with the objectives from the TMP throughout the temperature management season. If monitored water temperatures exceed the average daily target temperature for three consecutive days, despite efforts to monitor conditions and manage proactively, Reclamation will notify NMFS of what actions, if any, are being or will be taken to address the exceedances and will arrange for a follow-up on day 4 if the actions do not resolve the issue. Reclamation will monitor implementation of the TMP using updated data on reservoir storage and coldwater pool via reservoir profiles and water temperatures downstream of Keswick Reservoir.

2.3.2 Temperature Profile Tracking

Reclamation will collect temperature profile measurements for Shasta (Table 2), Whiskeytown, and Trinity reservoirs every month at 25 ft intervals and distributed through the SRG following QA/QC.

Table 2. Temperature Profile Measurements for Shasta Reservoir

Dates	Profiles
Dec. – Feb.	Monthly at 25 ft. Intervals
Mar. – April	Every Two Weeks at 5 ft. Intervals
May – Nov. 15	Every Week at 5 ft. Intervals
Nov. 15 – Nov. 30	Every Two Weeks at 5 ft. Intervals

2.3.3 Annual Winter-run Chinook Salmon Broodyear Assessment

In order to inform operations, risk tradeoffs for determining the downstream extent of water temperature management, and the need to pursue increasing production or taking other actions at LSNFH, the JPE SubTeam will conduct a winter-run Chinook salmon broodyear assessment for the previous year's cohort and the cohort of return adults that hatched three years prior. The purpose is to track species conditions and take appropriate actions to avoid adverse impacts to the following year's cohort. If the previous year's cohort and the cohort three years prior, is determined to have experienced "adverse conditions", then more actions would be taken to manage the objectives for each Bin, including both biological and drought protection objectives. The broodyear assessment will be developed by February 1 of each year using the best available science to guide calculation of each metric described below. The broodyear

assessment will be based on the best available science each year and the JPE SubTeam may consider using the following indicators or information:

- >30% TDM
- <20% ETF survival
- 25% of historic JPE
- TMP compliance point was above CCR
- Adverse Population Viability Trends (per previous year's annual brood year report if there was an increase in any of the five criteria in Lindley et. al. 2007)
- High Risk of Extinction (per 5 year status review)
- Outyear adult escapement forecast based on Pacific Fishery Management Council winter-run stock abundance analyses

The JPE SubTeam will provide the broodyear assessment to Reclamation and the SHOT. If the broodyear assessment determines Adverse Conditions for Winter-run Chinook salmon and identifies that Shasta storage and hydrology are expected to result in continuing adverse conditions to the coming broodyear, the SHOT will report these conditions and proposed actions to the Directors and all reasonable actions will be taken to avoid continued adverse conditions. These indicators of broodyear strength can be revised by the SHOT with NMFS approval.

2.4 Sacramento River Settlement Contractor Resolution

The Sacramento River Settlement Contractors approved A Resolution Regarding Salmon Recovery Projects in the Sacramento River Watershed, Actions Related to Shasta Reservoir Annual Operations, and Engagement in the Ongoing Collaborative Sacramento River Science Partnership Effort. Pursuant to the resolution, the Sacramento River Settlement (SRS) Contractors will continue to participate in, and act as project champions for future Sacramento Valley Salmon Recovery Program projects, subject to the availability of funding, regulatory approvals, acceptable regulatory assurances, and full performance of the SRS Contracts.

Pursuant to the resolution, the SRS Contractors will meet and confer with Reclamation, NMFS, and other agencies as appropriate to determine if there is any role for the SRS Contractors in connection with Reclamation's operational decision making for Shasta Reservoir annual operations in those years. This determination will include consideration of what actions are feasible, consistent with the terms of the SRS Contracts. In addition to the 25% reduction during Shasta Critical Years as set forth in the SRS Contracts, the types of actions that may be considered include, but are not necessarily limited to: (1) the scheduling of spring diversions by the SRS Contractors; (2) voluntary, compensated water transfers by the SRS Contractors subject to Reclamation approval; and (3) smoothed SRS Contractor diversion for rice straw decomposition during the fall months. Any mutually agreeable proposed actions resulting from these meet-and-confer discussions must be consistent with the terms of the SRS Contracts and may also be subject to other regulatory approvals.

Decisions related to implementation of these Shasta-related voluntary actions will be carried out through SHOT.

2.4.1 Monthly SHOT Planning and Actions

This section describes the monthly SHOT planning process and actions that will be discussed. The planning approach is based on the seasonal water year and identifies actions that are necessary to implement the Shasta Management Plan.

- **October**

- The SHOT begins meeting for the new water year.
- Kick-off JPE SubTeam – establish 5-agency team, confirm meetings, schedule, work products.
- Expected work products: JPE, Winter-run Broodyear assessment.
- Begin tracking system conditions and hydrologic outlook. The goal is to take stock of system conditions and tracking water year hydrology.
- SHOT discussing October releases for purpose of tracking Winter run redd dewatering and incidental take limits.
- SHOT available for elevation for Redd Maintenance and Fall Flow Smoothing actions.
- Reclamation, through coordination with SHOT, planning for winter refill flows.
- Reclamation, through coordination with SHOT, tracking VA assets and discussing options for deployment.
- If necessary, SHOT discussing water transfer schedules.
- SHOT tracking downstream winter-run counts.

- **November**

- SHOT provides support to JPE SubTeam as needed.
- Continue tracking system conditions and hydrologic outlook.
- SHOT discusses November–April Keswick minimum releases based on EOS. In the event of a dry fall where the previous year was a Bin 2 or 3 year, strive to get to 3,250 cfs by December 1 or sooner.
- SHOT available to the SRG for elevation for Redd maintenance and Fall Flow Smoothing.
- SHOT tracking winter refill flows.
- SHOT is tracking VA assets and discussing options for deployment.
- Receive winter-run adult spawning escapement numbers from summer.
- SHOT tracking downstream winter-run counts.

- **December**

- SHOT provides support to JPE SubTeam.

- JPE SubTeam issues JPE Memo to SHOT by December 31.
- Continue tracking system conditions and hydrologic outlook.
- For the most part, December is not a drought planning month, but may be in extreme low storage conditions.
- Under very dry fall conditions that have resulted in extremely low storage conditions, Reclamation and DWR, in coordination with the SHOT, will start to review the Drought Toolkit in anticipation of drought conditions developing or persisting.
- Tracking fishery conditions.
- SHOT is tracking VA assets and discussing options for deployment.
- Review the temperature and TDM results from the previous water year versus the objectives from TMP to determine if 1) any deviations from the TMP were understood by the SRG and SHOT team, 2) if an independent panel review is appropriate for better understanding the differences and 3) if any adjustments to the planning process are warranted. In some cases, the SHOT may work with the SRG to conduct an operational and/or biological necropsy to determine the cause of any exceedance.
- **January**
 - SHOT provides support to JPE SubTeam
 - If an adjustment is needed, the JPE SubTeam will issue JPE Adjustment Memo to SHOT Team by January 15-31
 - SHOT reviewing drought tool kit in low storage years or if drought conditions are present
 - SHOT is tracking VA assets and discussing options for deployment
 - SHOT evaluating possible need for LSNFH production adjustments or other actions to protect winter-run production at the hatchery
 - SHOT considering non-critical year voluntary actions if low storage conditions or drought conditions are developing
- **February**
 - If February 90% forecast EOA/EOS projections indicate Bin 2:
 - SHOT may initiate Meet and Confer regarding water supply neutral actions. Discussions based on 90% February forecast unless a different forecast is more appropriate to reflect a conservative outlook.
 - SHOT evaluating system-wide tradeoffs.
 - SHOT evaluating Drought Toolkit for possible actions.

- FWS, through coordination with SHOT, determines if it's appropriate to increase production at LSNFH or to take other actions to protect winter-run production.
- Broodstock collection begin.
- VA asset planning begins.
- If February 90% forecast EOA/EOS projections indicate potential Bin 3:
 - SHOT may initiate Meet and Confer regarding voluntary actions discussions based on 90% February forecast unless a different forecast is more appropriate to reflect a conservative outlook
 - SHOT evaluating system-wide tradeoffs
 - SHOT evaluating Drought Toolkit for possible actions
 - FWS, through coordination with SHOT, determines if it's appropriate to increase production at LSNFH or to take other actions to protect winter-run production
 - Broodstock collection begin
- Regardless of Bin type:
 - JPE SubTeam issues annual winter-run broodyear assessment memo to SHOT.
 - SHOT coordination on February Operational Outlook.
 - Reclamation announces initial Shasta-critical determination and CVP allocations – Note: most deliveries do not start until April or May.
 - If Shasta end of September storage is projected to be above 2.4 MAF, then walk through the forecast after the allocation comes out.
 - If a borderline year, then Reclamation will discuss any key forecasting assumptions with the SHOT prior to allocations. This may include expected release ranges and storages for all reservoirs, expected pumping levels and expected regulatory requirements. Due to the very tight time frame for reviewing any data before the allocation is released, this may not include a full outlook but rather the key factors that prevent Shasta from reaching 2.4 MAF or higher. This may be done either verbally in a SHOT meeting or via email.
 - SHOT is tracking VA assets and discussing options for deployment
 - VA asset planning begins.
 - SHOT begins discussing system-wide tradeoff actions.
 - SRG meets to start planning for possible March pulse flow either from the Proposed Action or from the VAs. If SRG recommends an early

(March) pulse flow, it will be recommended to SHOT as soon as possible but no later than the end of February.

- SHOT decision on spring pulse flow could be based on temp modeling or could be based on storage and broodstock only. If the SRG decides spring pulse flow is appropriate, will pass to SHOT as a recommendation. To the extent possible when consistent with action objectives, try to combine the spring pulse flow with meeting delta objectives, either D1641 or the VA system-wide objectives depending on the source of the pulse flow water.
- SHOT considers tradeoffs associated with a pulse flow action in the context of the broodyear assessment, projected EOA and EOS storage, system conditions, current hydrology and forecasts.
- **March**
 - If March 90% forecast indicates EOA/EOS projections indicate Bin 2:
 - SHOT needs confirmation on scheduling for spring diversions per SRSC resolution
 - Confirmation on resolution items, particularly the delayed spring offset and begin to get an idea of volumes of transfers
 - Preliminary temperature modeling; convene SRG
 - If March 90% forecast EOA/EOS projections indicate Bin 3:
 - Preliminary signal for allocation or delivery adjustments
 - Preliminary temperature modeling; convene SRG
 - Regardless of Bin type:
 - SHOT begins meeting weekly or as needed.
 - SHOT begins enhanced reporting out to Water Operations Management Team (WOMT).
 - SHOT initiates preliminary scenarios and TMP planning.
 - SHOT begins discussions to plan for April and May release patterns.
 - Continue to coordinate on non-critical year voluntary actions. Need a preliminary idea of SRSC diversion quantities and transfers.
 - SHOT evaluating Drought Toolkit for possible actions.
 - SHOT discusses potential signals for possible drought actions.
 - Continuing to evaluate system wide tradeoffs.
 - LSNFH broodstock collection continues.

- Reclamation shares the March Operational Outlook with the SHOT and any concerns or trade-offs are discussed as appropriate.
- Reclamation tracking Shasta Critical Determination.
- Reclamation announces March allocations if appropriate. SHOT coordination involves:
 - If Shasta EOS is projected to be above 2.4 EOS, then walk through the forecast after the allocation comes out.
 - If a borderline year, discuss key forecasting parameters that prevent Shasta from reaching 2.4 MAF.
 - VA asset planning continues.
 - SHOT discussing system-wide tradeoff actions.
 - SRG Planning.
 - SRG pulse flow group planning for possible March or April pulse flow.
 - SHOT Decision on spring pulse flow – could be based on preliminary temp modeling or could be based on storage and broodstock only. If the SRG decides spring pulse flow is appropriate, will pass to SHOT as a recommendation. To the extent possible when consistent with action objectives, try to combine the spring pulse flow with meeting delta objectives either D1641 or the VA system-wide objectives depending on the source of the pulse flow water.
 - SHOT considers pulse flow action in consideration of broodyear assessment, storage, system conditions...risk/balance/tradeoffs.
- **April**
 - If April 90% forecast indicates EOA/EOS projections indicate Bin 2:
 - Transfer planning – Identify bounds of volume and timing
 - If April 90% forecast EOA/EOS projections indicate Bin 3:
 - Transfer planning – Identify bounds of volume and timing
 - Final decisions on many drought actions including available water supply for SRSC diversions and diversion patterns
 - Regardless of Bin type:
 - SHOT meeting weekly or as needed
 - SHOT continues enhanced reporting out to WOMT
 - Reclamation announces April allocations if appropriate. SHOT coordination involves:

- If Shasta EOS is projected to be above 2.4, then walk through the forecast after the allocation comes out
 - If a borderline year, then discuss key forecasting parameters that prevent Shasta from reaching 2.4 MAF
- SHOT continues planning discussions for April and May release patterns
- Continue to coordinate on non-critical year voluntary actions
- May pulse flow decision
- LSNFH actions continuing
- Reclamation shares the April Operational Outlook with the SHOT and any concerns or trade-offs are discussed as appropriate
- Draft Temperature Management Plan (table and/or graphs only – no report):
 - If going into a bin 2 or 3 (90% exceedance unless altered by hydrology) then based on March forecast with a date of April 15th to allow for SRG coordination
 - If bin 1, then date of April 30th using the April forecast unless later decided by SHOT
- Profile frequency – SHOT determines optimal frequency
- Determine final shoulder temps if necessary
- **May**
 - If May 90% forecast indicates EOA/EOS projections indicate Bin 2:
 - Transfer planning – Identify bounds of volume and timing
 - If May 90% forecast EOA/EOS projections indicate Bin 3:
 - Continue Meet and Confer. Make decisions regarding commitments under SRSC resolution
 - Transfer modifications – Draft/Final bounds
 - Evaluating Drought Toolkit if necessary
 - Regardless of Bin type:
 - SHOT back to meeting Monthly or as needed.
 - Reclamation shares the May Operational Outlook with the SHOT and any concerns or trade-offs are discussed as appropriate.
 - SHOT continues planning discussions for May release patterns.
 - Final allocations if appropriate: SHOT Coordination includes:

- If Shasta EOS is projected to be above 2.4, then walk through the forecast after the allocation comes out.
 - If a borderline year, then discuss key forecasting parameters that prevent Shasta from reaching 2,4 MAF.
- It is common that May will be the final allocation.
- Continue to coordinate on non-critical year voluntary actions.
- Evaluate system wide trade offs.
- LSNFH actions continue.
- Possible May pulse flow.
- Final TMP shared with both NMFS and the State Water Board with a copy to all SHOT and SRG members. Final will be issued by May 31st unless a later date is agreed upon by the SHOT.
- **June**
 - SHOT is meeting monthly or as needed and coordinating with the SRG during implementation of the TMP
 - SHOT may consider adjustments to the TMP if recommended by the SRG
- **July**
 - SHOT is meeting monthly, or as needed, and coordinating with the SRG during implementation of the TMP
 - SHOT may consider adjustments to the TMP
- **August**
 - SHOT is meeting monthly, or as needed, and coordinating with the SRG during implementation of the TMP
 - SHOT may consider adjustments to the TMP
 - SRG begins discussing fall release planning
- **September**
 - SHOT is meeting monthly, or as needed, and coordinating with the SRG during implementation of the TMP. There may be a need to coordinate fall transition planning to minimize redd dewatering based on available cold water and overall storage conditions.

2.4.2 Drought Operations Priority Framework

Under certain conditions, such as prolonged drought or unexpected hydrologic conditions, the February 90% forecast may indicate that EOS is projected to be less than 2.0 MAF. Under these conditions, Reclamation will develop a drought emergency plan that, at a minimum, will include the following actions with the goal of achieving a projected EOS storage as close to 2.0

MAF as possible:

- Evaluation of system priorities.
- Plan to continue to pursue all applicable 3B actions.
- Full assessment of hydrologic and ecosystem conditions.
- Assessment of Public Health and Safety needs.
- Managing salinity to meet basic public health and safety needs.
- Ability to meet demands for public health and safety water deliveries.
- Enhanced coordination between the SHOT, Directors and SRSCs.
- After exploring all applicable 3B actions, develop a Temperature Management Plan which accounts for the drought emergency plan and applies the best available approaches for managing the available coldwater supply to best balance tradeoffs between the spatial and temporal extent of winter-run suitable habitat while considering impacts to other species.

All actions in the Drought Toolkit will also be considered. Over the long-term additional actions are being considered or implemented to provide improved conditions for species during future droughts in addition to the actions identified in this plan:

- Designing habitat projects with drought refugia and resilience in mind
- Investments in other habitats for salmon spawning
- Consider objectives when planning for and implementing other water projects

Management Rationale: In these circumstances, all of the relevant Bin 3B actions will be considered but there is a low likelihood that taking all of the actions would increase forecasted EOS conditions above 2.0 MAF and therefore, Reclamation, in coordination with the SHOT and WOMT, will develop a drought emergency plan that establishes system priorities and a temperature management plan that seeks to provide winter-run Chinook spawning temperatures to avoid catastrophic losses related to summer temperature management.

2.5 Clear Creek

As a component of the Trinity Division of the CVP, Reclamation operates and maintains Whiskeytown Dam on Clear Creek (Figure 8), with a capacity of 241,100 acre-feet, for irrigation and other beneficial uses, hydroelectric power generation, fish and wildlife, recreation, and upper Sacramento River temperature control and water rights requirements. Whiskeytown Lake provides reregulation of trans-basin imports from the Trinity River. Diversions from Lewiston Lake on the Trinity River through the Judge Francis Carr Powerhouse and the runoff from the Clear Creek drainage area flow into Whiskeytown Lake. Water from Whiskeytown Lake is released into Clear Creek, diverted through the Muletown Conduit, or diverted through the Spring Creek Tunnel and Spring Creek Powerplant into Keswick Reservoir. Whiskeytown Lake has two temperature curtains to pass cold water through the bottom layer and limit warming from Judge Francis Carr Powerhouse to the Spring Creek Powerplant.

Reclamation operates and maintains Spring Creek Debris Dam on Spring Creek, with a

capacity of 5,870 acre-feet, for hydroelectric power generation and upper Sacramento River temperature control and water rights requirements. Spring Creek Debris Dam controls debris and contaminated runoff resulting from old mine tailings on Spring Creek, which would otherwise enter the Spring Creek Powerplant tailrace. Water from Spring Creek Debris Dam and Spring Creek Powerplant discharges into Keswick Reservoir.

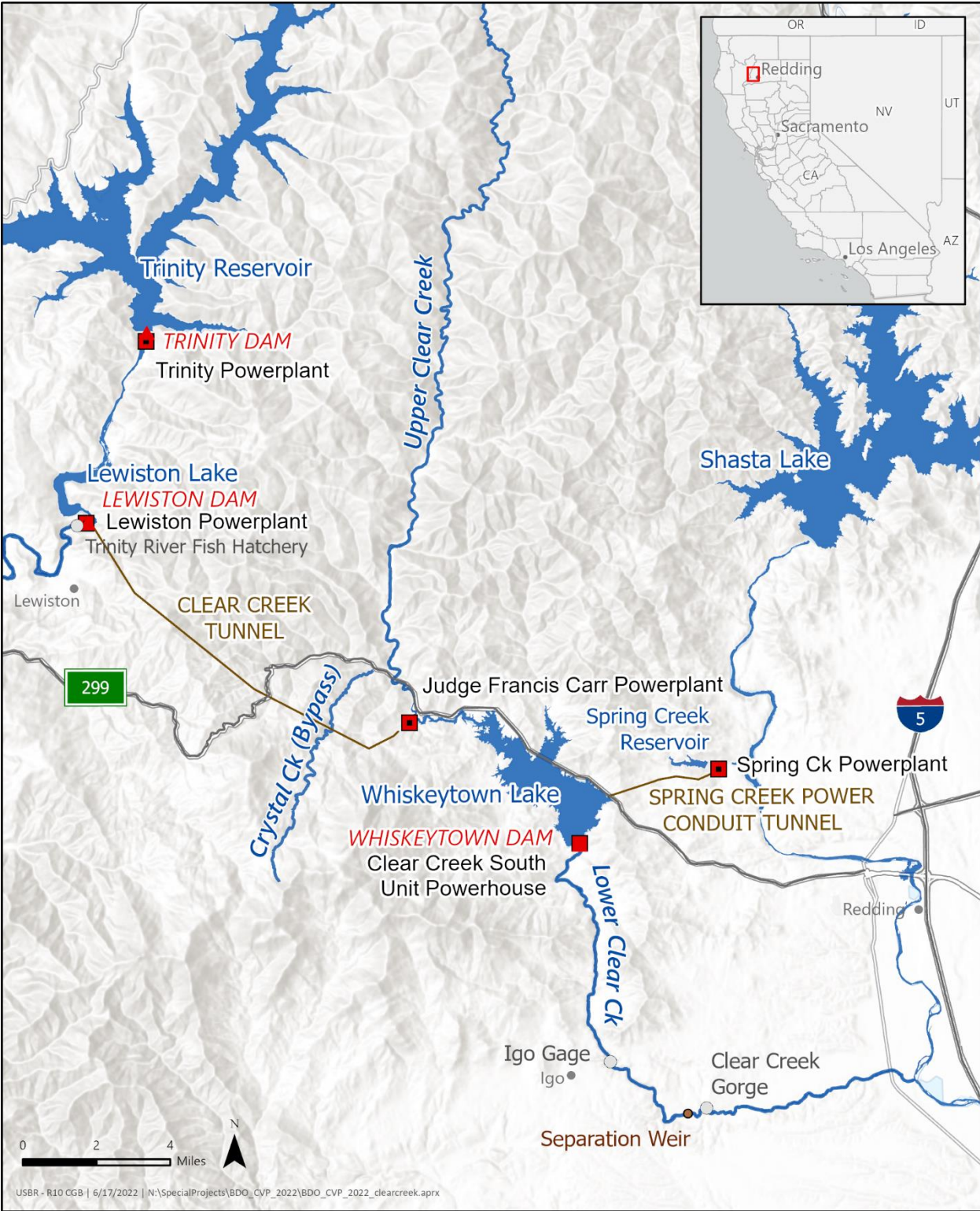


Figure 8. Clear Creek Facilities in the Trinity Division of the Central Valley Project.

Statutory, Regulatory, and Contractual Requirements, see Appendix A:

- Public Law 84-386 Trinity River Division
- Section 3406(b)(12) of CVPIA
- Instream Flow Preservation Agreement 2000 (Contract No. 00-WC-1719-B8)
- April 15, 2002, State Water Board permit, minimum flows
- 1980 Memorandum of Understanding (MOU) with CDFW and the State Water Board (Spring Creek Debris Dam)

Programs in the environmental baseline to highlight:

- Spawning and Rearing Habitation Restoration

2.5.1 Seasonal Operations

In the winter and spring, Whiskeytown Lake is operated to regulate flows for flood management. Starting in November, Reclamation will draw down Whiskeytown Lake by approximately 35 TAF to create flood management space, generally refilling in April or May. USACE does not regulate Whiskeytown Lake for flood control. Operations at Whiskeytown Lake during flood conditions are complicated by its operational relationship with the Trinity River, Sacramento River, and upper Clear Creek. On occasion, imports of Trinity River water to Whiskeytown Lake may be suspended to avoid aggravating high flow conditions in the Sacramento Basin. Heavy rainfall events occasionally result in uncontrolled gloryhole spillway discharges to Clear Creek, through the Whiskeytown Gloryhole.

During the summer and early fall, Reclamation operates to provide lake elevations as full as practical for recreation. Whiskeytown Lake is a major recreational destination with recreational facilities administered by the National Park Service. Summer and fall imports help maintain Whiskeytown Lake elevations, provide cool water for releases to Clear Creek for temperature control objectives, decrease residence time in Lewiston Lake for Trinity River temperature control, and help maintain temperature objectives in the Sacramento River by supplying water to Keswick Reservoir.

2.5.2 Ramping Rates

Ramping rates address the stranding risk stressor. Reclamation will use down ramping rates of up to 25 cfs per hour and schedule these reductions in consideration of listed species behavior (e.g., diel movement patterns).

Reclamation may vary from these ramping requirements during flood control. Reclamation, through Clear Creek Technical Team (CCTT), may develop a faster or slower down ramping rate on a case-by-case basis.

2.5.3 Minimum Instream Flows (Seasonally Variable Hydrograph)

Minimum instream flows address habitat stressors. Reclamation will release water through Whiskeytown Dam to provide intra-annual variation to emulate natural processes. As provided in Figure 9 and Table 3 flows will oscillate over a 1-year period, with releases transitioning from 300 cfs in the winter, down to 100 cfs in the summer, and back to 300 cfs by the following winter. In critical years, Reclamation will target an average 150 cfs based on available water from Trinity Reservoir and attempt to maintain above 100 cfs.

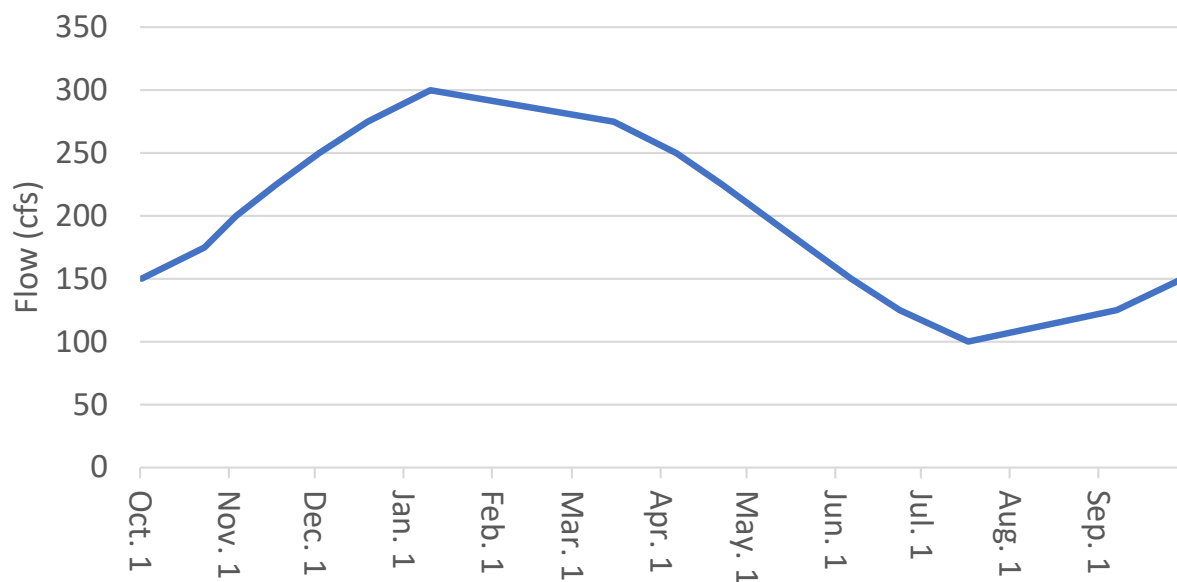


Figure 9. Clear Creek Seasonally Variable Hydrograph Minimum Flows, Except Critical Years

Table 3. Proposed Annual Clear Creek Flows Changes

Date	From (cfs)	To (cfs)
October 1	125	150
October 23	150	175
November 3	175	200
November 17	200	225
December 2	225	250
December 19	250	275
January 10	275	300
March 15	300	275
April 6	275	250
April 22	250	225
May 7	225	200
May 22	200	175
June 6	175	150
June 23	150	125
July 17	125	100
September 7	100	125

cfs = cubic feet per second.

Reclamation, through the CCTT, will schedule the hydrograph to maximize multi-species benefits. Reclamation, through the CCTT, may modify the timing and flow rates provided in Figure 9 and Table 3 by February 1 and updated through May on a case-by-case basis. The flow schedule is subject to agreement by Redding Electric Utility for use of their facilities.

2.5.4 Pulse Flows

Pulse flows address the stressors on migration cues. Except in years with significant uncontrolled spill, Reclamation will release up to 10,000 acre-feet from Whiskeytown Dam for channel maintenance, spring attraction flows, and to meet other physical and biological objectives. In critical years, Reclamation will release up to 5,000 acre-feet. Reclamation, through CCTT, will develop pulse flow schedules, which include measures (e.g., nighttime down ramping, slow down ramping rates, coordination with natural precipitation events) to mitigate for potential risks (e.g., potential juvenile fish stranding). The pulse flows are not to exceed safe outlet works capacity of Whiskeytown Dam, currently 840 cfs, and will be scheduled on or after February 1.

Availability of water for pulse flows is tied to water year type. The determination of water year type will be based on the Sacramento Valley Index (SVI), at 90% exceedance level. Due to unknowns in winter precipitation, Clear Creek pulse flows are not to occur prior to the February SVI reporting. The full pulse flow volume (10,000 acre-feet) will be available if the SVI is greater than 5.4, at the SVI updates (i.e., dry or wetter years). If the SVI updates are equal to or less than 5.4 (critical years), Reclamation would limit releases of pulse(s) flows to 5,000 acre-feet.

2.5.5 Water Temperature Management

Water temperature management addresses adult water temperature and egg incubation stressors. Reclamation will target Whiskeytown Dam releases to not exceed the mean daily temperatures at Igo gauge:

- 61°F from June 1 through August 15
- 60°F from August 16 through September 15
- 56°F from September 16 through November 15

Water temperature management on Clear Creek is implemented through changes in guard gate configurations and flow manipulations. In dry, critical, or import curtailment years, Reclamation may not be able to meet these temperatures and will operate Whiskeytown Dam as close to these temperatures as practicable.

Additional flows may be required to meet temperature objectives. Reclamation will determine if additional water is available for temperature management and inform the agency representatives through the CCTT. If two consecutive days of mean daily temperature are exceeded, and Reclamation determines additional water is available, then 25 cfs per day will be added to the base flow to address temperatures.

Any flow changes completed for temperature management in the late-summer or fall, implemented at 25-cfs increments, would be maintained until the base flow of the seasonal hydrograph rises to meet the elevated temperature release. For example, if flows were increased to 150 cfs on September 10 to decrease water temperatures, they would remain there until October 23 when the hydrograph would normally increase to 175 cfs. This relieves the

need to down ramp during spawning and potentially dewater redds. If additional flows are needed to meet temperature in late spring or summer during a hot spell for instance, ramp-down to base flow would occur when meteorological conditions allow.

2.5.6 Segregation Weir

The segregation weir addresses competition, introgression, and broodstock removal stressors. Reclamation proposes to ensure placement of a segregation weir on Clear Creek typically installed between the Clear Creek Gorge Cascade and Clear Creek Road Bridge in late August and remain in place through early November. Reclamation, through the CCTT, will select the location based on channel cross-section suitability for weir placement and the distribution of adult spring run Chinook Salmon holding locations. Previous placements have occurred at River Mile (RM) 8.2 or 7.5. An additional location is being prepared at RM 7.25. Placement of the weir would occur before fall run Chinook Salmon enter Clear Creek to minimize hybridization with spawning spring-run Chinook Salmon and redd superimposition. Removal of the weir would occur after the peak of fall run Chinook Salmon spawning when the risk of redd superimposition is very low. The weir location and timing protect most of the spring-run Chinook Salmon utilizing Clear Creek, while minimizing effects on other salmonids.

2.6 American River

Reclamation operates and maintains the American River Division of the CVP for flood control, M&I and agricultural water supplies, hydroelectric power generation, fish and wildlife protection, recreation, and Delta water quality. Facilities include Folsom Dam, its reservoir (977 TAF capacity), power plant, temperature control shutters on the power plant, and the Joint Federal Project auxiliary spillway, as well as the Nimbus Dam, Lake Natoma, Nimbus Power Plant, and Folsom South Canal (Figure 10). The CVP additionally delivers water to the Freeport Regional Water Project Intake. Releases from Folsom Dam are re-regulated approximately seven miles downstream by Nimbus Dam. Nimbus Dam creates Lake Natoma, which serves as a forebay for diversions to the Folsom South Canal and the Nimbus Fish Hatchery. Water diverted to the fish hatchery returns to the American River through four outfalls approximately 0.5 mile downstream of Nimbus Dam. Releases from Nimbus Dam to the American River pass through the Nimbus Power Plant, or the spillway gates at flows more than 5,000 cfs.

Folsom Reservoir is the main storage and flood control reservoir on the American River. Numerous other smaller non-CVP and SWP reservoirs in the upper basin provide hydroelectric generation and water supply without specific flood control responsibilities. The total upstream reservoir storage above Folsom Reservoir is approximately 820 TAF, and these reservoirs are operated primarily for hydropower production. Ninety percent of this upstream storage is contained by five reservoirs: French Meadows (136 TAF); Hell Hole (208 TAF); Loon Lake (76 TAF); Union Valley (271 TAF); and Ice House (46 TAF). Reclamation coordinates with the operators of these non-CVP and SWP reservoirs to aid in planning for Folsom Reservoir operations.

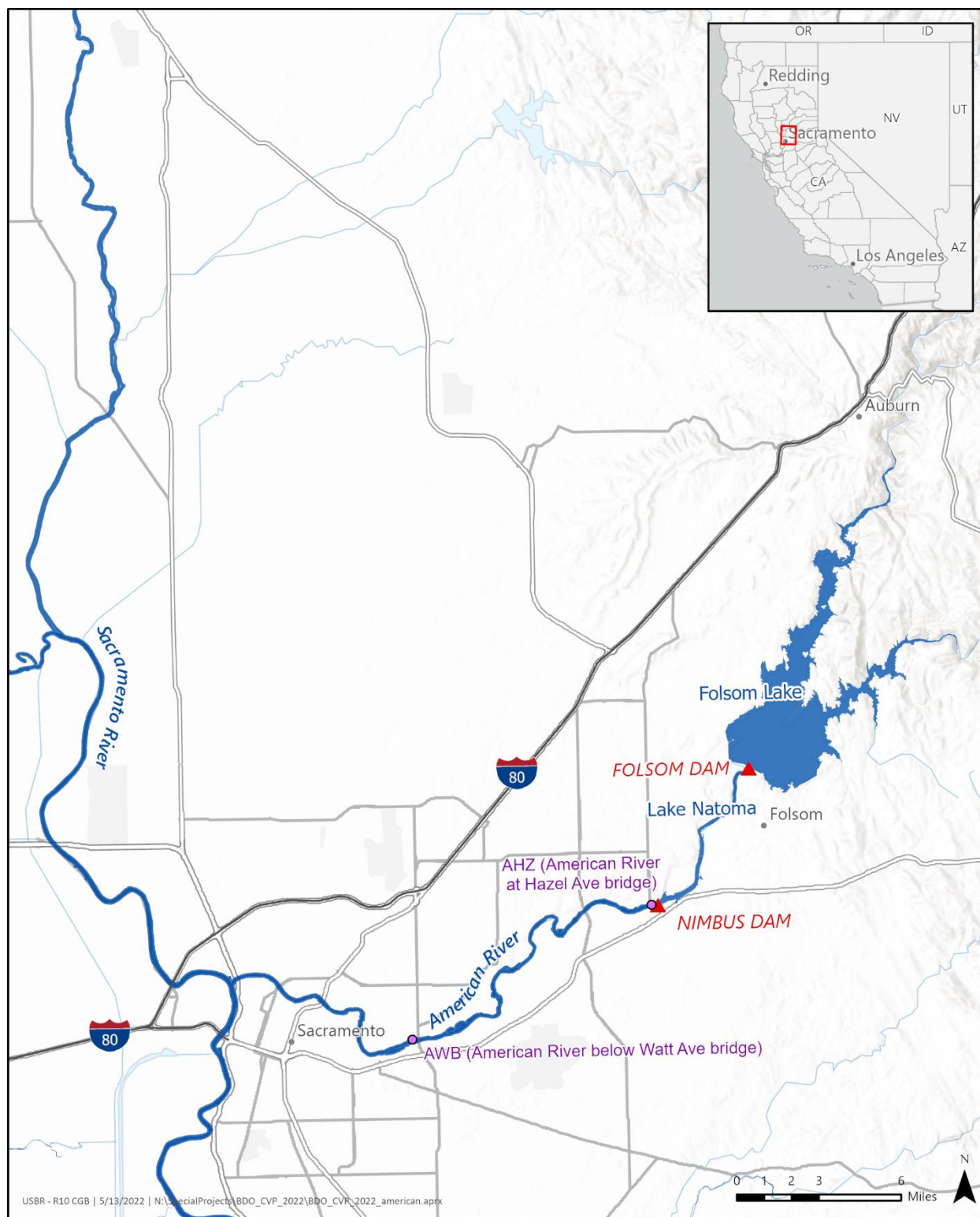


Figure 10. Facilities in the American River Division of the Central Valley Project

Statutory, Regulatory, and Contractual Requirements, see Appendix A:

- Public Law 81-356 American River Development Act of October 14, 1949, ch. 690, 63 Stat. 852

- Public Law 89-161 Auburn-Folsom South Unit - Act of September 2, 1965, 79 Stat. 615
- Freeport Regional Water Authority Intake
- State Water Board D-893
- State Water Board D-1641
- Water Control Manual for Folsom Dam and Lake (June 12, 2019) and its October 16, 2018, NMFS Biological Opinion
- Water Forum MOU March 29, 2021

Programs in the environmental baseline to highlight:

- Nimbus Hatchery Genetics Management Plan
- Temperature Modeling Platform.
- Spawning and Rearing Habitat Restoration.
- Folsom Dam Raise and Temperature Control Shutters

2.6.1 Seasonal Operations

Reclamation operates Folsom Reservoir in the winter primarily for flood control and minimum flows in the American River and Delta. Flood control may drive operations in wetter years. The USACE 2019 *Water Control Manual: Folsom Dam and Lake* provides operational rules for dam safety and flood risk management. Flood operation criteria target flow rates below downstream channel capacities. During non-flood control operations, Reclamation stores Folsom Reservoir inflows that exceed releases for minimum instream flows and Delta water quality requirements. Reclamation seeks consistent steady releases to minimize potential redd dewatering, redd scouring, and juvenile stranding for steelhead and fall-run Chinook salmon, but Delta outflow requirements may require varying releases.

In the spring, when not operating to flood control requirements, Reclamation seeks to maximize capture of the spring runoff to fill as close to full as possible. The American River Minimum Flow Schedule (ARMFS), Appendix ARMFS, includes both minimum releases and, in some years, a pulse flow to cue juvenile salmonids to emigrate. Reclamation also operates for water supply and Delta outflow requirements. As the closest reservoir to the Delta, increased releases from Folsom are frequently called on to address Delta water quality requirements under State Water Board D-1641. When releases from upstream CVP and SWP reservoirs meet Delta outflow requirements, Folsom releases can be reduced, and system-wide reservoirs balanced.

When developing the operational forecast, Reclamation would evaluate an end-of-December Folsom storage of at least 300 TAF. In some years, operational constraints may result in an end-of-December storage of less than 300 TAF. If, based on the May forecast, Reclamation does not anticipate meeting 300 TAF at the end of December, it will be reported at the May American River Group meeting. In those instances, Reclamation and the American River Parties will develop a list of potential actions that may be taken to either improve forecasted storage or decrease demand on Folsom Reservoir. The objective of considering storage in the forecasting process is to provide releases of salmonid-suitable temperatures to the Lower

American River and reliable deliveries to American River water agencies dependent on deliveries or releases from Folsom Reservoir. In September, storage is typically at its lowest after releases and diversions for summer demands. When planning in the spring for temperature management later in the year, meteorological forecasts of precipitation events are uncertain for October through December. Assuming higher precipitation events than may materialize may present a higher risk of the reservoir not having sufficient carryover storage by the end of December. Reclamation is implementing a pilot program that considers an end-of-December planning minimum of 300 TAF (Water Forum MOU, March 2021).

In the summer, Reclamation typically releases flows above the minimum instream flow requirements for instream temperature control, Delta outflow, and water supply. Reclamation manages water temperatures through the volume of water released and shutter elevations, in consideration of projected meteorological conditions. Reclamation balances the need to access Folsom Reservoir coldwater pool for instream temperature control during the summer for steelhead and the need to preserve cold water for fall-run Chinook salmon.

In the fall, operations focus on temperature control management. Limited coldwater pool and limited storage require balancing releases and shutter operations to maximize the ability to maintain suitable temperatures for steelhead rearing and fall-run Chinook salmon spawning. If reservoir inflows are greater than the release needs, Reclamation stores the surplus water. Reclamation will ramp down to the revised minimum flows from Folsom Reservoir as soon as possible in the fall and maintain these flows through fall-run Chinook salmon spawning and egg emergence, where possible, to minimize redd dewatering and juvenile stranding.

2.6.2 Ramping Rates

Ramping rates address the stranding stressor. Reclamation will ramp down releases in the American River below Nimbus Dam as shown in Table 4 and at night, if possible.

Table 4. American River Ramping Rates

Lower American River Daily Rate of Change (cfs)	Amount of Decrease in 24 Hours (cfs)	Maximum Change per Step (cfs)
20,000 to 16,000	4,000	1,350
16,000 to 13,000	3,000	1,000
13,000 to 11,000	2,000	700
11,000 to 9,500	1,500	500
9,500 to 8,300	1,200	400
8,300 to 7,300	1,000	350
7,300 to 6,400	900	300
6,400 to 5,650	750	250
5,650 to 5,000	650	250
<5,000	500	100

cfs = cubic feet per second.

Reclamation may vary from these ramping requirements during flood control. Reclamation, through the American River Group (ARG), may develop a faster down ramping rate on a case-by-case basis to implement temporary flow reductions for critical monitoring or maintenance needs.

2.6.3 Minimum Instream Flows (Minimum Release Requirements)

Minimum release requirements address egg dewatering, adult stranding and juvenile habitat stressors. For lower American River flows (below Nimbus Dam), Reclamation proposes to adopt the ARMFS. The ARMFS is based on the Modified Flow Management Standard developed by the Water Forum in 2017 (2017 MFMS), with additional modifications as described below. The ARMFS includes minimum release requirements (MRRs) ranging from 500 to 2,000 cfs based on time of year and annual hydrology. The flow schedule is intended to provide suitable habitat conditions for steelhead and fall-run Chinook salmon. As detailed in Appendix S, the Sacramento River Index (90% exceedance forecast) will be used to develop the MRR in January. The American River Index (90% exceedance forecast, with certain spills subtracted) will be used to calculate the MRR in February through December. All MRR calculations will be based on the hydrologic indices reported in the first Bulletin 120 of each month. Reclamation will continue to work with the American River Group to coordinate the shaping of upcoming releases within operational constraints.

Key differences in the ARMFS compared to the 2017 MFMS include the following:

- While the 2017 MFMS calculates the MRR for each month using a hydrologic index based on a 50% or 75% exceedance forecast, Reclamation proposes to calculate the MRR based on the 90% exceedance forecast for the relevant hydrologic index.
- The 2017 MFMS didn't specify how to transition from one month's MRR to the next month's MRR. In the ARMFS, Reclamation established a more defined timeframe for when the MRR would go into effect, targeting five business days after the initial monthly release of Bulletin 120. If the MRR is not implemented within five business days, Reclamation will notify the American River Group.
- Within one year of the Record of Decision (ROD), Reclamation, through the American River Group, will (a) evaluate the equations used to calculate the MRRs in November through December to consider whether an adjustment to the maximum MRR is warranted based on habitat improvements and other relevant information, (b) develop recommendations, (c) and explanations on any recommendations not accepted.
- The offramp and volume offset in the spring pulse flow were removed so that in years when a spring pulse flow is triggered (based on the March MRR), the full volume is available to shape without a reduction in the MRR later in the spring. The current Proposed Action also specifies that the fish agencies, within operational constraints, may determine the timing of the flow.

2.6.4 Spring Pulse Flows

Spring pulse flow addresses stressors on outmigration cues to increase emigration rates and move juveniles downstream. Reclamation will implement a spring pulse in years that the MRR for March (based on the March forecast) is between 1,000 cfs and 1,500 cfs, as described in the ARMFS. The peak flow of the pulse flow would be 3 times the March MRR, even if implemented in April or May, but no higher than 4,000 cfs and lasting two days. Following two days at the peak flow, Nimbus releases would be decreased at no more than 500 cfs per day and no more than 100 cfs per hour. Changes in Nimbus releases would occur at night, if possible.

The American River Group will provide technical input on shaping Spring Pulse Flow volumes, with the final timing determined by CDFW, FWS, and NMFS.

Reclamation, through the ARG, will develop a pulse flow schedule. Reclamation, through the ARG, may facilitate an additional spring pulse flow event if water is made available from non-CVP sources, or if there is flexibility to shape planned releases in a more variable schedule.

2.6.5 Redd Dewatering Protective Adjustments

The redd dewatering protective adjustment (RDPA), as described in ARMFS, adjusts the MRR to account for hydrology and potential dewatering impacts to fall-run Chinook salmon redds in January and February and steelhead redds in February through May based on the MRR.

Dewatering Protective Adjustments based on the MRR are not protective when actual flows in-river are above the MRR. Releases can be above the MRR in the fall and winter due to contractual obligations, Delta water quality requirements, and precipitation events. There are not Redd Dewatering Protective Adjustments based on actual flows. The American River Group will provide technical input on shaping Redd Dewatering Projective Adjustments.

In January, the MRR can only decrease and cannot be less than 70% of the December MRR. In February, the MRR cannot be less than 70% of the December MRR. Based on the January MRR, Table 5 shows the minimum flow for steelhead redds through May. If the February MRR is higher than January, the February MRR is used through May.

Table 5. Steelhead Redd Dewatering Protective Adjustment-Based MRR for February through May³

January or February MRR (cfs)	Steelhead Redd MRR through May (cfs)
≤700	500
800	520
900	580
1,000	640
1,100	710
1,200	780
1,300	840
1,400	950
1,500	1,030
1,600	1,100
1,700	1,180
1,800	1,250

cfs= cubic feet per second; MMR = minimum release requirement.

The maximum MRR in January through May is 1,750 cfs, but 1,800 cfs is included in the table

³ The maximum MRR in January through May is 1,750 cfs, but 1,800 cfs is included in the table as a maximum value

as a maximum value. In February, the ARI-based and fall-run Chinook salmon RDPA-based MRRs for February are compared to the steelhead RDPA-based MRR in Table 5, using the controlling MRR in January as a basis. The highest of the three MRRs controls operations.

For March through May, the ARI-based MRR for the month is compared to the steelhead RDPA-based MRR in Table 5, using the highest of the controlling MRRs in January or February as a basis. The highest of the two MRRs controls operations.

2.6.6 Water Temperature Management

Temperature management supports fall-run and addresses the water temperature stressor on steelhead. The most suitable water temperature for juvenile steelhead rearing habitat in the lower American River is 65°F or lower. Ideally, the Temperature Management Plan would provide for daily average water temperatures no higher than 65°F from Nimbus Dam (just upstream of the Hazel Avenue bridge) down to the Watt Avenue bridge. The active temperature management season is approximately May 15 to October 31. Of additional importance, water temperatures below 56°F are suitable for fall-run Chinook salmon spawning. Carcass surveys in the lower American River indicate spawning from approximately mid-October through December and into January.

Reclamation will implement the Automated Temperature Selection Procedure (ATSP), which was developed in consultation with representatives of state and federal agencies and prioritizes water temperatures during the summer to support steelhead rearing over water temperatures in the fall to support Chinook salmon spawning. Each ATSP schedule determines a monthly series of water temperature targets (for daily average water temperature) at the Watt Avenue bridge. Schedule 1 has a water temperature upper limit of 63°F from May through September, and 56°F in October and November. Schedule 78 has a water temperature upper limit of 72°F from May through November. Schedules 2 through 77 each represent a change in a single month's upper temperature limit by 1°F. Reclamation would consider modification to the ATSP or utilize another method in the event ARG members and fish agencies request consideration based on year-type conditions.

In years in the lower American River will have temperatures unsuitable for rearing or spawning, Reclamation, will meet with fisheries agencies to evaluate actions that can be taken to minimize temperature impacts to fisheries, may modify the ATSP as follows:

- For Schedule 28 or higher (greater than 65°F at Watt Avenue Bridge, May through September), the TMP may consider a temperature location at Hazel Avenue
- For greater than 65°F at Hazel Avenue bridge for May through September, the TMP will include an evaluation of whether modified Folsom operations could support an improved temperature schedule (e.g., an alternate release schedule over the summer)
- For greater than 68°F at Hazel Avenue for May through September, the TMP will include an evaluation of whether modified Folsom operations could support an improved temperature schedule (e.g., an alternate release schedule over the summer) and evaluate a power bypass during the summer and/or fall
- For greater than 56°F at Hazel Avenue in November, the TMP will evaluate a power bypass in the fall, with the evaluation likely to occur in August and September

By May 15, Reclamation will provide a draft TMP and solicit technical input from the ARG.

By June 15, Reclamation, through ARG, will annually prepare a Temperature Management Plan for the summer through fall. The Temperature Management Plan will contain: (1) forecasts of hydrology and storage; and (2) a modeling run or runs, using these forecasts, demonstrating what temperature compliance schedule can be attained. Reclamation will plan shutter configurations to attain the best possible (lowest numbered) temperature schedule. The priority for use of the lowest water temperature control shutters at Folsom Dam, within operational constraints, will achieve the water temperature requirement for steelhead, and may also be used to provide cold water for fall-run spawning. During plan implementation, if the temperature is exceeded for 3 consecutive days, or is exceeded by more than 3°F for a single day, Reclamation, will notify NMFS and the ARG, and outline steps to realign water temperature with the Temperature Management Plan.

2.7 Delta

Reclamation operates and maintains the Delta Division of the CVP for M&I and agricultural water supplies, hydroelectric power generation, fish and wildlife protection, recreation, and Delta water quality. The major CVP features are the Delta Cross Channel, Contra Costa Canal and Rock Slough Intake facilities, Tracy Fish Collection Facility and C. W. “Bill” Jones Pumping Plant (Jones Pumping Plant), and Delta-Mendota Canal (Figure 11). The Jones Pumping Plant, located about 5 miles north of Tracy, has six fixed-speed pumps with an operating capacity of 4,600 cfs. The Jones Pumping Plant discharges into the head of the Delta-Mendota Canal.

Reclamation operates and maintains the San Luis Unit of the West San Joaquin Division for M&I and agricultural water supplies, hydroelectric power generation, fish and wildlife protection, recreation, and water quality. The major joint CVP and SWP features are the O’Neill Forebay, San Luis Reservoir, Bernice Frederic Sisk Dam, O’Neill Pumping-Generating Plant, William R. Gianelli Pumping-Generating Plant, San Luis Canal, Dos Amigos Pumping Plant, and Los Banos and Little Panoche Detention Dams and Reservoirs. The major CVP-only facilities include the Coalinga Canal and Pleasant Valley Pumping Plant.

Reclamation operates the San Felipe Division for M&I and agricultural water supplies, fish and wildlife protection, and recreation. The major CVP features are the Pacheco Pumping Plant, Tunnel, and Conduit.

The main SWP Delta features are the Barker Slough Pumping Plant, Suisun Marsh facilities (including the Suisun Marsh Salinity Control Gate, Roaring River Distribution System, Morrow Island Distribution System, Goodyear Slough Outfall Gates), Clifton Court Forebay, and John E. Skinner Delta Fish Protective Facility (Skinner Fish Facility), Harvey O. Banks Pumping Plant (Banks Pumping Plant) and a portion of the California Aqueduct. The Barker Slough Pumping Plant diverts water from Barker Slough into the North Bay Aqueduct for delivery to the Solano County Water Agency and the Napa County Flood Control and Water Conservation District. The Suisun Marsh Salinity Control Gates (SMSCG) are located on Montezuma Slough about 2 miles downstream from the confluence of the Sacramento and San Joaquin Rivers, near Collinsville. The purpose of SMSCG operation is to decrease the salinity of the water in the eastern portion of the Suisun Marsh. When operated tidally, the gates reduce salinity by restricting the flow of higher salinity water from Grizzly Bay into Montezuma Slough during incoming tides and by retaining lower salinity Sacramento River water from the previous ebb tide. Operation of the gates in this fashion lowers salinity in eastern Suisun Marsh

channels and results in a net movement of water from east to west through Suisun Marsh.

The SWP Banks Pumping Plant, located near the Jones Pumping Plant, has 11 pumps. Pumping is limited to a maximum permitted capacity of 10,300 cfs per day. The Banks Pumping Plant discharges into the California Aqueduct. The Delta-Mendota Canal/California Aqueduct Intertie is used to move water between the California Aqueduct and the Delta-Mendota Canal and can pump up to 700 cfs from the Delta-Mendota Canal to the California Aqueduct and convey up to 900 cfs from the California Aqueduct to the Delta-Mendota Canal. This structure was built to help both federal and state water projects more effectively move water from the Delta into the San Luis Reservoir.

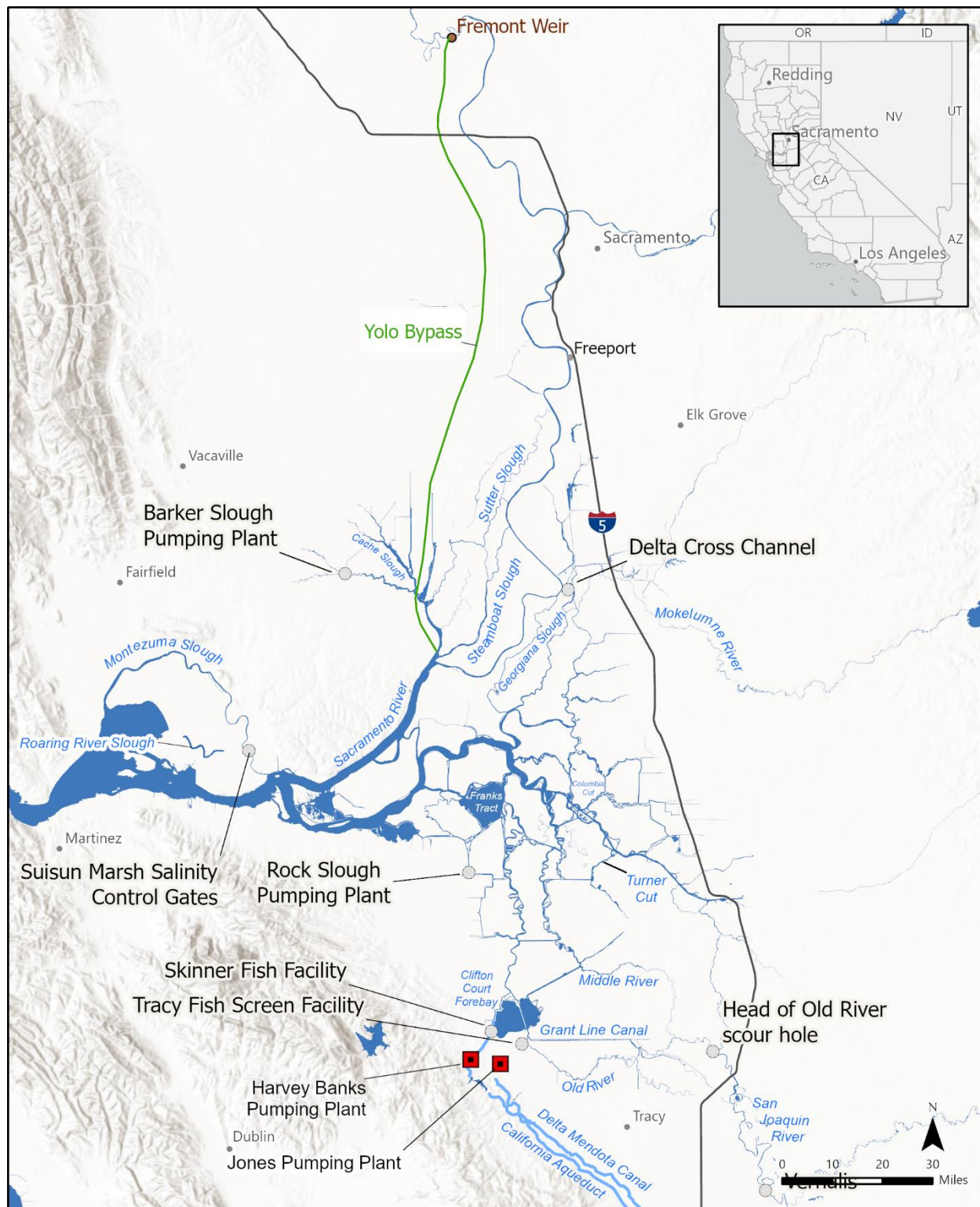


Figure 11. Map of the Delta Division Facilities

Statutory, Regulatory, and Contractual Requirements, see Appendix A:

- Public Law 74-392 CVP Re-Authorization Act
- State Water Board D-1641

- 1986 COA and 2018 COA amendment
- Public Law 99-546, Suisun Marsh Preservation Act
- 1986 Settlement Agreement with South Delta Water Agency (Clifton Court Forebay gate operations)
- October 13, 1981, USACE Public Notice #5820A (Clifton Court inflow criteria)
- DWR's Division of Safety of Dams criteria (Clifton Court Forebay storage)
- USACE permit number 199900715 (Clifton Court Forebay additional 500 cfs)
- DWR/CDFW Agreement (Skinner Fish Facility)
- USACE permit numbers SPK-200100121, SPK-20000696 (Temporary Barriers)

Programs in the environmental baseline to highlight:

- Agricultural Barrier Construction (USACE)
- Barker Slough Pumping Plant Fish Screen (DWR)
- Contra Costa Los Vaqueros Expansion – Phase 1
- Contra Costa Rock Slough Fish Screen
- Delta Cross Channel Gate Improvements Study
- Georgiana Slough Non-Physical Barrier (DWR, USACE)
- Head of Old River – Scour Hole Predation Reduction Study
- B.F. Sisk Dam Raise and Reservoir Expansion Project Construction
- Suisun Marsh Habitat Management, Preservation, and Restoration Plan
- Tracy Fish Collection Facility Improvement Program
- Yolo Bypass Salmonid Habitat Restoration and Fish Passage Project

2.7.1 Seasonal Operations

In the winter and spring, Reclamation and DWR typically export excess water. Excess water conditions occur when releases from upstream reservoirs plus unregulated flow exceed Sacramento Valley in-basin uses and exports. Actions to minimize entrainment of listed fish into the south Delta and at the Jones and Banks Pumping Plants limit the export of excess water. Exports during the winter and spring reduce the reliance on conveying previously stored water in the summer and fall for south-of-Delta water supply needs. In dry conditions, Reclamation and DWR may need to increase releases from upstream reservoirs beyond what is needed to meet minimum flow requirements in order to meet water quality or outflow requirements in the Delta.

During the summer, the CVP and SWP convey previously stored water through the Delta for export at the Jones Pumping Plant, Banks Pumping Plant, and other Delta facilities. Delta operations during the summer typically focus on maintaining salinity and meeting Delta outflow objectives while maximizing exports with the available water supply. In addition, the CVP and SWP make upstream reservoir releases for water temperature management and instream flows, which may be available for export after outflow, salinity, and in-Delta needs have been met.

In the fall, operations are adjusted to meet salinity requirements, Delta outflow requirements, and peak demands from CVPIA wildlife refuges. Upstream and in-Delta demands typically decrease, and accretions within the system typically increase. When water is available and not required for salinity and Delta outflow requirements, late summer and fall provide an opportunity to export water and start filling San Luis Reservoir for the next water year. When conditions are dry, there is little opportunity for exports. Releases from upstream reservoirs generally decrease to conserve water in storage for the next year. On occasion, releases to conserve flood storage or redds may occur and result in additional flows into the Delta. The Banks Pumping Plant pumps water from Clifton Court Forebay. The Clifton Court Forebay radial gates are closed during critical periods of the ebb and flood tidal cycle for water quality and water levels in the south Delta. During July through September, the maximum daily diversion limit from the Delta into the Clifton Court Forebay is increased from 6,990 cfs to 7,490 cfs, and the maximum averaged diversion limit over any 3 days is increased from 6,680 cfs to 7,180 cfs. From mid-December through mid-March, diversions into Clifton Court Forebay may be increased by one-third of the San Joaquin River flow at Vernalis when those flows exceed 1,000 cfs. Further, Banks Pumping Plant will pump up to 195,000 acre-feet for the CVP in accordance with the 2018 COA Addendum.

2.7.2 Delta Cross Channel Gate Closures

The Delta Cross Channel (DCC) closures address the outmigration cues and entrainment risk stressor for salmon and steelhead. Reclamation operates the Delta Cross Channel to: improve the movement of water from the Sacramento River to the export facilities at the Jones and Banks Pumping Plants; improve water quality in the central and south Delta; reduce salinity intrusion rates in the west Delta; and allow passage for boaters. Reclamation closes the Delta Cross Channel during the late fall, winter, and spring to reduce straying of Mokelumne River fall-run Chinook salmon, protect out-migrating salmonids from entering the interior Delta, facilitate the State Water Board D-1641 Rio Vista flow objectives for fish passage, and reduce potential scouring and flooding that might occur in the channels on the downstream side of the gates when Sacramento River flows exceed 20,000 cfs on a sustained basis. Delta Cross Channel closure will continue to occur as follows:

October 1 – November 30, Catch Index Closure

From October 1 through November 30, Reclamation proposes to close the DCC gates in addition to the requirements in D-1641 to further reduce juvenile salmonid entrainment risk based on the Knights Landing Catch Index and Sacramento Catch Index as described in Table 6. Observations of daily increases in catch indices are typically associated with increased flows at Wilkins Slough and tributaries to the upper Sacramento River, cooler water temperatures at these locations, and entry of migrating juvenile winter-run and spring-run Chinook salmon (Del Rosario et al. 2013; White and Low 2006).

Table 6. Delta Cross Channel Action Triggers and Responses from October 1–November 30

Action Trigger	Action Response
• Water quality criteria per D-1641 are met; and	Within 48 hours of index being reported to Reclamation, close the DCC gates for at least 3 days and keep closed until the catch index is less than three fish per day at both the

Action Trigger	Action Response
Knights Landing Catch Index or Sacramento Catch Index (daily index) ≥ 3.0	Knights Landing and Sacramento monitoring sites for two consecutive days
- Water quality criteria per D-1641 are met; and - Knights Landing Catch Index or Sacramento Catch Index (daily index) ≥ 3.0; and - Real time hydrodynamic and salinity modeling shows water quality levels of concern criteria (as presented in Table) are exceeded during 14- day period following DCC closure	Reclamation and DWR, through Delta Monitoring Teams, review monitoring data and complete risk assessment to inform real-time operations of DCC gate closure.
Water quality criteria are not met per D-1641 criteria	No DCC gate closure

Indices: Juvenile Chinook salmon at or above the minimum winter-run size based on the length-at-date Delta model used at a particular sampling location, and below the maximum size (for any run of salmon) considered by the length-at-date Delta model, on a given sampling date, are considered “older juveniles”.

- The Knights Landing Catch Index:* based on reported catch of older juveniles at the Knights Landing rotary screw trapping location and is calculated as the total catch of older juveniles (adjusted, as necessary, for partial cone operations) divided by the number of “trap days” (adjusted, as necessary, for downtime resulting from, for example, debris removal) since the last sampling event. This calculation for older juveniles/trap-day is implemented as [(total number of older juveniles/% cone sampling effort)/total hours fished] * (24 hours fished/trap day).
- The Sacramento Catch Index:* Both the Sacramento trawl (at Sherwood Harbor) and the Sacramento seine data are used to derive the Sacramento Catch Index. The reported catch of older juvenile Chinook salmon is used to generate a Sacramento Catch Index; a separate index for the seine data and a separate index for the trawl data.

 - The seine version of the catch index is standardized to eight hauls; therefore, the index is calculated as: (total number of older juveniles captured/# hauls) * 8. The Sacramento Seine route is based on eight sites: Verona, Elkhorn, Sand Cove, Discovery Park, American River, Miller Park, Sherwood Harbor, and Garcia Bend.
 - The trawl version of the catch index is standardized to 10 tows; therefore, the index is calculated as: (total number of older juveniles captured/# tows) * 10.

Table 7. Water Quality Levels of Concern Criteria (Simulated 14-day average Electrical Conductivity)

Station	Water Quality Concern Level (µmhos/cm)
Jersey Point	1800
Bethel Island	1000
Holland Cut	800
Bacon Island	700

µmhos/cm = micromhos per centimeter.

October 1 – November 30, Lower Mokelumne River Fall Closure

From October 1 through November 30, Reclamation proposes to close the DCC gates in addition to the requirements in D-1641 to enhance adult fall-run Chinook salmon passage into the Mokelumne River as described in Table 8. If the East Bay Municipal Utility District releases Lower Mokelumne River (LMR) attraction flows, water quality modeling shows concern level criteria (Table 7) are not likely to be exceeded for at least 14 days following the action, and there is no observed deterioration of interior Delta water quality, then Reclamation would close the DCC gates as soon as practicable (generally within 48 hours) for up to 5 days. Closure of the DCC gates when adult fall-run Chinook salmon attraction flows pass through the LMR can reduce straying of Chinook salmon between the Mokelumne and American rivers and increase the abundance of fall-run Chinook salmon returning to the Mokelumne River and its hatchery.

Table 8. Delta Cross Channel Action Triggers and Responses during Lower Mokelumne River (LMR) flow releases.

Action Triggers	Action Responses
• Water quality criteria per D-1641 are met and Real- time hydrodynamic; and • Salinity modeling shows water quality concern level targets are not exceeded during 14-day period following DCC closure; and • There is no observed deterioration of interior Delta water quality	Within 48 hours of start of LMR attraction flow release, close the DCC gates for up to 5 days
• Water quality criteria per D-1641 are met; and • Real time hydrodynamic and salinity modeling shows water quality concern level targets are exceeded during 14-day period following DCC closure	Reclamation and DWR, through Delta Monitoring Teams, review monitoring data and complete risk assessment to inform real-time operations of DCC gate closure.

Action Triggers	Action Responses
Water quality criteria are not met per D-1641	No DCC gate closure

December 1 – January 31

From December 1 to January 31, Reclamation proposes to close the DCC gates, except to avoid exceeding a D-1641 water quality criterion within the next 14 days based on water quality modeling (rather than increase releases and reduce reservoir storage further). Reclamation and DWR will prepare an assessment to evaluate opening the DCC gates for up to 5 days for up to two events within this period to avoid D-1641 water quality criteria exceedance. Reclamation and DWR will coordinate with USFWS, NMFS, CDFW and the State Water Board on how to balance D-1641 water quality and Endangered Species Act- (ESA) listed fish requirements and inform the Salmon Monitoring Team and Smelt Monitoring Team. The assessment will consider relevant monitoring information (e.g., upstream rotary screw traps, Delta juvenile fish monitoring surveys, Rio Vista flow standards, acoustic telemetered fish monitoring information) as well as potentially DSM2 modeling informed with recent hydrology, salinity, and tidal data. During these potential DCC gates openings, the CVP and SWP will limit combined exports as not to exceed 1,500 cfs, Health and Safety pumping level.

February 1 – May 20

Reclamation will keep the Delta Cross Channel Gates closed. State Water Board D-1641 requires the Delta Cross Channel Gates be closed.

May 21 – June 15

Reclamation will close the Delta Cross Channel Gates for a total of 14 days. Reclamation and DWR, through the Salmonid monitoring Team (SaMT), will prepare a plan that considers relevant information including: the upstream rotary screw traps, Delta juvenile fish surveys, Rio Vista flow standards, acoustic telemetered fish information, and DSM2 modeling. Reclamation typically schedules the Delta Cross Channel closures to occur on weekdays and keeps it open on weekends to accommodate recreational interests. State Water Board D-1641 requires the Delta Cross Channel to be closed for a total of 14 days after consultation with the USFWS, CDFW, and NMFS.

June 16 – September 30

From June 16 to September 30, Reclamation proposes to open the DCC gate.

2.7.3 Maintenance and Repair

The Reclamation Designers Operating Criteria, dated September 24, 1971, requires Reclamation to undertake routine maintenance and repair of the Delta Cross Channel Gates to continue reliable operation.⁴ Certain routine maintenance and repair require cycling of the Delta Cross Channel Gates (i.e., open and close the gates several times in a row). Routine maintenance and repair will require cycling of one or both gates approximately twice per year for one day each. To avoid and minimize effects, Reclamation to the extent practicable will:

⁴ Bureau of Reclamation. September 24, 1971. Reclamation Designers Operating Criteria.

- Perform cycling when federally listed fish are not likely present (mid-June through September)
- Perform cycling during daylight hours
- Minimize the duration of the time Delta Cross Channel is open during cycling when salmonids are present

Reclamation is required to maintain the Delta Cross Channel and may not have discretion over when the maintenance must occur. Reclamation will notify USFWS and NMFS of maintenance prior to its implementation, if it occurs during a closure period.

In addition:

As part of worker awareness training programs for federally listed species provided at the Delta Cross Channel facility, Tracy Fish Facility, Clifton Court Forebay facility and Barker Slough facility, Reclamation will include information about Northwestern Pond Turtle.

If Northwestern Pond Turtle is observed to be in harm's way in and/ or adjacent to the Delta Cross Channel Facility, Tracy Fish Facility, Clifton Court Forebay Facility and Barker Slough, Reclamation and DWR will ensure turtles are moved to the nearest habitat and notify the USFWS within 72 hours of event.

2.7.4 Old and Middle River Flow Management

Old and Middle River flow management addresses the entrainment stressor on adult delta smelt, larval and juvenile Delta smelt, adult longfin smelt, larval and juvenile longfin smelt, winter-run juveniles, spring-run juveniles, steelhead juveniles, and green sturgeon. Old and Middle River (OMR) provides a surrogate indicator for how export pumping at Banks and Jones Pumping Plants influence hydrodynamics in the south Delta. OMR will be calculated using the equation provided in Hutton 2008. If an equation is developed that results in a better representation of OMR flows, and Reclamation, DWR, NMFS, USFWS, and CDFW agree, then that equation will be updated in calculating the OMR index.

Winter-Run Early Season Migration

Winter-Run Early Season Migration: To minimize entrainment and salvage of early-migrating natural older winter-run Chinook salmon, DWR and Reclamation will adjust exports to achieve a 7-day of the average OMR value no more negative than -5,000 cfs for seven consecutive days, to be assessed on the seventh day of the averaging period after initiating operational changes in response to the OMR trigger, when the genetically verified 7-day rolling sum of winter-run Chinook salmon loss, calculated daily, exceeds the following annually calculated thresholds:

- From November 1 – November 30: 0.0044% (e.g., water year 2023) of the Red Bluff juvenile winter-run Chinook salmon Brood Year Total at the end of the second biweekly period in October, whereby the November Multiplier is:

$$\text{November Multiplier} = 0.0011 \times 0.25 \times \text{Survival}_{\text{Fry-to-Smolt}} \times \text{Survival}_{\text{Smolt}}$$

- From December 1 – December 31: 0.0084% (e.g., water year 2023) of the Red Bluff juvenile winter-run Chinook salmon Brood Year Total at the end of the second biweekly period in November, whereby the December Multiplier is:

- December Multiplier = $0.0021 \times 0.25 \times \text{Survival}_{\text{Fry-to-Smolt}} \times \text{Survival}_{\text{Smolt}}$

If the 7-day rolling sum of winter-run and spring-run Chinook salmon loss, calculated daily, is exceeded during a period of reduced exports, DWR and Reclamation will continue to adjust exports to achieve a 7-day average of the OMR value no more negative than -5,000 cfs until 7 days after the most recent exceedance. Loss shall be calculated for the export facilities using the 2018 CDFW loss equation (Attachment R).

Reclamation and DWR will adjust exports in response of meeting the threshold above based on initial length-at-date identification of natural older juvenile Chinook salmon. If genetic analysis of natural older juvenile Chinook salmon observed in salvage at the SWP or CVP indicates that any given Chinook salmon is not genetically winter-run or spring-run Chinook salmon, these fish will not count towards the loss threshold exceedance, and continued export adjustments pursuant to the OMR limit may not be required. Given that SHERLOCK is a new methodology currently undergoing peer review and field testing, both methodologies will be used to determine the final identification. In the event that SHERLOCK and GT-seq provide different run assignments, the results from the GT-seq method will be used to determine the final run assignment for the purposes of implementing this early season migration action. If a fish is not genetically identifiable or if genetic identification is pending, then the Delta model length-at-date criteria shall be used to classify the race of the juvenile Chinook Salmon in salvage.

Spring-Run Chinook Salmon

Reclamation and DWR, through SaMT, will use real-time monitoring data, coupled with new science gained through ongoing efforts to develop a spring-run juvenile production estimate and life cycle model to inform weekly risk assessments (October through June) for natural-origin juvenile spring-run Chinook Salmon. If the risk assessment identifies a more positive OMR flow requirement is needed to minimize take of natural-origin juvenile spring-run Chinook Salmon, the WOMT may consider a more positive OMR flow requirement.

Start of OMR Management

The OMR management season starts any time after December 1 if an Adult Longfin Smelt Entrainment Protection Action, if appropriate (see Section 0, *Adult Longfin Smelt Entrainment Protection Action*), or First Flush Action occurs (i.e., immediately following completion of the First Flush Action) or any time after December 20 if the turbidity threshold in the Adult Delta Smelt Entrainment Protection Action is reached. If neither the Adult Longfin Smelt Entrainment Protection Action or First Flush Action occurs or the Adult Delta Smelt Entrainment Protection Action is reached, the OMR management season starts automatically on January 1. From the onset of OMR Management, Reclamation and DWR shall adjust the OMR index on a 14-day running average will be no more negative than -5,000 cfs until the end of the OMR management season. A reduction in exports to achieve a new OMR index will occur within three days of an action that requires a change in OMR.

First Flush Action: to minimize project influence on the movement of Delta smelt and potentially other listed fish species into the South Delta, Reclamation and DWR will adjust CVP and SWP exports for 14 consecutive days, to be assessed on the seventh day of the averaging period after initiating operational changes in response to the OMR trigger, anytime between December 1 and the last day of February, to maintain a 14-day average of the OMR index no more negative than -2,000 cfs within three days of when the following criteria are met:

- Three-day running average of daily flows at Freeport is greater than, or equal to, 25,000 cfs, and
- Three-day running average of daily turbidity at Freeport is greater than, or equal to, 50 Formazin Nephelometric Units (FNU)

These criteria will be evaluated using data from the California Data Exchange Center Sacramento River at Freeport. The First Flush Action may only be initiated once each water year. The First Flush Action is exempt from the high-flow offramps as outlined below. Reclamation and DWR, through WOMT, may prepare an assessment to initiate the First Flush Action early if real-time monitoring of abiotic and biotic factors and salvage prediction models indicates the First Flush Action is likely to be triggered (i.e., within two to three days) and delta smelt salvage is possible.

Reclamation and DWR recognize that readings at individual turbidity sensors or localized groups of turbidity sensors can generate spurious results in real-time. To avoid triggering an OMR flow action during a sensor error or a localized turbidity spike that might be caused by local flows or a wind-driven event, Reclamation and DWR will consider and review data from other locations. In the event that the three-day running average of daily turbidity at Freeport is 50 FNU (or greater), and Reclamation and DWR believe that a First Flush action is not warranted based on additional data sources, DWR and Reclamation will provide the additional data to the Smelt Monitoring Team (SMT) and request they convene to confirm criteria will be met because of increased precipitation rather than sensor error or localized turbidity spike. If it is determined through WOMT that there is sensor error or a localized turbidity spike, Reclamation and DWR will take no additional action and provide the supporting information to the Service and CDFW within 24 hours.

A reduction in exports to achieve a new OMR index will occur within three days of an action that requires a change in OMR.

Once an OMR action is triggered, combined project exports will not be increased, except as scheduled prior to the trigger with notice to WOMT, in a manner that would make projected OMR more negative. Export reductions to meet the conditions of the trigger will be done using the normal scheduling procedure. Combined projected exports, export scheduling, and OMR will be discussed at WOMT each week. The intent is that combined project exports will not increase the risk to protected fish species after an OMR trigger is met.

Real-time Adjustments

Reclamation and DWR will manage to a more positive OMR than -5,000 cfs on a 14-day average under the following conditions:

Adult Delta Smelt Entrainment Protection Action (Turbidity Bridge)

The purpose of this action is to minimize adult Delta smelt entrainment risk by reducing exports during periods when turbidity is elevated in the south Delta resulting in habitat conditions that support movement of Delta smelt from the lower San Joaquin River into the south Delta and toward the export facilities (Smith et al. 2021). If after a First Flush Action or after December 20, whichever occurs first, daily average turbidity remains or becomes elevated to 12 FNU or higher at each of three turbidity sensors in the OMR corridor creating a continuous bridge of turbidity from the lower San Joaquin River to the CVP and SWP export

facilities, Reclamation and DWR will adjust exports to achieve a five-day average of the OMR flow that is no more negative than -3,500 cfs, to be assessed on the seventh day of the averaging period after initiating operational changes in response to the OMR trigger, until the daily average turbidity in at least one of the three turbidity sensors is less than 12 FNU for two consecutive days, thereby indicating a break in the continuous bridge of turbidity. The three turbidity sensors are Holland Cut, Old River at Bacon Island, and Old River at Frank's Tract near Terminous.

If the three turbidity sensors remain over 12 FNU at the end of a High Flow Off-Ramp or any time after five consecutive days, then Reclamation and DWR, through WOMT, may prepare an assessment to determine if another Adult Delta Smelt Entrainment Protection Action is warranted based on continued entrainment risk following the period of elevated flows and whether delta smelt distribution has shifted downstream, as informed by available quantitative tools and real-time data.

The Adult Delta Smelt Entrainment Protection Action ends when the three-day continuous average water temperatures at Jersey Point or Rio Vista reach 53.6°F (12°C).

When daily average San Joaquin River flows at Vernalis are greater than 10,000 cfs, the Adult Delta Smelt Entrainment Protection Action (Turbidity Bridge) is offramped. While offramped, the OMR Index will be managed to no more negative than -5,000 cfs on a 14-day average. The Adult Delta Smelt Entrainment Protection Action (Turbidity Bridge) would be immediately reinstated when daily average San Joaquin River flows at Vernalis drop below 8,000 cfs.

Adult Longfin Smelt Entrainment Protection Action

If cumulative water year salvage of Longfin smelt with fork length ≥ 60 mm at the CVP and SWP facilities exceeds the salvage threshold, where:

$$\text{Salvage threshold} = \left(\frac{\text{Age 1 + Longfin smelt index}}{20} \right) + 1$$

Where:

- The Age 1 + LFS index is calculated using age 1+ fish captured in the mid water trawl from the full San Francisco Bay Study sampling area (California Department of Fish and Game 1999). The Age 1 + LFS index is additive for the months of August, September, October, November, and December. If December data is not available at the start of this action period, then the August to November threshold will be used until the December data is available and the complete Age 1 + LFS Index is calculated.

Then:

- From December 1 to the start of the OMR management season, Reclamation and DWR shall adjust exports to achieve an OMR flow no more negative than -5,000 cfs on a seven-day average for seven consecutive days, to be assessed on the seventh day of the averaging period after initiating operational changes in response to the OMR trigger, and then, if appropriate, initiate the start of OMR management season. During the 7-day period, WOMT may convene and determine if initiation of OMR management season is warranted. If WOMT determines initiating OMR management is not warranted, the OMR management season does not begin at the conclusion of the 7-day period. If salvage of Longfin smelt ≥ 60 mm continues following the 7-day period where OMR is no more negative than -5,000 cfs, then Reclamation and DWR, through WOMT, may prepare an assessment to determine if additional Longfin smelt entrainment protection action is warranted based on continued entrainment risk, as informed by available

quantitative tools and real-time data. WOMT may determine if OMR management should be initiated. If WOMT does not meet then protections will be initiated.

- From the start of the OMR management season to the end of February, Reclamation and DWR shall operate to an OMR flow no more negative than -3,500 cfs on a seven-day average for seven consecutive days, to be assessed on the seventh day of the averaging period after initiating operational changes in response to the OMR trigger. If salvage of Longfin smelt ≥ 60 mm continues following the 7-day period where OMR is no more negative than -3,500 cfs, then Reclamation and DWR, through WOMT, may prepare an assessment to determine if additional Longfin smelt entrainment protection action is warranted based on continued entrainment risk, as informed by available quantitative tools and real-time data.

Larval and Juvenile Delta Smelt Protection Action

Larval and juvenile Delta smelt protections start upon the end of the Adult Delta Smelt Entrainment Protection Action. Reclamation and DWR will operate south Delta exports to a 7-day average of the OMR index no more negative than -5,000 cfs when the average Secchi disk depth in the most recent survey is greater than one meter. The Secchi disk depth will be calculated as the average measurement from all sampled stations on the San Joaquin River upstream of Jersey Point and stations south of the lower San Joaquin River. If the average Secchi disk depth in the most recent survey is less than 1 meter, then Reclamation and DWR will operate to a 7-day average of the OMR index no more negative than -3,500 cfs until the average Secchi depth has increased to more than 1 meter. The projects will operate to whichever of these OMR thresholds is appropriate given the latest Secchi disk depth data until the End of OMR Management Season.

Larval and Juvenile Longfin Smelt Protection Action

From January 1 through the end of OMR management season (see below), if:

- The 7-day average QWest is $< +1,500$ cfs (as calculated using the Dayflow QWest equation), and;
- Larval and juvenile Longfin smelt catch in the most recent Smelt Larva Survey (SLS) and 20mm survey at stations 809 and 812 exceeds the catch threshold set by the Age 1 + LFS Index as described in Table 8, for catch thresholds.

Reclamation and DWR will adjust the 7-day average OMR flow to no more negative than -3,500 cfs for seven days, to be assessed on the seventh day of the averaging period after initiating operational changes in response to the OMR trigger. Upon initiation of the action DWR and Reclamation, through WOMT, may prepare an assessment to determine if the 7-day action can be adjusted or offramped based on larval and juvenile LFS entrainment risk, as informed by available quantitative tools and real-time data. If offramped, the Larval and Juvenile Longfin Smelt Protection Action shall later be retriggered if conditions warrant.

If the WY cumulative juvenile Longfin smelt salvage at the CVP and SWP facilities exceeds 50% of the average annual salvage observed from 2009 through the water year preceding the current water year, then Reclamation and DWR shall adjust to a seven-day average of the OMR of -3,500 cfs for 14 days, to be assessed on the seventh day of the averaging period after initiating operational changes in response to the OMR trigger. If the WY cumulative juvenile Longfin smelt salvage at the CVP and SWP facilities during this period exceeds 75% of the average annual salvage observed from 2009 through the water year preceding the current water year,

then Reclamation and DWR shall adjust to a 7-day average of the OMR of -2,500 cfs for 14 days, to be assessed on the seventh day of the averaging period after initiating operational changes in response to the OMR trigger. If salvage of larval and juvenile Longfin Smelt continues following the 14-day period where OMR is no more negative than -2,500 cfs, then WOMT may request Reclamation and DWR, through the SMT, a risk assessment on appropriate OMR flows through the remainder of the OMR Management.

Table 8. San Francisco Bay Study Longfin Smelt Index Catch Threshold

San Francisco Bay Study Longfin smelt index ¹	Catch Threshold at 809 & 812
0 – 149	10
150 – 299	20
300 – 499	30
500 – 999	40
≥ 1000	50

High-Flow offramps for Larval and Juvenile Delta smelt and Longfin smelt

When the daily average Sacramento River flows at Rio Vista are greater than 55,000 cfs, or San Joaquin River flows at Vernalis are greater than 8,000 cfs, then the Larval and Juvenile Delta smelt and Longfin smelt Protection Actions are offramped. While offramped, the OMR Index will be managed to no more negative than -5,000 cfs on a 14-day average. The Larval and Juvenile Delta smelt and Longfin smelt Protection Actions would be immediately reinstated when the daily average Sacramento River flows at Rio Vista drop below 40,000 cfs or the San Joaquin River flows at Vernalis drop below 5,000 cfs. Rio Vista flows are calculated from the Dayflow equation and reported in the daily DWR Delta Hydrologic Conditions Report.

Winter-Run Chinook Salmon Annual Loss Threshold

Reclamation and DWR will manage OMR to avoid exceeding the following annual loss thresholds:

- Natural winter-run Chinook salmon (loss = 0.5% of JPE)
- Hatchery winter-run Chinook salmon (loss = 0.12% of JPE)

JPEs and annual loss thresholds will be calculated for natural winter-run Chinook and for each of the hatchery winter-run Chinook Salmon populations from LSNFH and Battle Creek. The JPE for natural and hatchery winter-run Chinook salmon will be calculated at least annually by the JPE SubTeam, as described in Appendix- Winter-Run Juvenile Production Estimate, and transmitted to WOMT and SHOT. Hatchery releases of winter-run Chinook salmon will be tracked individually, and cumulative loss will be summed across release groups with the same JPE and annual loss threshold. Loss shall be calculated for the export facilities using the 2018 CDFW loss equation (Attachment R).

Annual loss of natural and hatchery winter-run Chinook salmon at the CVP and SWP salvage facilities will be counted for each Brood Year, starting July 1 of the calendar year through June 30 of the following calendar year. If cumulative loss of natural or hatchery winter-run Chinook salmon in a brood year exceeds 50% of the annual loss thresholds, then DWR and Reclamation

will adjust south Delta exports to maintain a 7-day average of the OMR value no more negative than -3,500 cfs for 7 consecutive days, to be assessed on the seventh day of the averaging period after initiating operational changes in response to the OMR trigger. Once exceeded, each winter-run observed in salvage would trigger another operation to an OMR limit of -3,500 cfs for 7 days.

If the cumulative loss of natural or hatchery winter-run Chinook salmon in a brood year exceeds 75% of the annual loss thresholds, then DWR and Reclamation will adjust south Delta exports to maintain a 7-day average of the OMR value no more negative than the -2,500 cfs for seven consecutive days, to be assessed on the seventh day of the averaging period after initiating operational changes in response to the OMR trigger, when the Winter-Run Chinook Salmon Machine Learning Model and associated OMR Conversion Tool predict that the change to -2,500 cfs will shift the model output to a classification of absence with a minimum probability of absence prediction of 0.559 for 1 of 30 sub-models for any of the 7 most recent prediction days. These prediction values are calculated based on length-at-date and will be updated once genetic analysis is fully adopted.

If the cumulative loss of either natural or hatchery-origin winter-run Chinook Salmon in a brood year exceeds 100 percent of the annual loss thresholds, then DWR and Reclamation will immediately convene the Salmon Monitoring Team (SaMT) to review recent fish distribution information and operations and provide advice regarding future planned SWP and CVP operations to minimize subsequent loss during that year. The SaMT will report the results of this review and advice to the WOMT. Operational decisions will be made following the process described in Section 3.3.18, Governance. If either annual loss threshold is exceeded, DWR and Reclamation will also convene an independent peer review panel to review SWP and CVP operations and the annual loss thresholds prior to November 1. The purpose of the independent peer review is to review the actions and decisions contributing to the loss trajectory that led to an exceedance of an annual loss threshold, and make recommendations on modifications to SWP and CVP operations, or additional actions to be conducted to stay within the annual loss thresholds in subsequent years.

Reclamation and DWR will restrict exports in response to meeting the above thresholds based on the initial length-at-date identification of natural older juvenile Chinook salmon and the thresholds described above. If genetic analysis of natural older juvenile Chinook salmon observed in salvage at the SWP or CVP indicates that any given Chinook salmon is not genetically winter-run Chinook salmon, these fish will not count towards annual the loss threshold exceedance, and continued export adjustments pursuant to the OMR limit may not be required. Given that SHERLOCK is a new methodology currently undergoing peer review and field testing, both methodologies will be used to determine the final identification. In the event that SHERLOCK and GT-seq provide different run assignments, the results from the GT-seq method will be used to determine the final run assignment for the purposes of implementing this early season migration action. If a fish is not genetically identifiable or if genetic identification is pending, then the Delta model length-at-date criteria shall be used to classify the race of the juvenile Chinook Salmon in salvage.

Winter-Run Chinook Salmon Weekly Distributed Loss Threshold

To minimize the potential for a disproportionate impact of entrainment on any single week of natural winter-run Chinook salmon present in the Delta, Reclamation and DWR will manage the OMR index based on a weekly distributed loss threshold. There is no weekly distributed

loss for hatchery winter-run Chinook salmon as they generally move through the Delta quickly. The weekly loss threshold is a product of the weekly percentage of natural winter-run Chinook salmon present in the Delta, scaled to 100% (Table 9, Column E), and 50% of the natural winter-run annual loss threshold.

If the weekly distributed loss threshold is exceeded on any single day by the 7-day rolling sum of winter-run loss, then DWR and Reclamation will adjust exports to achieve a 7-day average of the OMR no more negative than -3,500 cfs for seven consecutive days. Loss shall be calculated for the export facilities using the 2018 CDFW loss equation (Attachment R).

The averaging period for OMR will begin within 3 days of a criterion being exceeded. If a JPE is not available at the start of OMR management, then the RBDD Brood Year Total from the most recent bi-weekly period will be used and applied, as described for early season management. If a fish is not genetically identifiable or if genetic identification is pending, then the length-at-date identification will be used to classify the race of the juvenile Chinook salmon in salvage.

Weekly thresholds will be based on historical distribution (Table 9, Column E) of genetically identified winter-run Chinook salmon from 2017-2021 and change every week (e.g., January 1-7, January 8-15). Each week, Reclamation and DWR, through SaMT, will compare weekly Delta entry and exit information to determine if the present data is tracking with the historical distribution data. Reclamation and DWR, through SaMT, may adjust subsequent weekly loss thresholds based on year-specific conditions. At the conclusion of the OMR management season, Reclamation and DWR will review and may adjust the historical distribution table, through SaMT, for the following year.

DWR and Reclamation, initially, will restrict exports in response to meeting the above thresholds based on the initial length-at-date identification of natural-origin older juvenile Chinook Salmon and the thresholds described above. If genetic analysis of natural-origin older juvenile Chinook Salmon observed in salvage at the SWP or CVP subsequently indicates that any given Chinook Salmon is not genetically identified as a winter-run Chinook Salmon, these fish will not count towards the loss threshold exceedance, and continued export adjustments pursuant to the OMR index limit may not be required. While the new method, SHERLOCK, undergoes field testing, both it and the current GT-seq method will be used to determine the final identification. In the event that SHERLOCK and GT-seq provide different run assignments, the results from the GT-seq method will be used to determine the final run assignment. If a fish is not genetically identifiable or if genetic identification is pending, then the Delta model length-at-date criteria shall be used to classify the race of the juvenile Chinook Salmon in salvage.

Table 9. Historical (Water Years 2017–2021) Presence of Winter-run Chinook Salmon Entering the Delta (Column B), Exiting the Delta (Column C), in the Delta (Column D = Column B–Column C) and in the Delta Scaled to 100% (Column E)

Week (starting January 1) (A)	Historical Cumulative entering the Delta (Sherwood Harbor) (B)	Historical Cumulative exiting the Delta (Chippis Island) (C)	Historical Present in Delta (D)	Historical Present in Delta (Scaled to 100%) (E)
1/1–1/7	2.47%	1.65%	0.82%	0.32%
1/8–1/14	2.47%	1.65%	0.82%	0.32%
1/15–1/21	4.94	1.65%	3.29%	1.30%
1/22–1/28	4.94%	1.65%	3.29%	1.30%
1/29–2/4	19.75%	2.20%	17.55%	6.91%
2/5–2/11	38.27%	4.95%	33.32%	13.13%
2/12–2/18	43.21%	5.49%	37.72%	14.86%
2/19–2/25	46.91%	9.89%	37.02%	14.59%
2/26–3/4*	50.62%	18.13%	32.49%	12.80%
3/5–3/11	55.56%	30.77%	24.79%	9.77%
3/12–3/18	77.78%	38.46%	39.32%	15.49%
3/19–3/25	85.19%	64.84%	20.35%	8.02%
3/26–4/1	93.83%	90.11%	3.72%	1.47%
4/2–4/8	98.77%	99.45%	0%	0%
4/9–4/15	100.00%	100.00%	0.00%	0.00%
4/16–End of Winter-run OMR Season	100.00%	100.00%	0.00%	0.00%

Notes: Data from genetically identified winter-run Chinook salmon entering the Delta (Sherwood Harbor Trawl) and exiting the Delta (Chippis Island Trawl) are used to estimate the percentage of winter-run Chinook salmon present in the Delta each week. Presence prior to January 1 each year is included in the first week of presence.

* The week of 2/26–3/4 includes 8 days during leap years

Steelhead Annual Threshold

In each year, Reclamation and DWR will manage exports to reduce loss at the CVP and SWP salvage facilities. To support survival and decrease entrainment loss, Reclamation and DWR will manage OMR to avoid exceeding the following annual loss threshold at CVP and SWP salvage facilities through the weekly distributed loss threshold described below.

- Unclipped juvenile California Central Valley steelhead loss = 3,000

Annual loss of unclipped juvenile CCV steelhead at the CVP and SWP salvage facilities will be counted cumulatively for each Brood Year, starting July 1st of the calendar year through June 30th of the following calendar year. Loss will be calculated for the South Delta Export Facilities using CDFW's steelhead loss multiplier until a loss method for steelhead (see Section 3.11.1 is approved by CDFW and NMFS. This loss threshold will be used until a new loss threshold is developed through the steelhead JPE Special Study (See Section 3.11.1).

Steelhead Weekly Distributed Loss Threshold

To minimize the potential for a disproportionate impact of entrainment of steelhead present in the Delta on any single week, Reclamation and DWR will manage OMR based on a weekly

distributed loss threshold. The weekly loss threshold is the annual loss threshold distributed over the period of observed steelhead salvage between January 1 and June 30 using the 7-day weekly periods identified in the weekly distributed loss table for winter-run Chinook salmon, extended through June 30. DWR and Reclamation will reduce exports to achieve a 7-day average OMR value no more negative than -3,500 cfs for seven consecutive days when the 7-day rolling sum of steelhead salvage, calculated daily, exceeds the weekly loss threshold of 120 fish.

Spring-Run Chinook Salmon and Surrogate Thresholds

To provide additional minimization protection for emigrating natural juvenile spring-run Chinook salmon from the Sacramento River and tributaries, including the Feather and Yuba rivers, into the channels of the central Delta, south Delta, and into SWP and CVP south Delta pumping facilities, DWR and Reclamation will restrict exports based on the presence of hatchery produced spring-run and associated yearling late-fall-run and young-of-year fall-run Chinook salmon surrogate groups at the CVP and SWP salvage facilities. DWR and Reclamation, in coordination with CDFW, NMFS, and USFWS through the SaMT, will select spring-run yearling and young-of-year surrogate groups. Yearling spring-run surrogates will be selected from late-fall Chinook salmon in-river release groups from the Coleman National Fish Hatchery. Spring-run young-of-year and associated surrogate groups will be selected from fall- and spring-run Chinook salmon in-river release groups from the Feather River Fish Hatchery and Coleman National Fish Hatchery.

From November 1 through the end of the OMR flow management period of each water year, if a cumulative loss threshold is exceeded for surrogate release group, Reclamation and DWR will adjust south Delta exports to achieve a 7-day average of the OMR index of no more negative than -5,000 cfs in November and December, and no more negative than -3,500 cfs beginning January 1 (or whenever the OMR management begins) through the end of OMR flow management season, or June 30, whichever occurs first. The cumulative loss threshold for coded wire tagged spring-run Chinook salmon surrogate groups at the CVP and SWP salvage facilities is 0.25% for each release group:

- Yearling spring-run Chinook salmon surrogates: WOMT, with input from SaMT, will select three in-river releases of late-fall Chinook salmon from Coleman National Fish Hatchery from November through February to use as yearling spring-run Chinook salmon surrogates. Input from SaMT could include a proposal with several alternatives. If three in-river releases appropriately distributed from November through February are not achievable in a given year because of hatchery limitations, then an alternative plan will be developed to ensure the adequate characterization of natural yearling spring-run Chinook salmon can still be achieved that year.
- Young-of-year spring-run Chinook salmon surrogates: WOMT, with input from SaMT, will select six in-river releases comprised of spring-run and fall-run Chinook salmon from the Feather River Fish Hatchery and fall-run Chinook salmon from the Coleman National Fish Hatchery from March through May to use as young-of-year spring-run Chinook salmon surrogates. Input from SaMT could include a proposal with several alternatives. If six in-river releases appropriately distributed from March through May are not achievable in a given year because of hatchery limitations, then an alternative plan will be developed to ensure the adequate characterization of natural origin young-of-year spring-run Chinook salmon can still be achieved that year.

Loss shall be calculated for the export facilities using the 2018 CDFW loss equation (Attachment R). The surrogate methods are intended to be an interim measure that will be replaced with a measure as described in Section 2.11.2, *Spring-Run Juvenile Production Estimate and Life Cycle Model*.

Storm-Flex

During the OMR management season, Reclamation and DWR, through WOMT, may prepare an assessment to evaluate operating to an OMR index no more negative than -6,250 cfs between the start of OMR management season and the larval and juvenile Delta Smelt Protection Action onramp, or the last day of February, whichever occurs first, to capture peak flows during storm-related events when:

1. The Delta is in excess conditions as defined in the 1986 Coordinated Operations Agreement, as amended in 2018; and
2. QWEST is greater than +1,500 cfs; and
3. X2 is <81km; and
4. The daily average turbidity at the Holland Cut, Old River at Bacon Island, and Old River at Frank's Tract sensors are < 12 FNU at each station; and
5. A measurable precipitation event has occurred in the Central Valley; and
6. Reclamation and DWR determine that the net Delta outflow index indicates a higher level of outflow available for diversion due to peak storm flows; and
7. None of the additional real-time OMR protections are controlling Project operations; and
8. Cumulative loss of the CVP and SWP export facilities of yearling Coleman National Fish Hatchery late-fall run chinook salmon (yearling spring run chinook salmon surrogate) is less than 0.5% within any of the release groups.

If the criteria above are met, WOMT will decide whether to request that DWR and Reclamation use estimates of the real-time distribution of listed-species from SMT and SaMT, as well as Particle Track Model (PTM) and prediction tool output to assess potential listed-species entrainment risk differences using OMR inputs of -5000 and -6250 cfs. If the assessment indicates that no additional real-time OMR protections for the upcoming week are likely to be triggered, Reclamation and DWR will bring a request back to WOMT for approval to operate to OMR no more negative than -6,250 cfs and will update the assessment no less than weekly.

If conditions indicate an additional real-time OMR protection is likely to trigger, Reclamation and DWR will adjust south Delta exports to achieve a 14-day average of the OMR index no more negative than -5,000 cfs, unless a further reduction in exports is required. If an entrainment protection condition is triggered, Reclamation and DWR will cease storm-flex and implement the entrainment protection condition. Storm-flex decisions will be re-evaluated weekly by WOMT.

End of OMR Management Season

OMR Management season for Delta smelt and Longfin smelt will conclude when the three consecutive days of daily mean water temperature at Clifton Court Forebay is 77.0°F (25°C) or higher, or on June 30, whichever occurs first.

Reclamation and DWR will conclude the management of OMR for salmonids on June 30 or when the following conditions have occurred, whichever occurs first:

- Daily mean water temperature at Mossdale has exceeded 71.96°F (22.2°C) for 7 non-consecutive days (does not have to be consecutive) in June; and
- Daily mean water temperature at Prisoner's Point has exceeded 71.96°F (22.2°C) for 7 non-consecutive days (does not have to be consecutive) in June.

End of Year Evaluation

Each year, DWR and Reclamation, in coordination with the SMT, will conduct an annual assessment of OMR protection measures for Delta smelt and longfin smelt, which will include an evaluation of salvage, management actions, and physical conditions in a seasonal report. This seasonal report may support improvements, if necessary, to the OMR Guidance Document, and may also guide operations in the future. This seasonal report will fulfill commitments under the ROD that will be signed by Reclamation on the Consultation on the Coordinated Long-Term Operation of the CVP and SWP to produce a seasonal report each year. Additionally, this seasonal report will be used to support the development of Reclamation's Annual Report on the Long-Term Operation of the Central Valley Project and State Water Project. Finally, this seasonal report will inform any Four-Year Review Panels adopted under the ROD. The purpose of the independent review will be to evaluate the efficacy of actions undertaken to reduce the adverse effects on listed species.

Each year, DWR and Reclamation, in coordination with the SaMT, will conduct an annual assessment of OMR protection measures for winter-run Chinook salmon, spring-run Chinook salmon, and steelhead, which will include an evaluation of salvage, management actions, and physical conditions. in a seasonal report. This seasonal report may support improvements, if necessary, to the OMR Guidance Document, and may also guide operations in the future. This seasonal report will fulfill commitments under the ROD that will be signed by Reclamation on the Consultation on the Coordinated Long-Term Operation of the CVP and SWP to produce a seasonal report each year. Additionally, this seasonal report will be used to support the development of Reclamation's Annual Report on the Long-Term Operation of the Central Valley Project and State Water Project. Finally, this seasonal report will inform any Four-Year Review Panels adopted under the ROD. The purpose of the independent review will be to evaluate the efficacy of actions undertaken to reduce the adverse effects on listed species.

2.7.5 Spring Delta Outflow

Reclamation and DWR will take actions intended to supplement Delta outflow per the terms of the VAs. Actions that will support the additional Delta outflow include the following: Reclamation and DWR south of Delta export modifications; Reclamation reoperating upstream reservoirs to advance and allow for scheduling of water made available by contractors in CVP watersheds; and passing Delta inflow from water made available by VA Parties. Actions to result in increased Delta outflow are shown in Table 10. These volumes (and associated footnotes) are reflected in the Memorandum of Understanding signed by VA parties in March

2022.

Table 10. Water Made Available by the CVP and SWP⁵

	Critical (TAF)	Dry (TAF)	Below Normal (TAF)	Above Normal (TAF)	Wet (TAF)
SWP and CVP Forgone Exports ⁶	0	125	125	175	0
SWP Flow Purchases Implemented through Forgone SWP exports	0	30	30	30	0
SRSC Following ⁷	2	102	100	100	0
Sac. Valley Purchase ⁸	0	10	10	10	0
American River Groundwater and Reoperation of Upstream Reservoirs ⁹	30	40	10	10	0
CVP SOD Purchase ¹⁰	0	12.5	24.5	35	0
Westlands Contract Assignment Purchase ¹¹	3	6	15	19.5	27
Additional CVP SOD ¹²	0	5	5	5	0
San Joaquin River Flows above Tributary VAs	0	50	50	50	0
Flow Purchases Acquired Through SWP Diversion Fees (implemented through tributary inflow from the following program) ¹³	0	45	45	45	0

⁵ These numbers are set forth in the Term Sheet, Appendix 1. Flow Tables

⁶ Subject to Public Health and Safety exports of 1,500 cfs.

⁷ SRSC will follow 25,000 acres of rice which is credited with 110 TAF, which includes 10 TAF of fixed price purchase water. Dry year water may be held in Shasta for storage to improve temperature management in the current or future years. 2TAF in Critical and Dry years are contributions from Mill/Cow Creek.

⁸ The new flow contributions from the Sacramento River Basin identified in this Table 3-12, plus new flow contributions resulting from the below-referenced PWA Water Purchase Program, Permanent State Water Purchases, and PWA Fixed Price Water Purchase Program line items in Table 3-12, are not intended to result in idling more than 35,000 acres of rice land in the Sacramento River Basin.

⁹ Contingent on public funding of groundwater substitution infrastructure to be completed by a subsequent year, and compensation of upstream surface storage releases on a per acre-foot basis. These flows are included in the Year 1 subtotal. Only implementable in 3 of 8 Dry or Critical years and 3 of 8 Above Normal or Below Normal years.

¹⁰ Subject to CVP SOD Agricultural Allocation.

¹¹ Quantity of water made available will be based on the maximum or a portion of the entitlement under certain assignment contracts and only that which is allocated to CVP SOD Agriculture.

¹² If flows are not obtained through this source, the equivalent volume would be obtained at market price or otherwise obtained through other mechanisms.

¹³ The VA's governance program will be used to determine the use of available funding to provide additional outflow in AN, BN, or W years. If DWR is called upon to provide the water by foregoing SWP exports, such call will be handled through a separate agreement between DWR and its contractors. The numbers for "Flow Purchases Acquired Through SWP Diversion Fees (implemented through tributary inflow from the following program)" are the SWP's partial contributions to the total values set forth in the Term Sheet, Appendix 1 under the PWA Water Purchase Program's following contributions for AN, BN and D years.

	Critical (TAF)	Dry (TAF)	Below Normal (TAF)	Above Normal (TAF)	Wet (TAF)
Total CVP and SWP Outflow Potentially through CVP and SWP Operations ¹⁴	33	423.5	414.5	478.5	27
Additional Feather River Actions accounted for under Total VA Outflow (below)		60	60	60	
Total VA Outflow by All VA Parties	155	825.5	750.5	824.5	150

Reclamation and DWR will operate consistent with the Voluntary Agreements approved by the SWRCB and executed agreements by VA Parties.

Reclamation Early Implementation: Reclamation, after coordination through WOMT, will provide the CVP Foregone Exports, along with other VA parties taking actions similar to those contemplated by the VAs only if: (i) Reclamation issues a Record of Decision for the coordinated operation of the CVP and SWP that are the subject of the consultation, and (ii) the SWRCB has not updated the Water Quality Control Plan. These early implementation actions are intended to develop data that could assist decisions whether to implement the VAs or decisions how to implement the VAs. Delta outflow from Reclamation actions described above would be in March through May and prioritized during the period of April 1 through May 31. These early implementation actions will continue until the SWRCB updates the Water Quality Control Plan or for two years, whichever occurs first.

Reclamation Post Early Implementation: After Reclamation's two-year early implementation period:

- Reclamation will operate consistent with the VAs only if (a) the SWRCB approves the VAs, as substantially proposed by the VA parties, and (b) the VA parties execute or are in the process of executing the agreements contemplated by the VAs, or
- Reclamation will operate as described by the alternative but without any of the actions contemplated for "early implementation" of the VAs if (i) the SWRCB does not incorporate the VAs, as proposed by the VA parties, into the Water Quality Control Plan, or (ii) the VA parties do not execute the agreements contemplated by the VAs.

DWR Implementation: DWR will operate pursuant to Section 3.3.3.2 Early Voluntary Agreement Implementation of their *November 2023 Incidental Take Permit Application, Long-Term Operations of the State Water Project*. DWR's early implementation actions will continue until the SWRCB approves the VAs.

2.7.6 Delta Smelt Summer and Fall Habitat

Fall X2

To increase the amount of low salinity zone habitat for Delta Smelt, in Wet and Above Normal hydrologic year types, Reclamation and DWR will maintain a 30-day average $X2 \leq 80\text{km}$ for September through October.

¹⁴ The volumes identified in this row represent the CVP and SWP contributions. Additional flows from other VA parties and Permanent State Water Purchases will increase Delta Outflow.

Suisun Marsh Salinity Control Gate

To address effects on critical habitat for juvenile Delta Smelt and increase habitat and food access for Delta Smelt in summer and fall (June through October) in Suisun Marsh and Grizzly Bay during above normal, below normal, and dry years following wet or above normal years, DWR will operate SMSCG for 60 days, to maximize the number of days that Belden's Landing three-day average salinity is equal to, or less than, 4 practical salinity units (psu) to maximize the spatial and temporal extent of Delta Smelt low salinity zone habitat in Suisun Marsh and Grizzly Bay. Operation of the SMSCG will occur between June 1 and October 31 in years which operation of the SMSCG is required. In dry years following below normal years, DWR will operate SMSCG for 30 days to maximize the number of days Belden's Landing three-day salinity is equal to, or less than 6 psu to maximize the spatial and temporal extent of Delta Smelt low salinity zone habitat in Suisun Marsh and Grizzly Bay. DWR and Reclamation, through the Delta Coordination Group (DCG), may prepare an assessment to propose an alternative gate operation if modeling of hydrological and/or existing D-1641 conditions indicate the action can achieve the same habitat benefits in an equal or better manner within the range of effects analyzed. Subsequently, DWR and Reclamation may propose alternative operations of the SMSCG for WOMT to consider prior to May 15 of each year a SMSCG action will be required. DWR and Reclamation, through the DCG, will develop a monitoring plan that responds to uncertainties in the performance metrics to evaluate action performance based on a schedule determined by the Adaptive Management Steering Committee (AMSC). DWR and Reclamation will also produce a report that summarizes monitoring findings and assess action performance based on a schedule determined by the AMSC. The Summer-Fall Habitat Action (SFHA) shall be included in independent reviews under the adaptive management program.

2.7.7 Tracy Fish Collection Facility

The Tracy Fish Collection Facility addresses the entrainment stressor. Reclamation will operate the Tracy Fish Collection Facility to screen fish from Jones Pumping Plant. The primary channel is a behavioral barrier with effectiveness that depends on the pumping Jones Pumping Plant. The secondary channel is a positive fish barrier. When south Delta hydraulic conditions allow and conditions are within the original design criteria for the Tracy Fish Collection Facility, the secondary channel is operated to achieve water approach velocities for striped bass of approximately 1 to 2.5 feet per second from June 1 through October 31 and for salmon of approximately 3 feet per second from November 1 through May 31.

Salvage of fish at the Tracy Fish Collection Facility occurs 24 hours per day, 365 days per year. Fish are salvaged in flow-through holding tanks, monitored by a 30-minute fish count every 120 minutes, and transported by truck to release sites near the confluence of the Sacramento and San Joaquin Rivers. Larval smelt sampling commences upon detection of a spent female at Tracy Fish Collection Facility or Skinner Fish Facility or when a temperature trigger of 53.6°F (12°C) at nearby California Data Exchange Center stations is met. Salvage and operations data necessary to calculate loss are made available daily by 10 a.m. The standard operating procedures for the Tracy Fish Collection Facility are included in Attachment T.

To seek additional improvements to the operating procedures and reporting of the Tracy Fish Collection Facility; Reclamation proposes to develop the Alternative Loss Pilot Study Implementation Plan (ALPS-IP) and implement the resulting pilot study, which would include consideration of additional salvage facility loss parameterization and study or further

procedural modifications if identified and prioritized through the ALPS-IP Structured Decision Making (SDM) results and would result in demonstrated improvements to the accuracy and reliability of data and fish survival.

Maintenance and Repair

Reclamation will provide the fish agencies notification of salvage disruption (salvage outage) due to planned facility maintenance at least 24 hours in advance. To minimize and avoid salvage disruptions, Reclamation conducts most planned outages during shutdowns of Jones Pumping Plant, typically in the spring and continuing into the summer and fall months. For unplanned facility maintenance, Reclamation will provide notice as soon as practicable and minimize the duration of the salvage outage. Reclamation, through technical assistance with the fishery agencies, will develop an appropriate loss factor for these outages.

Reclamation is required to maintain the Tracy Fish Collection Facility and may not have discretion over when the maintenance must occur.

2.7.8 John E. Skinner Delta Fish Protective Facility

Skinner Fish Facility addresses the entrainment stressor. DWR will operate the facility to screen fish from Banks Pumping Plant. Salvage of fish occurs at the Skinner Fish Facility whenever Banks Pumping Plant is pumping. Fish are salvaged in flow-through holding tanks, monitored by a 30-minute fish count every 120 minutes, and transported by truck to release sites near the confluence of the Sacramento and San Joaquin Rivers. Larval smelt sampling commences upon detection of a spent female at Tracy Fish Collection Facility or Skinner Fish Facility or when a temperature trigger of 53.6°F (12°C) at nearby California Data Exchange Center stations is met. Salvage and operations data necessary to calculate loss are made available daily by 10 a.m. The standard operation procedures for the Skinner Fish Facility are included as Appendix U.

To seek additional improvements to the Skinner Fish Facility; DWR proposes to develop the ALPS-IP. The ALPS-IP would include a structured decision-making (SDM) process to develop and implement a pilot study that would include consideration of additional studies and salvage facility loss parameterization and, potentially, procedural modifications. DWR will proceed with the following items, Debris Management Effectiveness Study, and facility improvements evaluations as described below and on the timelines provided.

Maintenance and Repair

DWR will provide Reclamation and the fish agencies notice of salvage disruptions due to planned facility maintenance (planned outages) at least 24 hours in advance. To minimize and avoid salvage disruptions, DWR conducts most planned outages during full shutdowns of Banks Pumping Plant, frequently in the spring. Further, the modular design of the Skinner Fish Facility in conjunction with total export capacity reductions is used to avoid salvage disruptions for maintenance and repair activities. For unplanned facility maintenance, notice will be provided as soon as practicable. In the event of an unplanned outage (e.g., power disruption) extending beyond one hour, DWR will stop pumping, but may continue to operate the Clifton Court Forebay radial gates.

Fish Protection Facility Operations Manual

DWR proposes to develop and implement a revised written training curriculum as identified in section IV: Fish Identification, of the 2021 DWR CDFW Interagency Agreement for Fish

Facilities Operation. Additionally, DWR proposes to annually review and update the revised Skinner Fish Facility Operations Manual after WY 2023 as specified in the manual. Skinner Fish Facility will have access to a staff biologist for consultation to support salvage staff, research studies, and special handling of tagged fish.

Fish Protection Facility Improvements

DWR proposes to continue to screen fish from Banks Pumping Plant with the Skinner Fish Facility, located west of the CCF, 2 miles upstream of the Banks Pumping Plant. DWR proposes to continue refinement and improvement of the Skinner Fish Facility fish sampling procedures and infrastructure to improve the accuracy and reliability of data and fish survival by:

1. Implementation of the ALPS-IP as part of the Alternative Loss Equation Pilot Study, which would include an SDM process to prioritize potential additional data needs, additional facility improvements to support salvaged listed fish species survival, and more accurate estimates of loss and loss parameters at the SWP and CVP export facilities.
2. Minimization of impacts from debris and excessive numbers of fish, which would include:
 - a. Continued implementation of the recently adopted fall herbicide application to CCF;
 - b. An Effectiveness Study to analyze the effectiveness of CCF herbicide application on debris management procedures;
 - c. If the results of the Effectiveness Study identify feasible additional improvements that require further development and/or prioritization, an SDM process may be utilized to develop improvement requirements including design criteria and/or procedures to implement the study recommendations (e.g. alternative methods of managing fish counts during periods of heavy debris and/or large numbers of fish); and
3. Implementation of updated training curricula as identified in Section 2.3.7.2, “Fish Protection Facility Operations Manual.”

Within one year from the ROD or ITP, whichever is later, DWR will submit a draft Effectiveness Study Plan to agency sub-directors for approval. The Effectiveness Study plan will include a timeline for study completion, and an SDM process for alternatives development and design criteria development with participation from DWR, CDFW, NMFS, and USFWS. At the conclusion of the SDM process, the SDM recommendations will be submitted to the sub-directors for implementation, as needed. In the interim, the historical count length reduction procedures for managing heavy debris and/or large numbers of fish will be used.

2.7.9 Tidal Habitat Restoration

DWR and Reclamation have or will carry out tidal habitat restoration acre targets identified from the 2008 and 2019 FWS Biological Opinions (8,000 acres) and the 2020 State Incidental Take Permit (396.3) to complete mitigation requirements for delta smelt and longfin smelt (per the 2020 Incidental Take Permit [ITP]). Currently, twelve restoration projects have been identified to satisfy the total acreage requirement of 8,396.3 acres (Table 11. The twelve projects are in different phases of completion: 1) constructed (3,584 acres), 2), in construction (3,490 acres) or 3) planned (1,662 acres). All twelve restoration projects are located in the northern arc of the upper estuary (area of highest delta smelt occupation) and are designed to

enhance food production and rearing habitat for delta smelt and longfin smelt (per the 2020 ITP). DWR and Reclamation will complete its 8,396.3 acre restoration requirements by 2026.

Table 11. Tidal Habitat Restoration

Project	Estimated Acres	Phase
Arnold Slough	138	Constructed
Decker Island	113	Constructed
Lower Yolo Ranch	1713	Constructed
Tule Red	590	Constructed
Winter Island	544	Constructed
Wings Landing	190	Constructed
Yolo Flyway Farms	296	Constructed
Bradmoor Island	490	Under construction
Lookout Slough	3000	Under construction
Prospect Island	1,500	Planning, construction planned in 2024
Chipps Island	687	Planning; construction planned in 2023

The process and documentation for design, protection and long-term management of these sites is described in Appendix V Tidal Habitat Restoration Administrative Process and Documentation Requirements.

2.7.10 Delta Smelt Supplementation

Delta smelt supplementation addresses the Allee effect in the baseline status of wild delta smelt. Too few delta smelt remain for effective breeding in the wild. In water year 2022, the U.C. Davis Fish Conservation and Culture Laboratory (FCCL) raised 55,733 fish that were released into the wild as part of experimental releases. Experimental releases are currently planned through water year 2025. The four years of experimental releases (water years 2022 – 2025) entail experimental learning about the logistics and mechanisms of transport and release, with the intent to inform the design and implementation of supplementation.

USFWS ran a simulation using an updated version of the life cycle model described by Smith et al. (2021) to estimate the probability that different release levels would result in wild Delta smelt populations high enough to support FCCL's broodstock collection efforts. Results indicate that an annual release of 150,000–175,000 fish is needed to have a greater than 50% chance of meeting the collection target. Reclamation and DWR will support a minimum production of 125,000 fish by water year 2024, a minimum of 150,000 fish by water year 2025, and a minimum of 200,000 fish by water year 2026, if feasible, that are at least 200 days post-hatch or equivalent.

Reclamation and DWR, through the Culture and Supplementation of Smelt Steering Committee, will continue to collaborate with USFWS and CDFW on the development of a program to conduct supplementation of the wild Delta smelt population with propagated fish consistent with USFWS' Supplementation Strategy (U.S. Fish and Wildlife Service 2020). The USFWS and CDFW may update the Supplementation Strategy in coordination with Reclamation and DWR. The Supplementation Strategy currently uses the FCCL.

The Supplementation Strategy also identifies a need for additional facilities and evaluation of new approaches to maintain these fish, support supplementation, improve transportation and release of fish, maximize genetic diversity, and minimize domestication effects. An existing Master Plan for a Delta Smelt Conservation Facility Fish Technology Center (U.S. Fish and Wildlife Service 2018) is currently being revisited and further developed to a 35% design-level plan, with completion expected 2024. Additional facilities would require a subsequent set of environmental compliance for their construction and eventual operation. Reclamation and DWR will collaborate with USFWS and CDFW for the additional development of this planning effort, incorporation into the Supplementation Strategy, and the construction and operational needs of facilities capable of meeting production of 400,000–500,000 fish that are at least 200 days post-hatch by water year 2030.

2.7.11 Water Transfers

Water transfers assist California urban areas, agricultural water users, and others in meeting their water needs. Reclamation and DWR will operate the CVP and SWP to facilitate transfers through providing water in streams for delivery to alternative diversion points, conveying water across the Delta for export, or storing water for delivery at a future time.

Seasonal operations describe deliveries up to contract totals. Included in this consultation are transfers of water, up to contract totals, between CVP contractors within counties, watersheds, or other areas of origin (e.g., Accelerated Water Transfers). These transfers do not require demonstration of that water being consumptively used or irretrievably lost to beneficial use. Transfers not meeting these requirements, including Out of Basin transfers (e.g., Long Term Water Transfer Program (North to South-of-Delta Transfers, Long Term San Joaquin River Exchange Contractor Transfers, “Warren Act Transfers”), follow the *Draft Technical Information for Preparing Water Transfer Proposals, as updated in 2019* (Water Transfers White Paper). The actions taken by contractors to make water available for these transfers (i.e., reducing consumptive use by crop idling, contractor reservoir releases or groundwater substitution) have separate ESA section 7 consultation (see Programs in the Environmental Baseline for additional information), and are not part of this consultation. However, the specific timing and operations associated with the movement of the water to be transferred is a component of this Proposed Action and, thus, covered by this consultation. Updated in 2019, the paper provides detailed information on establishing transfers and how to complete a particular transfer and document it in a way to prevent harm to other legal users of water. The following is a brief summary from the Water Transfers White Paper on making water available for transfer. Making water available for transfer is not a part of this Proposed Action:

- **Cropland Idling/Crop Shifting Transfers:** Water from idling cropland or growing lower-water-use crops. The seller reduces surface water diversion from their normal operations.
- **Groundwater Substitution Transfers:** Water from reducing surface water diversions and replacing that like amount water with groundwater pumping.
- **Reservoir Storage Release:** Water from seller releasing stored water from their reservoir in excess of what would be released annually under their normal operations (e.g., reservoir storage targets, historical operation patterns, instream flow requirement, conveyance losses, refill, and other downstream obligations).

Reclamation and DWR will provide a transfer window across the Delta from July 1 through November 30. When pumping capacity is needed for CVP or SWP water, Reclamation and DWR may restrict transfers. Maximum transfers are shown in Table 12.

Table 12. Proposed Annual North to South (out of basin) Water Transfer Volume

Water Year Type	Maximum Transfer Amount North to South (TAF)
Critical	Up to 600
Dry (following critical)	Up to 600
Dry (following dry)	Up to 600
All other years	Up to 360

TAF = thousand acre-feet.

In general, a north to south water transfer involves an agreement between a willing seller and a willing buyer to use available infrastructure capacity to convey water between the parties. To make water available for transfer, the willing seller must take action to reduce the consumptive use of water or release additional water from reservoir storage (i.e., Water Transfers White Paper). This water is then conveyed to the buyers' service area for beneficial use.

Programs to make transfer water available not included in this consultation include:

- Long Term Water Transfer Program (North to South-of-Delta Transfers)
- Long Term San Joaquin River Exchange Contractor Transfers
- Non-Project Transfers, e.g., "Warren Act Transfers"

Reclamation and DWR frequently transfer project and non-project water supplies through CVP and SWP facilities, including in-basin and out of basin transfers. The quantity and timing of a specific water transfer may or may not require operational changes to both CVP and SWP reservoir releases and CVP and SWP facilities pumping.

2.7.12 Agricultural Barriers

Agricultural barriers maintain water levels for south Delta agricultural diverters. DWR has renewed permits from the USACE for the installation of three agricultural barriers in the south Delta for 2023-2027. DWR may install barriers as early as May 1 in Old River near Tracy 0.5 mile upstream of the Tracy Fish Collection Facility; in Middle River 0.5 mile upstream of the junction with Victoria Canal; and in Grant Line Canal, about 400 feet upstream of the Tracy Boulevard Bridge. All barriers will be removed by November 30 each year.

Operation of the Agricultural Barriers is part of the long-term operation of the CVP and SWP. Upon completion of installation, DWR will allow the barriers to operate tidally depending on stage conditions, except for one culvert at each of the three agricultural barriers. These culverts will remain open beyond June 1 if water levels for diversion in the south Delta is not a concern and the mean daily water temperature at Mossdale is less than 71.6°F (22°C).

2.7.13 Barker Slough Pumping Plant

DWR, at its sole expense, will operate the Barker Slough Pumping Plant to an annual

maximum diversion of 125 TAF and a maximum daily diversion rate of 175 cfs. The Barker Slough Pumping Plant is a SWP screened diversion that pumps water through the North Bay Aqueduct, via an underground pipeline, to Cordelia Forebay outside of Vallejo. The North Bay Aqueduct serves Napa County, Vallejo, Benicia, and Travis Air Force Base.

Maximum Spring Diversions

DWR operates the Barker Slough Pumping Plant (BSPP) to divert water from the North Delta into the North Bay Aqueduct. Longfin Smelt are attracted to the favorable habitat conditions in the North Delta and can potentially inhabit this area during their spawning period in drier years. The operation of the BSPP in combination with other diversions and losses can result in the net negative flow of water from the North Delta into Barker Slough, and these hydrodynamic conditions can lead to the entrainment of larval Longfin Smelt when they are present. Cumulative BSPP diversions for the January 1 to March 31 period, at design capacity, are limited to approximately 26 TAF. The incidental take of larval Longfin Smelt at the BSPP is expected to be low due to (1) generally minimal diversion rates during periods when larval Longfin Smelt presence is expected to be greatest (February and March) and (2) BSPP utilizing a positive barrier fish screen making the injury or death of adult and juvenile Longfin Smelt unlikely. However, a small number of larval Longfin Smelt may be entrained during BSPP operations when larvae are present in the area.

Barker Slough Pumping Plant Protections for Larval Delta Smelt

Barker Slough Pumping Plant maximum spring diversions addresses the entrainment risk and transport direction stressor for Delta smelt. Cumulative Barker Slough Pumping Plant diversions for the March to June period, at design capacity, is 42 TAF.

The incidental take of larval Delta smelt at the Barker Slough Pumping Plant is expected to be low due to (1) generally low diversion rates during periods when larval Delta smelt presence is expected to be greatest (March and April) and (2) Barker Slough Pumping Plant utilizing a positive barrier fish screen making the injury or death of adult and juvenile Delta smelt unlikely. However, a small number of larval Delta smelt may be entrained into Barker Slough during Barker Slough Pumping Plant operations.

Barker Slough Pumping Plant Conservation Measures

Larval Longfin Smelt

DWR proposes to operate the BSPP to protect larval Longfin Smelt from January 1 to March 31 of dry and critical water years. If the water year type changes after January 1 to below normal, above normal, or wet, this action will be no longer in effect. If the water year type changes after January 1 to dry or critical, DWR proposes to operate according to this measure. From January 1 to March 31 of dry and critical water years, DWR proposes to operate to a maximum seven-day average diversion rate at BSPP less than 100 cfs.

Larval Delta Smelt

DWR proposes to operate the BSPP to protect larval Delta Smelt from March 1 to June 30 of dry and critical water years. If the water year type changes after March 1 to below normal, above normal, or wet, this action will be no longer in effect. If the water year type changes after March 1 to dry or critical, DWR proposes to operate according to this measure.

DWR, at its sole expense, from March 1 to April 30 of dry and critical water years, if catch of larval Delta Smelt (length less than 25mm) in 20mm Survey at station 718 exceeds 14% of the

total catch of larval Delta Smelt across the North Delta (20mm Survey stations 716, 718, 719, 720, 723, 724, and 726), then DWR proposes to operate to a maximum seven-day average diversion rate at BSPP less than 60 cfs.

DWR, at its sole expense, from May 1 to June 30 of dry and critical water years, if catch of larval Delta Smelt (length less than 25mm) in 20mm Survey at station 716 exceeds 5% of the total catch of larval Delta Smelt across the North Delta (20mm Survey stations 716, 718, 719, 720, 723, 724, and 726), then DWR proposes to operate to a maximum seven-day average diversion rate at BSPP less than 100 cfs.

Maintenance

Fish screen cleaning, sediment removal, and aquatic weed removal at the Barker Slough Pumping Plant is needed year-round to maintain operation of the Barker Slough Pumping Plant. Raising and cleaning of the fish screens is necessary to prevent excessive head loss and minimize localized approach velocities.

Sediment removal from the trap and concrete apron in front of the facility is necessary to prevent accumulation and clogging of the screens and facility. Removal of aquatic weeds is necessary to avoid blocking flow and causing water levels to drop in the pump wells behind the screens, triggering automatic shutoffs to protect the pumps from cavitation. Attachment W provides the operating manual and details for Barker Slough Pumping Plant maintenance, including best management practices to minimize adverse effects on listed species.

2.7.14 Clifton Court Forebay Weed Management

Aquatic weed management is needed year-round to prevent potential damage to SWP equipment through cavitation at the pumps and excessive weight on the fish protection louver array. Excessive weed mats entrained into the fish holding tanks and collection baskets in Skinner Fish Facility reduce the efficiency of fish salvage, affect the ability of staff to conduct fish counts, and smother fish. Dense stands of aquatic weeds additionally provide cover for predators that prey on listed species within the Clifton Court Forebay. Algal blooms degrade drinking water quality through production of taste and odor compounds or algal toxins. DWR will apply herbicides and algaecides or will use mechanical harvesters on an as-needed basis to control aquatic weeds and algal blooms in the Clifton Court Forebay. The March 2023 Clifton Court Forebay Aquatic Weed Management Standard Operating Procedures provides the operations manual and details for Clifton Court Forebay Weed Management, including best management practices to minimize adverse effects on listed species.

2.7.15 B.F. Sisk Dam Raise and Reservoir Expansion

Upon completion of construction, Reclamation and DWR will operate Delta facilities with an expanded San Luis Reservoir. The raising of Bernice Frederick Sisk Dam will increase reservoir storage capacity by 130 TAF. Reclamation and DWR completed a final EIS/Environmental Impact Report in September 2019 for the addition of shear keys and downstream stability berms to provide seismic stability for the embankment during a large earthquake and to raise the dam crest by 12 feet. Reclamation consulted with the USFWS on construction and signed a record of Decision in October 2023. This Proposed Action consults on the operational effects from increased exports with an expanded San Luis Reservoir.

2.7.16 Suisun Marsh – Roaring River Distribution System Fall Flood-Up

This Proposed Action includes DWR's operation of the Suisun Marsh Facilities (SMSCG, RRDS, MIDS and GYSO) in accordance with the Suisun Marsh Preservation Agreement (SMPA), which contains provisions for DWR and Reclamation to mitigate the effects on Suisun Marsh channel water salinity from SWP and CVP operations and other upstream diversions. The SMPA requires DWR and Reclamation to meet salinity standards in accordance with D-1641. The SMSCG are operated on an as-needed basis to meet D-1641 and SMPA water quality standards in Montezuma Slough. The duration of gate operation may range from no use to full use for the entire September through May period. Assuming no significant long-term changes in the operational data, gate operations (outside of additional actions described under Delta Smelt Summer-Fall Habitat Action) will continue as necessary to meet D-1641 and SMPA standards.

The Roaring River Distribution System (RRDS) was constructed to provide lower salinity water to approximately 8,000 acres of managed wetlands. RRDS diversion rates have been controlled to maintain a maximum approach velocity of 0.2 feet/second at the intake fish screen except for a 5-week contiguous period (5-week flood-up window) when RRDS diversion rate will be controlled to maintain a maximum approach velocity of 0.7 feet/s for fall flood-up operations. The dates of the 5-week flood-up window may change annually due to waterfowl season dates changing each year and corresponding flood-up needs but will occur during the months of September through November. The Proposed Action includes operation of the RRDS for a 5- week flood up period each year.

If Reclamation and DWR reinitiate the consultation on the SMP (i.e., *Biological Opinions on the Proposed Suisun Marsh Habitat Management, Preservation, and Restoration Plan and the Project-Level Actions in Solano County, California*), operations of the Suisun Marsh Facilities would be included in their entirety under those consultations and no longer under the long-term operation of the CVP and SWP ROD.

2.8 Stanislaus River

Reclamation operates and maintains the Eastside Division of the CVP for flood control, M&I and agricultural water supplies, hydroelectric power generation, fish and wildlife protection, recreation, and water quality. Reclamation's facilities include the New Melones Dam, Reservoir (2.4 MAF capacity), and Powerplant (Figure 12).

The Tri-Dam Project, a partnership between the Oakdale Irrigation District and South San Joaquin Irrigation District, consists of Donnell's and Beardsley Dams, located upstream of New Melones Reservoir on the middle fork Stanislaus River, and Tulloch Dam and Powerplant, located approximately six miles downstream of New Melones Dam on the mainstem Stanislaus River. Releases from Donnell's and Beardsley Dams affect inflows to New Melones Reservoir. The main water diversion point on the Stanislaus River is Goodwin Dam, an impassable barrier for fish migration approximately two miles downstream of Tulloch Dam.

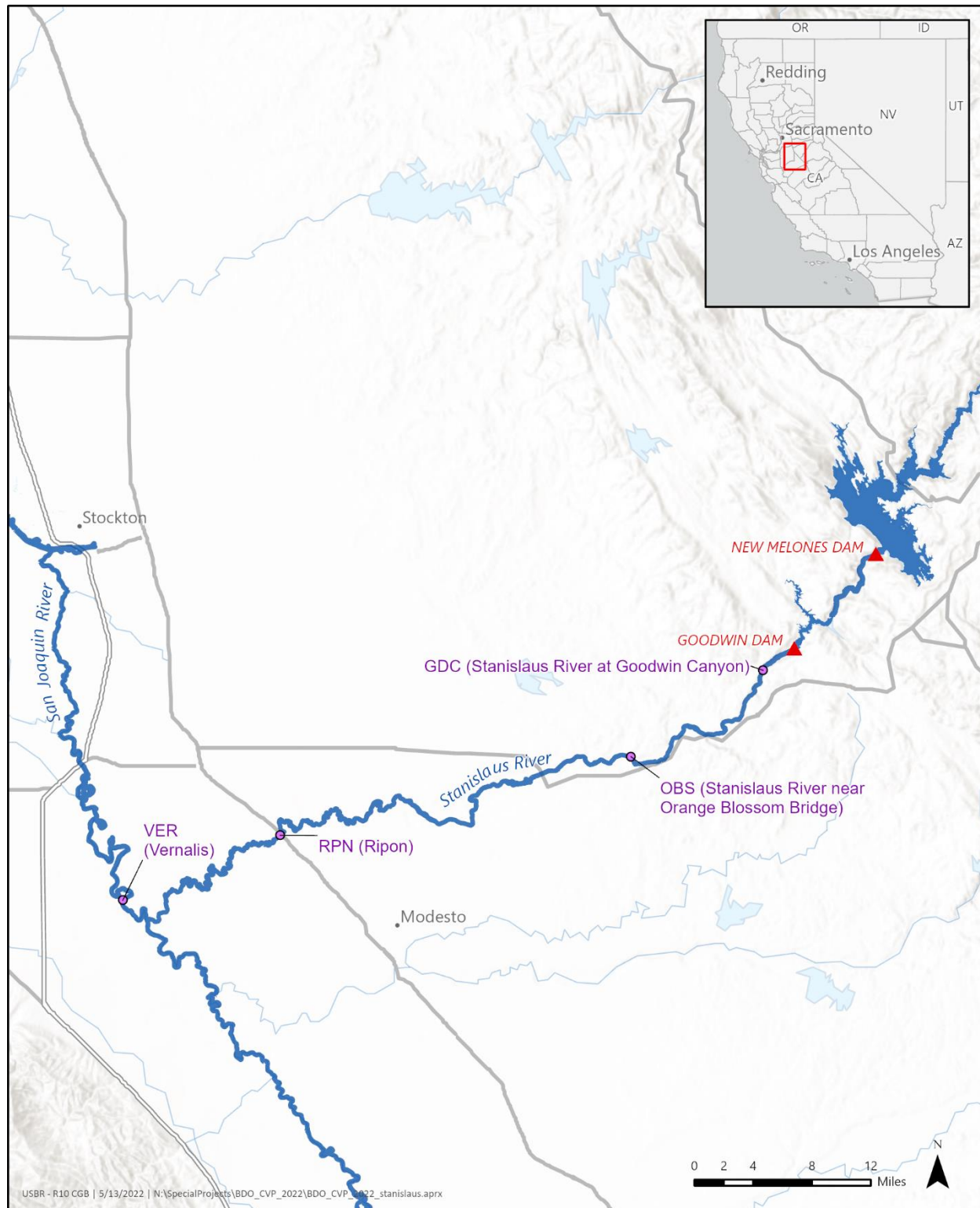


Figure12. Map of the Stanislaus River and Eastside Division

Statutory and Regulatory Requirements, see Appendix A:

- USACE Standard Operation and Maintenance Manual for the Lower San Joaquin River Levees Lower San Joaquin River and Tributaries Project, California (April 1959)

- Public Law 87-874 Flood Control Act of 1962
- USACE Standard Operation and Maintenance Manual for the Lower San Joaquin River Levees Lower San Joaquin River and Tributaries Project, California (April 1959)
- Minimum flow standards below Goodwin Dam: “Interim Instream Flows and Fishery Studies in the Stanislaus River Below New Melones Reservoir” (1987 Agreement between Reclamation and CDFG)
- Minimum Dissolved Oxygen standards: State Water Board D-1422
- State Water Board D-1641, D-1422, D-1616, Bay-Delta Plan flow objectives and subsequent assignment of responsibility
- 1992 CVPIA 3406(b)(2)
- Agreements and Contracts
- 1988 Agreement and Stipulation with Oakdale Irrigation District and South San Joaquin Irrigation District
- Water Service Contracts
- Tri-Dam Agreement

Programs in the environmental baseline to highlight:

- Spawning and Rearing Habitat Restoration
- Temperature Modeling Platform

2.8.1 Seasonal Operations

In the winter and spring, Reclamation will operate to D-1641 and for flood control in accordance with the USACE Standard Operation and Maintenance Manual for the Lower San Joaquin River Levees Lower San Joaquin River and Tributaries Project, California (April 1959). Operating to flood control constraints is relatively infrequent because New Melones is a larger reservoir relative to its annual inflow. However, Tulloch Lake is subject to high local inflows, and may be in flood control operations for brief periods when New Melones Reservoir is not. During these periods, releases from Tulloch Lake may be used to meet flow objectives, schedules, or requirements on the lower Stanislaus River below Goodwin Dam but are generally of a short duration. Reclamation seeks to minimize potential redd dewatering, redd scouring, and juvenile stranding for steelhead.

Reclamation is required to maintain applicable dissolved oxygen standards on the lower Stanislaus River for species protection. The 7.0 milligrams per liter (mg/L) dissolved oxygen requirement at Ripon applies year-round but is most often controlling (requiring additional releases from Goodwin Dam) from June 1 to September 30.

In the fall, Reclamation operates to a D-1641 fall pulse flow requirement at Vernalis in October for fish attraction. Otherwise, Reclamation operates to base flow requirements in order to rebuild storage. If necessary, releases might be made for dissolved oxygen at Ripon or EC concerns at Vernalis, but these are rare.

2.8.2 Minimum Instream Flows

Minimum instream flows (i.e., Goodwin Dam releases) will be in accordance with the 2023

New Melones Stepped Release Plan (2023 SRP; Figure 13; Appendix N Attachment N (excel sheet). The 2023 SRP increases the potential outmigration response of juvenile steelhead and increases the annual total volume of water for all year types. Modifications would use a single pulse and increase peak releases from 400 cfs to 3,000 cfs in the default schedule.

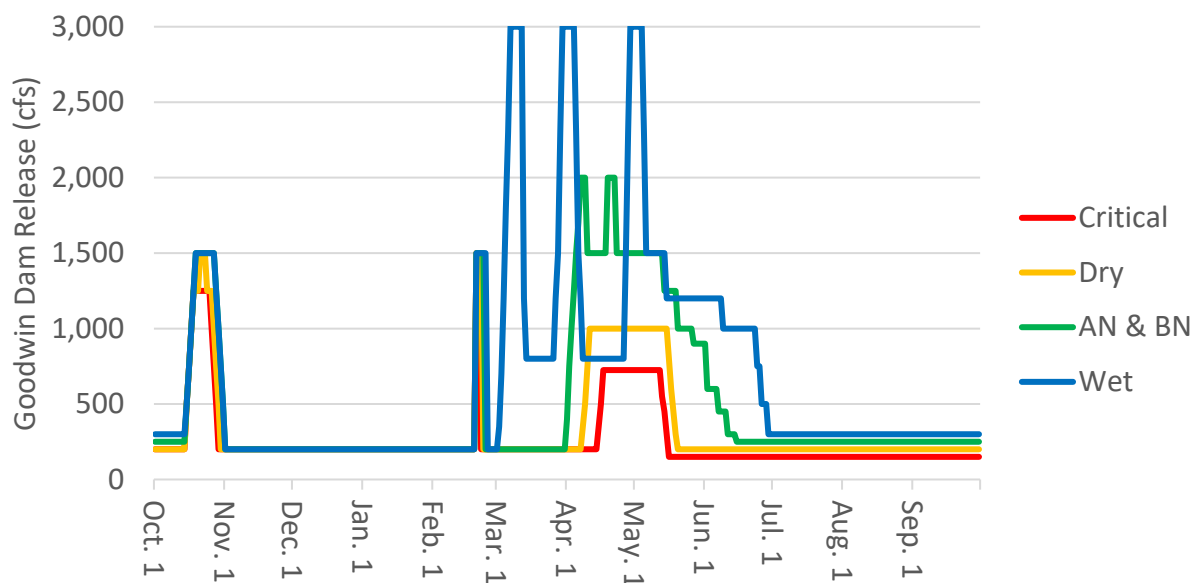


Figure 13. 2023 New Melones Stepped Release Plan with Modified Winter Instability Flows

For determining the water year type, Reclamation will use the San Joaquin Valley “60-20-20” Water Year Hydrologic Classification (60-20-20) developed for D-1641 implementation and based on a 90% exceedance forecast. The 2023 SRP includes the ability to shape monthly and seasonal flow volumes as described below:

Winter Instability Flows

Winter instability flows address the outmigration and juvenile habitat stressors. Reclamation releases additional flow in February, as provided in the 2023 SRP, to simulate natural variability in the winter hydrograph and to enhance access to varied rearing habitats. Reclamation, through the Stanislaus Watershed Team, schedules the winter instability flow volume. Whenever possible the pulse is scheduled to coincide with a natural storm event, which may naturally cue outmigration. In some years, natural rain events may provide sufficient natural variability in the hydrograph and an additional pulse may be determined to necessary. Reclamation, through the Stanislaus Watershed Team, will prepare an assessment when rain events meet the need for winter instability flows and not require additional releases.

Spring Pulse Flows

Spring pulse flows address the outmigration and juvenile habitat stressors. Reclamation will release additional flows starting as early as March through as late as June. Reclamation, through the Stanislaus Watershed Team, will schedule spring pulse flow volumes consistent with volumes in the Stepped Release Plan.

Fall Pulse Flows

Fall pulse flows improve instream conditions and provide an attraction cue for adult salmonids

returning to spawn. Reclamation will release additional flows in October and/or November. Reclamation, through the Stanislaus Watershed Team, will schedule fall pulse flow volumes consistent with the volumes in the Stepped Release Plan and considering other system objectives.

2.8.3 Ramping Rates

Ramping rates address the stranding risk stressor. Reclamation will coordinate releases on the Stanislaus River as shown in Table 13. For determining the water year type, Reclamation will use the San Joaquin Valley “60-20-20” Water Year Hydrologic Classification (60-20-20) developed for D-1641 implementation and based on a 90% exceedance forecast.

Table 13. Goodwin Dam Ramping Rates

Goodwin Release Range (cfs)	Standard Rate of Increase (cfs per 2 hours)	Standard Rate of Decrease (cfs per 2 hours)	C and D Water Year Type Rate of Increase (cfs per 2 hours)	C and D Water Year Type Rate of Decrease (cfs per 2 hours)
At or above 4,500	250	250	250	250
2,000 to 4,499	500	250	500	250
500 to 1,999	250	100	500	200
300 to 499	100	50	200	100

cfs = cubic feet per second; C = critical (60-20-20 San Joaquin Index); D = dry (60-20-20 Index).

Reclamation, through the Stanislaus Watershed Team, may develop a faster down ramping rate on a case-by-case basis to implement temporary flow reductions for critical monitoring or maintenance needs. For winter instability flows, Reclamation, through the Stanislaus Watershed Team, may implement faster ramping rates in critical and dry water year types provide more flexibility for shaping flow volumes of water for the purposes of improving biological benefits. Ramping rates that promote recruitment of native riparian vegetation on floodplain surfaces should be considered when instream flow budgets are sufficient. Reclamation may vary from these ramping requirements during flood control.

2.9 San Joaquin River

Reclamation operates the Friant Division for flood control, M&I and agricultural water supplies, and fish and wildlife purposes. Friant Dam provides flood control on the San Joaquin River, downstream releases to meet senior water rights requirements above Gravelly Ford, Restoration Flows under Title X of Public Law 111-11, and diversions into the Madera and Friant-Kern Canals.

The Friant Division facilities include Friant Dam, Millerton Reservoir, and the Friant-Kern and Madera Canals (Figure 14). Water is delivered to about one million acres of agricultural land in Fresno, Kern, Madera, and Tulare Counties in the San Joaquin Valley via the Friant-Kern Canal south into Tulare Lake Basin and via the Madera Canal north to Madera and Chowchilla Irrigation Districts.

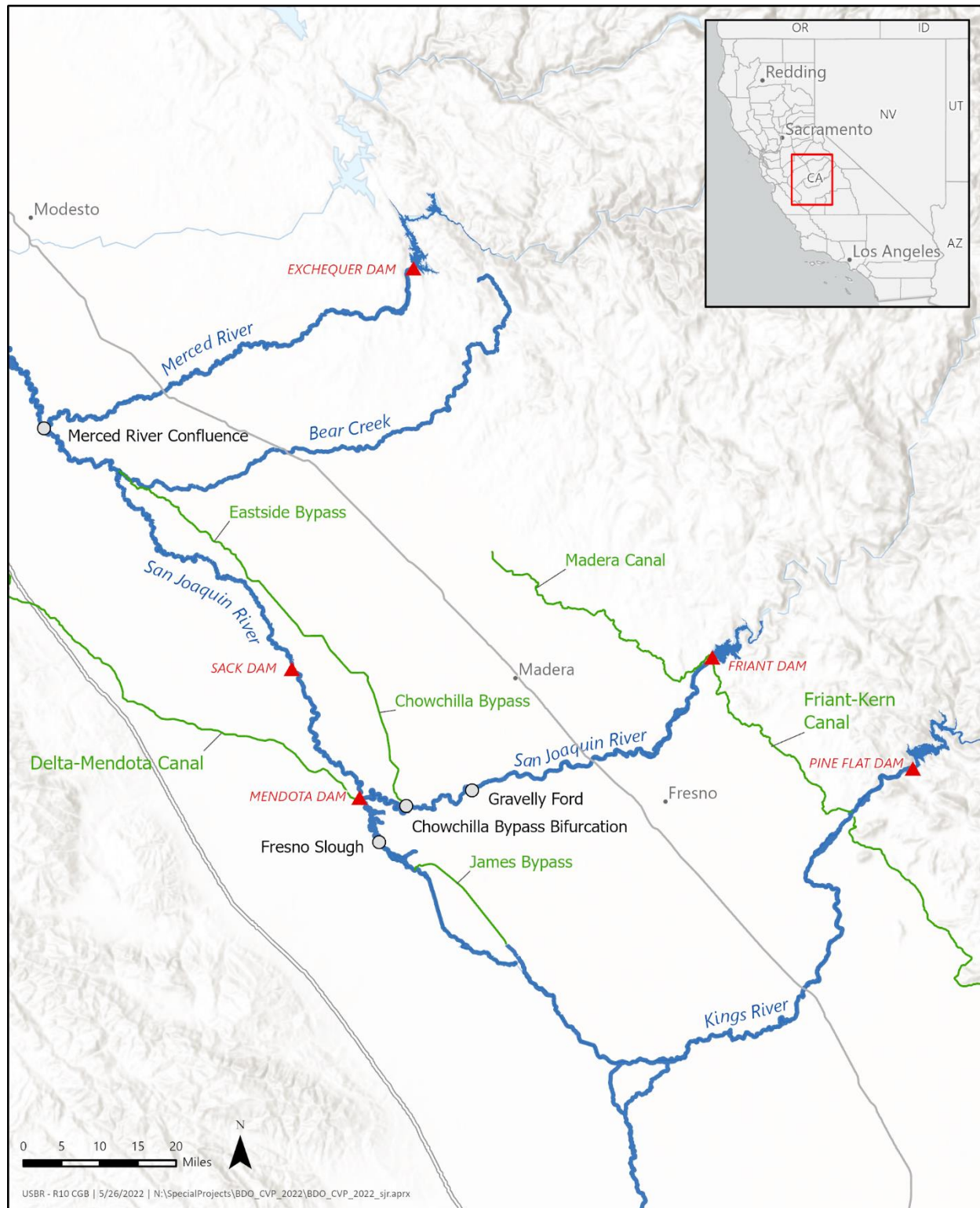


Figure 14. Map of the Friant Division and San Joaquin River

Statutory, Regulatory, and Contractual Requirements

- Public Law 74-392 CVP Re-Authorization Act
- Public Law 111-11 (San Joaquin River Restoration Settlement Act)

- State Water Board D-1641
- 1995 Bay-Delta Water Quality Control Plan
- USACE Public Notice 5820A Amended
- Friant Division Riparian Holding Contracts
- Friant Division Water Service Contracts

Programs in the environmental baseline to highlight

- San Joaquin River Restoration Program

Reclamation would operate the Friant Division consistent with the San Joaquin River Restoration Program Record of Decision, which is a related action not included in this consultation.

2.10 Monitoring

Reclamation and DWR would undertake monitoring to inform long-term operations associated with this Proposed Action. Monitoring is necessary to determine and help avoid and minimize the effects of the Proposed Action, including minimizing anticipated incidental take, and informing specific real-time actions.

Because of the ongoing nature of the Proposed Action, ongoing monitoring efforts to inform operational actions and effects of those actions are currently occurring under existing and separate Section 7 consultations and section 10(a)(1)(A) permits and are described in the Baseline. Potential future changes to monitoring programs associated with the operation of the CVP and SWP will be addressed as a Framework Programmatic consultation.

Some programs in the environmental baseline currently provide incidental take coverage for monitoring associated with the Coordinated Operation of the CVP and SWP. Active ESA-listed species take permits and consultations cover real-time monitoring surveys, status and trend surveys, and current special studies. Please refer to Chapter 2, *Environmental Baseline*, for more detail on these ongoing monitoring efforts, including regulatory mechanisms that are in place to exempt take from these efforts.

Reclamation and DWR propose a Framework Programmatic consultation approach to include as part of this Proposed Action that addresses future changes to monitoring associated with the Proposed Action. Subsequent changes to existing monitoring programs would be coordinated and included in future consultations of the long-term operation of the CVP and SWP to allow for a more uniform analysis and improved accounting of incidental take coverage associated with the operation of the CVP and SWP. The Framework Programmatic consultation approach specifies that material changes to monitoring efforts and/or ESA compliance would require subsequent consultation.

Reclamation and DWR provide funding to various partners for ongoing monitoring efforts associated with the long-term operation of the CVP and SWP. Section 7 compliance and incidental take coverage would continue to be provided by the existing consultations and permits outlined in the environmental baseline section until and if Reclamation and DWR complete a subsequent consultation with FWS and NMFS on changes to monitoring. Changes outside the scope and effects in the existing consultations and permits are not authorized to

commence until the subsequent consultation is completed.

The Framework Programmatic consultation approach for monitoring includes the following principles which would be incorporated into any future changes to monitoring programs addressed in a subsequent consultation:

- Ensure monitoring will be beneficial to long-term operation of the CVP and SWP for:
 - minimizing effects on listed species and habitat (informing real-time operations, understanding species status, etc.)
 - understanding if various operational objectives are met (e.g., effectiveness and validation monitoring); and
 - measuring if and when the reinitiation trigger associated with amount or extent of incidental take has been met.
- Confirm that data collected should meet data quality objectives and open data practices;
- Establish multi-agency collaborative approach including management structure for decision making;
- Ensure scientific rigor of new or modified monitoring and achieving objectives of new or modified monitoring;
- Develop and test mechanisms for learning and adopting new technologies, while maintaining comparability and continuity to historical information on fish and the environment;
- Incorporate a fish, aquatic habitat, and ecosystem monitoring enterprise for the long-term operations of the CVP and SWP should effectively measure physical conditions, water quality, primary and secondary production; abundance, distribution, and production of ESA-listed species (natural and hatchery origin); Delta and tributary fish assemblages; and salvage at the CVP/SWP fish collection facilities;
- Establish mechanisms for close coordination with any existing or future adaptive management program; and
- Provide for robust synthesis of monitoring data to incorporate results and lessons learned.

Monitoring of the LTO operations is subject to change over time by implementing these principles to improve monitoring where incorporating the best available scientific information indicates such change is appropriate. If and when Reclamation and DWR decide changes to a given monitoring program are necessary, Reclamation will provide the supporting information to USFWS and NMFS to support subsequent section 7 consultation as outlined in 50 CFR 402.14.

2.11 Special Studies

Special studies address areas of scientific uncertainty on the reasonable balance among competing demands for water, including the requirements of fish and wildlife, M&I, agricultural, and power contractors. While special studies do not avoid, minimize, or mitigate adverse effects on federally listed species, over time they may inform the effectiveness of

measures taken to avoid, minimize, or mitigate incidental take. Studies are incorporated for the following reasons:

1. The study design is complete, implementation is needed to authorize the LTO, and success is not reliant on requiring flexibility to make future changes.
2. Incidental take is likely required: This consultation seeks the necessary incidental take coverage, if not already covered.
3. The new information may reveal effects and/or warrant a modification of the Proposed Action in a manner or to an extent not previously considered: Analysis could consider a broader potential range of operations and/or different confidence in likelihood of effects from operations.

The criteria for identification of a special study in the Proposed Action balances uncertainty and flexibility. Reclamation would not rely on uncertain outcomes from a study but may require direct or incidental take to conduct the study. Requiring modifications to this Proposed Action to change special studies may impose unnecessary administrative delays or risk an unnecessary need for reinitiation of consultation.

Special studies in the Proposed Action are described below.

2.11.1 Steelhead Juvenile Production Estimate

Reclamation and DWR will propose an expanded steelhead JPE framework for the San Joaquin and Sacramento River Basins. Based on data generated from the San Joaquin and Sacramento River Basins, JPE, and feedback from an independent review of progress after 2025, Reclamation and DWR will update the JPE framework including steelhead telemetry, steelhead lifecycle monitoring, and a steelhead JPE.

Steelhead Telemetry Research:

Reclamation and DWR will implement Steelhead telemetry research on routing and survival of hatchery- and wild-origin steelhead through the San Francisco Bay-Delta. This research will provide information on how CVP and SWP operations impact steelhead routing and survival through different routes, the facilities, and to Chipps Island. In addition, the steelhead telemetry research may enable through Delta survival estimates for juvenile steelhead tagged in the Stanislaus River or Clear Creek as part of the life cycle monitoring and JPE development in these tributaries.

Steelhead Lifecycle Monitoring

Reclamation will maintain the infrastructure supporting the Stanislaus River steelhead life cycle monitoring program and develop infrastructure that will support a life cycle monitoring program in Clear Creek. In addition, Reclamation and DWR will support genetic and age-structure monitoring of juvenile steelhead collected at state and federal salvage facilities to facilitate identification of brood year and natal origin. The goal of this research and monitoring in the San Joaquin and Sacramento Rivers is to provide the data necessary to develop a basin-specific steelhead JPE. In addition, the goal of this research and monitoring is to provide the basis for evaluating how actions related to stream flow enhancement, habitat restoration, and/or water export restrictions affect biological outcomes including juvenile and adult population abundance, age structure, growth and smoltification rates, and anadromy and adaptive potential in Sacramento- and San Joaquin-origin steelhead.

Steelhead JPE

Reclamation proposes to develop a steelhead JPE for tributaries with CVP facilities that will focus on the annual production of outmigrating juvenile steelhead. Data used in the JPE will inform the status and trends of Sacramento and San Joaquin basin steelhead and may also help inform actions that will increase steelhead abundance and improve steelhead survival through the Delta. Reclamation and DWR, in coordination with FWS, NMFS, and CDFW, will create or use an existing technical team to use the Southern Sierra Nevada Diversity Group Steelhead Science Plan, which describes the JPE framework, to identify infrastructure and monitoring needs in tributaries with CVP or SWP facilities and a method for expanding the JPE framework from the tributary to basin levels.

Reclamation and DWR propose to conduct the first independent panel review from data generated from the Stanislaus River steelhead life-cycle monitoring program. Reclamation and DWR anticipate the independent panel will provide feedback on the scientific merits of the JPE framework and recommendations for improving the JPE framework. Reclamation and DWR will work with the technical team to incorporate review panel feedback and recommendations on the JPE framework, as appropriate.

Beginning Fall 2025, Reclamation and DWR will work with the technical team to consider implementing an expanded JPE framework to the San Joaquin and Sacramento basins. By summer 2026, Reclamation and DWR will decide to address deficiencies in the JPE framework and/or expand the JPE framework to remaining CVP or SWP tributaries.

Reclamation and DWR anticipate conducting the second independent panel review from data generated from the San Joaquin and Sacramento basins JPE. Reclamation and DWR anticipate the independent panel will provide further feedback on the scientific merits of the JPE framework and further recommendations for improving the JPE framework. Reclamation and DWR will work with the technical team to incorporate review panel feedback and recommendations on the JPE framework, as appropriate.

2.11.2 Spring-Run Juvenile Production Estimate and Life Cycle Model

Spring-run Chinook salmon Juvenile Production Estimate (SR-JPE)

Reclamation and DWR will support continued development of a SR-JPE framework for CVP and SWP tributaries and the Delta, and propose a framework for implementation, including an approach for modeling a SR-JPE and the monitoring program to support that approach. The SR-JPE framework will incorporate independent review and will be the basis for consideration of updated entrainment minimization measures, including updating hatchery surrogate measures. The process to develop the framework will continue the ongoing effort to develop a SR-JPE initiated in 2020 and outlined in the SR-JPE Science Plan (California Department of Water Resources et al. 2020), the SR-JPE Interim Monitoring Plan (Allison et al. 2021), the SR-JPE Run Identification Research and Initial Monitoring Plan (Bedwell et al. 2021), the SR-JPE Data Management Strategy (Harvey et al. 2022), and the SR-JPE Decision Charter (Horndeski 2022). These plans describe the decision processes, research, monitoring, and data management infrastructure that will be needed to meet the goal of developing an SR-JPE ready for implementation in 2026, including guidance by an interagency Core Team using structured decision making principles, rapid and coordinated reporting of new data onto a publicly accessible repository, routine and rapid genetic testing, and additions to existing and/or new monitoring programs at Delta entry and in representative spring-run streams: Clear Creek,

Battle Creek, Mill Creek, Deer Creek, Butte Creek, Yuba River, and Feather River.

Spring-run Chinook Salmon Lifecycle Model

DWR and Reclamation will support the development of a Spring-run Chinook Salmon Lifecycle Model (SR-LCM) for the purpose of informing management actions to improve Central Valley spring-run population status. DWR and Reclamation will assemble an interagency management team including representatives from Reclamation, DWR, CDFW, NMFS, and USFWS, to define the specific management issues and objectives to be addressed by the SR-LCM. Because of the close link between SR-LCM and SR-JPE development through a shared use of historical and newly generated data, the SR-JPE Core Team will be responsible for guiding the development of the SR-LCM to address the management objectives, and for determining whether the required modeling can be accomplished through an update of one or more existing Central Valley (CV) Chinook salmon modeling efforts, such as the SR-JPE, the NMFS spring-run lifecycle model, and the CVPIA Science Integration Team salmon lifecycle models. The Core Team will use structured decision making principles when appropriate. The Core Team will develop and submit a modeling plan and timeline to the SR-LCM management team for approval, and guide implementation of the plan. To facilitate open communication between the lead life-cycle modeler and agency staff, a Lifecycle Model Subteam will be established. Throughout the process to develop and implement the SR-LCM, the lead lifecycle modeler will collaborate with the Lifecycle Model Subteam through regular meetings to solicit feedback and integrate that feedback into model development iteratively, in a manner similar to the SR-JPE Modeling Subteam described above.

Required actions in 2025:

1. Under the guidance of the Core Team, the Modeling Team will develop an initial JPE model based on available spring-run data and provide the model to the Core Team for review. The Core Team will recommend an SR-JPE framework, composed of the initial SR-JPE model and the monitoring program required to provide data to calculate an annual JPE.
2. DWR and Reclamation will assemble the SR-LCM Management Team and begin coordination with the SR-JPE Core Team on the development of the SR-LCM.

Required actions in 2026:

1. In coordination with the SR-JPE Core Team, the Adaptive Management Steering Committee will charter and convene an independent peer review panel to provide feedback on the SR-JPE Core Team's recommended SR-JPE framework.
2. Following the independent peer review, DWR and Reclamation will prepare a draft SR-JPE Plan in collaboration with CDFW, NMFS, and USFWS that describes the approach to calculating a SR-JPE and the monitoring and special studies needed to collect the data to calculate a SR- JPE annually. The draft SR-JPE Plan will be guided by the SR-JPE Core Team SDM process and SR-JPE framework recommendation, and by the independent peer review panel. DWR and Reclamation will submit the draft SR-JPE Plan to the SR-JPE Core Team for review and work collaboratively to incorporate SR-JPE Core Team comments into the final SR-JPE Plan.

3. The SR-JPE Core Team will review the spring-run Chinook Salmon hatchery surrogate OMR measure .
4. DWR, CDFW, Reclamation, and NMFS will meet to contemplate development of a new or modified spring-run Chinook Salmon hatchery surrogate OMR measure informed by the independent peer review panel input on the SR-JPE framework, historical spring-run Chinook Salmon data, new data obtained from the monitoring and special studies needed to collect the data to calculate the SR-JPE, SR-JPE Core Team review of the spring-run Chinook Salmon hatchery surrogate OMR measure, and other relevant information (for example Georgiana Slough monitoring data). Any new approach for spring-run Chinook Salmon will:
 - a. Take into account the limitations of the initial SR-JPE approach to calculate the SR-JPE
 - b. Be an interim approach to be refined as the SR-JPE approach evolves and the SR-LCM is completed
 - c. Anticipate future iterations and refinements of SR-JPE approach
 - d. Rely primarily on monitoring data rather than salvage data
5. DWR and Reclamation will submit the final SR-JPE Plan to CDFW and NMFS for approval no later than six months after the independent peer review and spring-run Chinook Salmon hatchery surrogate OMR measure review are completed, whichever is later.
5. After the final SR-JPE Plan is approved by CDFW and NMFS, DWR and Reclamation will convene the SR-JPE Core Team and subteams to provide an annual SR-JPE estimate, implement the final SR-JPE Plan (including monitoring), and ensure all data obtained through long-term monitoring programs is stored in a publicly accessible repository.
6. The SR-JPE Core Team will develop and submit a draft SR-LCM Modeling Plan and timeline to the SR-LCM Management Team for approval and guide implementation of the final SR-LCM Modeling Plan upon approval.
7. DWR and Reclamation will assemble the Lifecycle Modeling Subteam for coordination between the lead life cycle modeler and the SR-JPE Core Team.

Required actions in 2027:

1. If approved by CDFW and NMFS, DWR and Reclamation will implement the new or modified spring-run Chinook Salmon OMR measure based on the initial SR-JPE approach to calculate the SR-JPE.
2. DWR and Reclamation will implement changes to monitoring if recommended through the SR-JPE SDM process and approved by CDFW and NMFS, through appropriate take authorization for monitoring activities and contingent on stakeholder participation from non-CVP or SWP tributaries.
3. The SR-JPE Modeling Subteam will continue to develop and refine the SR-JPE model by integrating new data as they become available and adjusting the modeling approach in

collaboration with the SR-JPE Core Team and in response to SDM processes conducted by the SR-JPE Core Team.

4. The Lifecycle Modeling Subteam will convene regular meetings to implement the final SR-LCM Modeling Plan and to solicit and incorporate feedback on model development.

Required actions in 2028:

1. Under the guidance of SR-LCM Management Team and SR-JPE Core Team, the Lifecycle Modeling Subteam will recommend an initial SR-LCM.
2. In coordination with the SR-JPE Core Team and the SR-LCM Management Team, the Adaptive Management Steering Committee will consider chartering and convening an independent peer review panel to provide feedback on the SR-JPE model and the initial SR-LCM.

Required actions in 2029 and 2030:

1. Following the independent peer review, the SR-JPE Core Team and the Lifecycle Modeling Subteam will review independent peer review panel input (if convened) and the SR-JPE Core Team will use SDM to evaluate and implement changes to the SR-JPE model and the initial SRLCM.

2.11.3 Tidal Habitat Restoration Effectiveness

DWR and Reclamation will use the adaptive management program to evaluate and identify actions that may improve the effectiveness of its restoration projects. Adaptive management actions will be focused on a comprehensive understanding of how all restoration projects function across the landscape and in consideration of other conservation measures (e.g., Yolo Notch Project, etc.). that may enhance food web production and rearing habitat for Delta smelt. The process for completing the administrative documentation to ensure these restoration sites are protected, monitored, and managed so that they function as intended long-term. This process is described in *Appendix V: Tidal Habitat Restoration Administrative Process and Documentation Requirements*.

2.11.4 Tributary Habitat Restoration Effectiveness

The Upper Sacramento River Anadromous Fish Habitat Restoration Project Monitoring Plan and Protocols (2017) are designed to determine the effectiveness of the Upper Sacramento River Anadromous Fish Habitat Restoration Project in meeting identified objectives and to validate the linkage between restoration actions and the biologic response to those actions. This monitoring plan follows the framework for detecting biological responses to flow management described by Souchon et al. (2008). Monitoring methods structured as field protocols are described in the Plan and Protocols including control site selection, longitudinal profile and cross sections, juvenile habitat mapping protocols, snorkel survey protocols, seining, enclosure studies, invertebrate drift sampling, redd surveys, and stream temperatures. The existing CVPIA Upper Sacramento River Habitat Restoration Technical Team includes Reclamation, USFWS, NMFS, CDFW, consultants (e.g., Chico State University, PSMFC), and recipients of competitive funding for habitat restoration will be utilized as the AMT for this action.

2.11.5 Winter-Run Early Life Stage Studies

Sacramento River winter-run Chinook salmon (winter-run) are exposed to a variety of stressors throughout their lifecycle that impair their survival, reproduction, and the ability of the population to rebound from periods of low abundance. Survival during early life stages—spawning success, egg incubation, emergence, and juvenile rearing and migration—is affected

by various environmental factors. Understanding the relative contribution of different stressors, particularly those that we can manage through water operations and other actions, will improve our ability to manage water and improve winter-run early life stage survival.

The Early Life Stage Survival Science Action aims to address two distinct knowledge gaps:

1. Reducing uncertainty around the effects of water temperature and other factors (e.g., dissolved oxygen, spawning habitat and flow) on egg-fry-survival
2. Improving understanding of juvenile survival during rearing and migration, including reducing uncertainties in the field monitoring data

2.11.6 Shasta Spring Pulse Studies

Reclamation and DWR, through the SRG, will support hindcast evaluation of action effectiveness that includes technical review of the functional elements of the pulse flow (i.e., timing, magnitude, duration, and frequency) as well as an evaluation of criteria used to support beneficial use decisions.

2.11.7 Delta Route Selection and Survival

These studies involve an acoustic receiver network and associated real-time and retrospective modeling of the data. The objectives are to provide real-time estimates of reach-specific survival and route entrainment for juvenile salmonids in the Sacramento River and Delta.

2.11.8 Delta Smelt Summer and Fall Habitat

DWR and Reclamation will consider food subsidy measures to augment the Summer-Fall Habitat Action. Food subsidy actions are hypothesized to increase localized prey availability for delta smelt in the north Delta and Suisun Marsh, resulting in opportunities for higher growth and survival of juvenile and sub-adult life stages. DWR and Reclamation will decide which of the following food subsidy actions are most appropriate given hydrologic conditions (i.e., water year type), logistical constraints, and information needs: one of several variations of the North Delta Food Subsidy Action, one of several variations of Managed Wetland reoperation in Suisun Marsh, and/or the Sacramento Deepwater Ship Channel Food Subsidy Action. For any year when one or more of the food subsidy actions is implemented, an action plan, science and monitoring plan, and monitoring report will be produced to evaluate action effectiveness. Monitoring plans and reports will also be produced in years actions are not implemented to serve as contrasts to baseline conditions. Food subsidy action plans, monitoring plans, and reports will be developed in collaboration with, and reviewed by the DCG. Food subsidy action research results will be included in seasonal reporting and adaptive management reviews of the Summer-Fall Habitat Action to evaluate the science and monitoring, efficacy of actions, hypothetical alternative strategies and/or actions, and potential inclusion of food subsidy actions as potential permanent action elements of the Summer-Fall Habitat Action, or if appropriate, termination of actions deemed ineffective.

2.11.9 Longfin Smelt Science Plan

DWR, in coordination with Reclamation, will implement science activities identified in the 2020 ITP Longfin Smelt Science Plan; including the development of mathematical life cycle model. The life cycle model will be used as a quantitative tool to characterize the effects of abiotic and biotic factors on Longfin Smelt populations. Additional Longfin smelt science and monitoring informed by the life cycle modeling efforts will be implemented as needed through the Adaptive Management process.

Longfin Smelt Science and Monitoring Initiatives

DWR and CDFW, in collaboration with the State Water Contractors and USFWS, developed the LFSSP to meet a requirement in the 2020 ITP, and the LFSSP was finalized on December 8, 2020. DWR, in coordination with Reclamation, will support the implementation of the Longfin Smelt Science Plan (LFSSP) through a multi-agency process. The purpose of the LFSSP is to provide a framework for Longfin Smelt science investments through 2030, including seven key priority areas. Longfin Smelt science and monitoring informed by the life cycle modeling efforts will continue beyond 2030, as appropriate.

Science priority areas in the LFSSP:

1. Life cycle modeling
2. Factors affecting abundance, growth, and survival
3. Improved distribution monitoring
4. Improved larval entrainment monitoring
5. Longfin Smelt culture
6. Fish migration and movements
7. Spawning and rearing habitats for Longfin Smelt

The Longfin Smelt Technical Team is charged with the implementation and refinement of the science conducted under the LFSSP. Additionally, the Longfin Smelt life cycle model, prioritized in the LFSSP and currently under development, will highlight critical gaps in our current understanding of Longfin Smelt ecology and will guide implementation of core elements of the LFSSP, particularly with respect to new and expanded monitoring.

2.11.10 Management of Winter-run Spawning Location and Timing

Reclamation will study how flow and temperatures can be used to manage Sacramento River winter-run Chinook salmon spawning on the Sacramento River. Reclamation will support the applicable costs and implement the results of the studies, contingent on available appropriations, to improve future management as applicable. This action does not specify the funding level for this project, only the commitment to fund as appropriations are available. The goal of this management action is to ensure a resilient portfolio of life history strategies by supporting a diversity of spawn timings and locations in the population.

Modeling indicates that the peak spawn timing of winter-run Chinook salmon may be influenced by water management decisions that are intended to conserve cold water for use during the summer temperature management season (Johnson et al. 2017; Windell et al. 2017). Annually, the start timing of winter-run Chinook salmon spawning is relatively constant while the peak varies year to year – with cool springtime water temperatures associated with earlier peak spawning, and warm springtime temperatures associated with later peak spawning (Hendrix et al. 2017, Jennings and Hendrix 2020). Specifically, there is evidence that higher April and May water temperatures correspond to increased and delayed peak spawning in July and August. The model using both April and May temperatures as cofactors had the best fit to the observed female spawner data (Jennings and Hendrix 2020). In their historic spring-fed stream habitat, cool spring temperatures are hypothesized to trigger earlier peak in spawning to ensure sufficient time for egg maturation. Conversely, historically (pre-dam), later peak

spawning in warm years could have resulted in later peak emergence; this could mean the juvenile fish experienced lower temperatures upon emergence reducing egg and alevin mortality.

However, a cause-and-effect relationship between water temperatures during pre-spawn staging and the timing of peak spawning has not been demonstrated. Randomized experimentation should be used to determine whether manageable changes in water temperatures during the period of pre-spawn staging directly cause changes in the spawn timing of winter-run Chinook salmon and, if so, the level of covariation between these variables. Findings from these investigations may explain a direct linkage between temperature management and winter-run Chinook salmon reproductive performance on the Upper Sacramento River (National Marine Fisheries Service 2014, Bureau of Reclamation 2019), as evidence suggests reproductive success is variable (Blankenship et al. 2020). In light of this potential relationship, two possible management strategies are suggested by Jennings and Hendrix (2020):

To mitigate winter-run Chinook Salmon egg and alevin mortality during drought years, two possible strategies for cool water management are: (1) release cool water early (April-May) to drive the peak of winter-run spawning earlier in an attempt to achieve emergence from gravel before temperatures increase; or (2) hold cool water until later in the season, when the bulk of spawners begin to deposit eggs... ultimately, models that combine reservoir management dynamics with winter-run Chinook salmon spawning and egg incubation will be necessary to understand how reservoir management might affect spawn timing, egg and alevin development, and egg-to-fry survival under various climate conditions.

This research strategy recommends a phased approach to better understanding the relationship between water temperatures during winter-run Chinook salmon staging and the timing of peak spawning.

1. Implement necessary studies to determine whether a functional (cause and effect) relationship exists and what is the nature and strength (variability) of that relationship.
2. Develop analytical tools to evaluate potential management opportunities that could use the functional relationship (if it exists) to benefit the reproductive success of winter-run Chinook salmon. This phase of the investigation may involve assessments of the interaction between multiple life stages runs, and species with different water operation scenarios. For example, early warm water could also affect *O. mykiss* egg survival or influence the distribution of spring run Chinook Salmon by altering the river's temperature relative to that of Clear Creek.

The first phase of the research strategy could include a literature review or analysis of temperature data and information to assess effects on Chinook Salmon migration timing. Another initial step could include manipulative, randomized experimentation to evaluate the relationship between water temps during adult staging and spawn timing. Such a study's objective would be to demonstrate a cause-and-effect relationship through a controlled, manipulative experimentation in a captive environment, such as a hatchery, where individual fish can be randomly assigned to treatment groups consisting of different water temperatures.

The second strategy was implemented in the river in 2021 when we bypassed power production

to release warmer water in April and May, saving the cooler water till later in the season. The effectiveness of this action can still be evaluated using the data collected over that season. Modeling will be an important tool for the second phase of the proposed research strategy. Modeling operational scenarios will help plan the action by estimating the potential effect(s) of operational actions on smolts survival across different hydrological conditions. Modeling will also be used to evaluate any potential increases to winter-run Chinook Salmon TDM and estimate potential decreases in the Shasta Reservoir Cold Water Pool as a result of different operational actions. The modeling may also consider possible impacts to pre-spawn mortality from running warmer earlier in the season. An evaluation of the modelling tools will be assessed by comparing predictions with monitoring data which will be documented in Reclamation's Shasta Cold Water Pool Seasonal Report and/or Shasta Storage Rebuilding Seasonal Report.

During the second phase of the research strategy, hypothetical tradeoff scenarios may include preserving cold water until peak spawning and emergence occurs to reduce TDM impacts to early life stages. At certain warm temperatures, pre-spawn mortality may occur.

Annually, real-time operations monitoring will be implemented to measure biological and operational responses relevant to evaluating the relationship between spring water temperatures and spawning timing and location. These include spawning timing, spawner condition, redd location, water temperatures, and egg-to-fry survival.

Reports as part of this multiyear Research Strategy will communicate the operational effects of the water and temperature management actions taken for managing winter-run Chinook salmon spawning and other observed biological and ecological responses. Modeling and decision support tools can highlight the magnitude of uncertainty related to mechanisms behind spawn timing that may warrant experiments to better understand the potential impacts of managing spawning behavior.

The primary objective of these activities will determine if keeping water colder earlier induces earlier spawning, or if keeping April/May Sacramento River temperatures warmer induces later spawning. It would be valuable to be able to identify and quantify if spawning timing contributes to or limits reproductive success to better assess proportional sources of mortality by separating pre-spawning water temperature effects from other variables (e.g., thiamine deficiency, incubation temperatures, redd superimposition, habitat restoration, water quality, hatchery effects, etc.). The research strategy may support learning about reproductive success, more broadly, as an additional objective.

No later than one year after completion of consultation, Reclamation will submit to NMFS for approval a report that identifies technical team membership, provide a final list of study topics and alternatives for agency management review, and committed funding levels, contingent on available appropriations, to implement the action. When research actions are completed, Reclamation will report the result to the Sacramento River Temperature Task Group for potential implementation into temperature management.

Potential research actions may include:

- Summarize available literature on thermal tolerance for adult Sacramento River Winter-Run Chinook to understand drivers of spawning behavior, gamete viability, epigenetics, and pre-spawning stress/mortality.

- Controlled experimentation (e.g., in a laboratory or hatchery setting) to evaluate effects of water temperatures on spawning timing of winter-run Chinook salmon.
- Review available data and/or measure historic Shasta spring operations effects of temperatures on adult Chinook salmon (e.g., pre-spawning stress/mortality, changes in spatial and temporal spawning distribution). May include acoustic telemetry study of adult behavior or observations from carcass survey. " Analyze spawn timing has shifted in the past 20 or so years and how that relates to flows before and during spawning to determine if management recently has shifted spawning behavior.
- Calculate Sacramento River winter-Run Chinook salmon birth date distributions, which could be accomplished by otolith analyses of juvenile Chinook salmon collected at Red Bluff Diversion Dam (RBDD). This would provide information on whether there was disproportionate survival of progeny from the temporal distribution of adult spawners (e.g., early vs. late spawning). Genetic method could also help test for disproportionate survival of progeny from early vs late spawning females.
- Genetic analyses (i.e., parentage and relatedness approaches of adults and juveniles) to see which juveniles survive from which spawning adults (specifically associated with spawning location, time, sex, and origin).
- Reconstruction of temperature histories of juveniles at RBDD or returning adults to assess the temperatures individuals experienced at emergence. Oxygen isotope measurements in otoliths can provide this temperature reconstruction. Paired with thermal landscapes, one can assess mortality (lack of representation) of individuals sampled at a later point in time.

Previous efforts for this action are described in the Spring Management of Spawning Locations Research Strategy.

2.11.11 Alternative Loss Estimation Pilot Study

DWR, in coordination with Reclamation, has completed a draft updated Alternative Loss Equation (ALE-22) software tool for estimating losses at the SWP and CVP export facilities to quantify incidental take of winter-run and spring-run Chinook Salmon, and Central Valley (CV) steelhead. DWR, in coordination with Reclamation, proposes to further refine the parameters of this tool by developing an ALPS-IP to implement this tool in parallel with current loss estimation methods. The goal of this pilot study is to provide a more accurate estimates of loss, and loss parameters, at the SWP and CVP export facilities while understanding the utility of the new alternative method relative to the existing method. The ALPS-IP will be completed in coordination with the Skinner Fish Facility and Salvage Release sites improvements activities and if practicable will be utilized to further enhance these activities.

DWR and Reclamation propose to collaborate on the following actions:

1. ALPS-IP Development

- Within six months of the latest effective date of the ROD or ITP, DWR in collaboration with Reclamation shall conduct a knowledge transfer and methods workshop for the ALE-22 tool. Participants may include representatives from NMFS, USFWS, CDFW, DWR, State and Central Valley Water Contractors, and Reclamation.

- Within six months of the completed ALE-22 workshop DWR, in collaboration with Reclamation, shall convene the ALE Technical Team (ALE-TT), a sub-team of the Central Valley Fish Facilities Review Team (CVFFRT), and DWR shall submit a draft ALPS-IP to the ALE-TT for review and comment.
 - The draft ALPS-IP shall include:
 - SDM process outline
 - Interim, draft, and final reporting protocols
 - Pilot Study design
 - Procedures, and timelines (e.g., start and stop dates)
 - Target species (e.g., winter-run and spring-run Chinook Salmon, and California CV steelhead)
 - Assessment of multiple parameters to account for losses including, but not limited to salvage facility outages during louver cleaning or mechanical failure; post release survival on salvaged fish
- Within four months of receiving ALE-TT review comments DWR would submit the final draft ALPS-IP to the CVFFRT, SaMT, and the agency sub-directors for comment/approval.
- Within one month of receiving CVFFRT, SaMT review, and subsequent agency sub-director comments/approval DWR would finalize the ALPS-IP.

2. Pilot Study Implementation and Prioritization

- DWR and Reclamation shall conduct the ALPS-IP pilot study as defined.
- DWR and Reclamation would utilize the ALE-TT and the defined SDM procedures to complete a prioritization of the pilot study recommendations for further implementation.
 - The ALE-TT may utilize an independent science panel review to further enhance the SDM prioritization process.
- DWR and Reclamation shall complete the Pilot Study and prioritized recommendations within 1.5 years of completing the ALPS-IP and submit final recommendations to the agency sub-directors for approval.

3. Implementation Prioritization recommendations

- DWR and Reclamation shall proceed with the recommendations for further implementation

The ALPS-IP, Pilot Study, the prioritization of the recommendations for further implementation, and implementation shall be completed within 7 years after the latest effective date of the ROD or ITP.

2.11.12 Georgiana Slough Migratory Barrier Effectiveness

Operation of the salmonid migratory barrier should improve the seasonally averaged through-

Delta survival probability to Chipps Island compared with survival probability if the salmonid barrier were not in operation. Barrier operations and monitoring details are defined in the Georgiana Slough Salmonid Migratory Barrier (GSSMB) Operations and Monitoring Plans developed by the GSSMB Coordination Group. To further maximize seasonal survival benefits to migrating salmonids, DWR and Reclamation will continue leading the GSSMB Coordination Group, with membership comprised of DWR, Reclamation, CDFW, USFWS, NMFS, and State/Federal Water Contractors representatives. DWR and Reclamation, working with the GSSMB Coordination Group, will provide at least a triennial report and review and update, as necessary, the GSSMB Operations and Monitoring Plans.

2.12 Drought

Starting each October, Reclamation and DWR, through the Drought Relief Year Team, will meet at least monthly to determine whether it would be appropriate to pursue actions to respond to current or anticipated drought and dry year conditions. At each meeting, Reclamation and DWR will review the actions in the Drought Toolkit, Appendix Q and determine if it would be appropriate to pursue any of them, and evaluate the effectiveness of those actions. The Drought Toolkit will list the minimum decisions required each month and Reclamation and DWR expect a more focused review of the Drought Toolkit in times when resources to meet required operations and goals are limited. These limited resources may include, but are not limited to hydrology, current and projected reservoir storages, facility limitations and fish conditions. These decisions will be documented monthly or more often if necessary in the WOMT notes.

Reclamation and DWR, through the DRY Team, may update the Drought Toolkit. Reclamation and DWR, through the DRY Team, will evaluate drought actions taken to reduce drought impacts related to CVP and SWP operations described in the Drought Toolkit. This evaluation will provide additional information on the effectiveness of drought response so as to support updates to the Drought Toolkit. This evaluation will be included in the annual Drought Report.

2.13 Governance

2.13.1 CVP/SWP Governance

CVP/SWP Governance identifies ongoing engagement by participating State and Federal Agencies (collectively the “Agencies”), interested parties, and/or the public following completion of the Biological Opinions and Record of Decision. Governance describes the system-wide organization of technical groups, group membership, activities that are subject to governance, and decision making approaches and protocols.

The purposes of CVP/SWP Governance are to:

- Identify the roles and responsibilities of the agencies that are part of real time operations
- Establish that the agencies will work together in good faith
- Identify the governance principles agreed to by the participating agencies
- Identify operations that are subject to Governance

- Identify the implementation teams that are part of governance, and processes for technical collaboration and elevating issues for resolution
- Incorporate learning and adopt new technologies from monitoring, adaptive management and ongoing science
- Describe relationships between technical and policy groups
- Describe Reporting and Outreach

The Agencies are committed to communicate each organization's respective interests and recognize the intent to work together in a good faith effort to resolve issues through the groups described in this governance document. Every member is committed to identifying potential issues and communicating these issues to the relevant technical or policy team as soon as possible. Representatives who participate on technical and policy teams are clear about their ability to represent agency decisions. Representatives who participated on technical and policy teams are empowered to represent their agency and make decisions appropriate for that level. Each representative represents the science, policy and management based on the best of their ability and current knowledge. Representatives come understanding their authority (not agency authority but representatives' authority). Representatives are aware and clear about their role with other members. Representatives will either be able to make decisions on other parts of the system or have an avenue for doing that quickly.

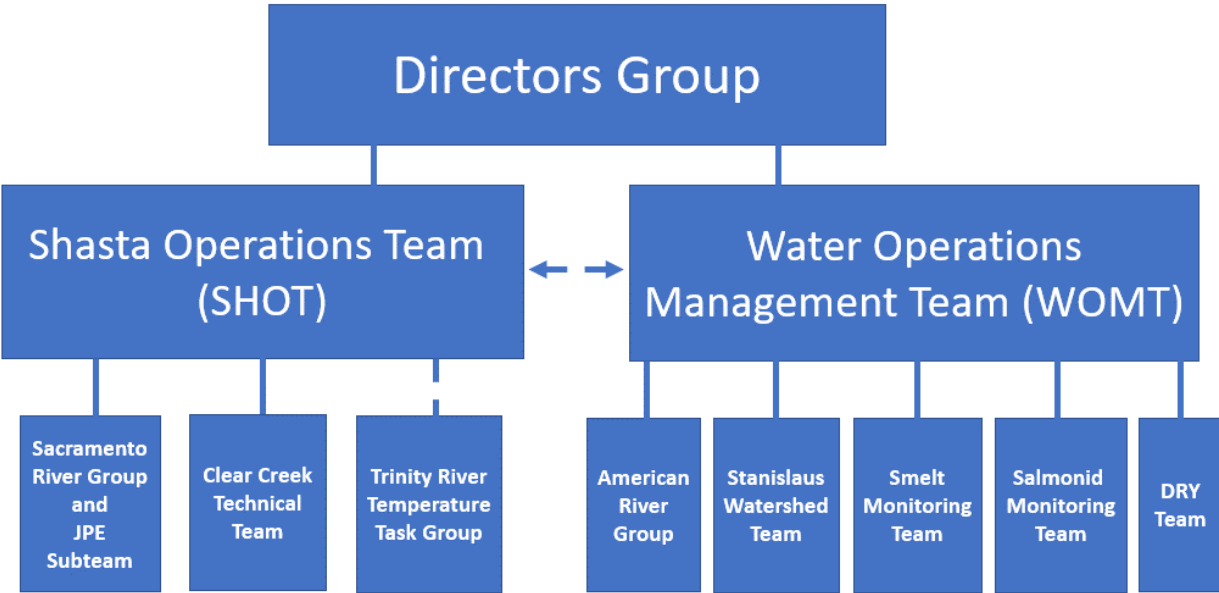
CVP/SWP Governance is framed around the following principles:

- **Collaboration**—The leading principle of CVP/SWP Governance is collaborative, science-based decision making. CVP/SWP governance is structured to seek consensus across scientific, technical and policy levels, with elevation and decision making processes in place when consensus cannot be reached.
- **Effectiveness**—It is workable and efficient. Effectiveness considers what information is available and when. Effective CVP/SWP governance recognizes that there is more uncertainty early in the year and that uncertainty may change as the year progresses.
- **Accountability**—Operational, regulatory, proactive, and addresses long-term planning.
- **Inclusiveness**—Collaborative and cooperative. The elevation and decision making structure maintains accountability at all levels.
- **Transparency**—The processes are not ambiguous. They are open for others to see and understand through implementation of a communication plan.
- **Communication**—Be aware and clear about roles. If you spot a potential issue, communicate it.

2.13.2 Organizational Structure and Description of Collaborative Teams by Division

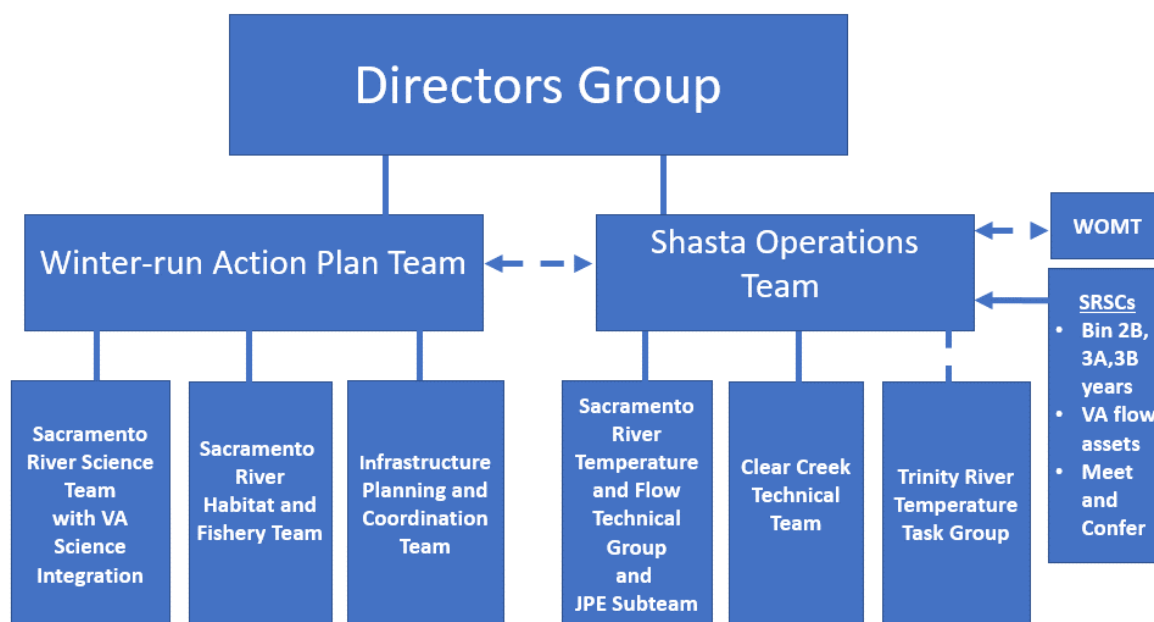
CVP/SWP Governance is structured such that a 5 Agency Directors Group oversees the ongoing authorities of each respective agency and serves as the final decision making body for operational matters. The Directors Group directly interfaces with two management and policy level groups (SHOT and WOMT), whose Federal and State agency representatives discuss the actions described in the Proposed Action when implementation may have biological, system

conditions or water supply impacts or tradeoffs. These policy groups work with numerous technical groups that coordinate on seasonal and real-time operations for specific divisions or watersheds. Figure 15 illustrates the CVP/SWP structure for water operations. Figure 16 illustrates the more specific governance structure for Shasta and Sacramento River activities, including direct coordination between SHOT and WOMT. The organizational structure for Shasta and Sacramento River activities integrates the Winter-run Action Plan to advance specific science, habitat and infrastructure initiatives.



Solid lines indicate a direct relationship for elevation and decision making, the dashed arrow between WOMT and SHOT indicates a direct line of communication and regular coordination, the dashed line between SHOT and the Trinity River Temperature Task Group indicates seasonal communication and coordination on an as-needed basis.

Figure 15. Governance Structure for the Central Valley Project and State Water Project Water Operations



Solid lines indicate a direct relationship for elevation and decision making, the dashed arrow between Winter-run Action Plan Team and SHOT indicates a direct line of communication and regular coordination, the dashed arrow between WOMT and SHOT indicates a direct line of communication and regular coordination, the dashed line between SHOT and the Trinity River Temperature Task Group indicates seasonal communication and coordination on an as-needed basis. The solid arrow between SHOT and the SRSCs indicates SRSC integration into SHOT.

Figure16. Governance Structure for Shasta and Sacramento River Activities

2.13.3 Chartering Teams

Teams and groups involved in planning and providing input regarding water operations are described below for each division of the CVP and SWP. Team membership, roles, and processes will be described in team charters, as specified for each division below. Some teams may already have charters in place which will continue to be followed until and if replaced in the future. These charters may be supplemented by guidance documents which further elaborate roles, responsibilities, and process for these teams. These guidance documents will be updated as needed by mutual agreement.

External participants are also included in many of the Collaborative Teams to provide technical expertise and allow sharing and communication of operational decisions. The expectations and group norms for the external participants will be described in team charters.

Sacramento River Division – Water Operations

For the Sacramento River and Shasta Reservoir water operations there are three main coordination forums that will meet regularly to discuss seasonal and real-time operations. These include the SHOT, SRG, and the Winter-run JPE SubTeam. The SHOT is a policy level group that discusses water operations actions described in this Proposed Action when implementation may have biological, system conditions or water supply impacts or tradeoffs. The SHOT also discusses activities from the Winter-run Action Plan Team that may affect water operations. It is composed of management and policy staff from participating agencies

including the SRSCs. The SRG is a technical group to discuss pulse flow shaping, temperature management, fall flow smoothing and fall/winter base flows. It is composed of technical staff from Reclamation, DWR, NMFS, USFWS, CDFW, SRSCs, WAPA, the State Water Board, and Native American Tribes. The Winter-run JPE SubTeam is a technical group tasked with development of the winter-run JPE each year and the winter-run broodstock assessment. It is composed of technical staff from the 5 Agencies. Generally, topics will be discussed at a technical level through SRG with agency feedback provided prior to being discussed at the SHOT. The SHOT will coordinate regularly with WOMT and other work groups as appropriate. Sacramento River Governance will use a collaborative approach to planning and decision making.

Shasta Operations Team

A SHOT consisting of Agency subdirectors and managers will serve as the management and policy group for decisions related to Shasta operations. The team will develop a charter to describe membership and process. The purpose of the SHOT is to ensure agency interaction and coordination on the Sacramento River and also with the broader CVP/SWP system, including downstream demands that affect Shasta releases.

The SHOT Team will coordinate with WOMT as needed on operational issues and decisions that have implications for both of their respective purviews, including but not limited to Drought Toolkit implementation and Voluntary Agreement asset management. A summary of Shasta Reservoir operations will be communicated at WOMT meetings and documented in WOMT meeting notes.

The SHOT will meet year-round and hold monthly meetings, or as needed to coordinate on Shasta Reservoir operations and potential system-wide management actions and risks. Reclamation will provide operational outlooks and the applicable drought and dry year actions from the Drought Toolkit or other relevant drought planning documents. The SHOT may convene relevant technical teams to support Shasta or system-wide policy decisions. Reclamation will provide updates from the SHOT relevant technical teams. Each of the 5 Agencies is responsible for being informed of conditions and communicating with their respective representatives on other teams.

Consistent with the Shasta Division part of the Proposed Action, the SHOT will work together, with input from the Sacramento River Temperature and Flow Task Group, to manage Sacramento River Basin Voluntary Agreement (VA) assets. Relevant operational actions that VA assets are intended to support include Shasta Reservoir cold water pool management, seasonal pulse flows planning and fall flow management. The SHOT will consider the contribution of these assets to conditions that contribute toward maintaining flows and temperatures that support viable Chinook salmon populations by enhancing spawning, rearing, growth and migration corridors and make decisions about their deployment.

Sacramento River Temperature and Flow Technical Group

The Sacramento River Temperature and Flow Technical Group is a multiagency and stakeholder group established to provide technical and scientific information regarding temperature management and instream flows. The SRG will be composed of representatives from Reclamation, DWR, USFWS, CDFW, NMFS Central Valley Office, NMFS Southwest Fisheries Science Center, the State Water Board, WAPA, the Yurok Tribe, the Hoopa Tribe and the Sacramento River Settlement Contractors. The team will develop a charter to describe

membership and process. The SRG develops temperature and flow plans for implementation of temperature management, fall and winter refill and redd maintenance actions, flow smoothing for rice decomposition, spring and seasonal pulse flows, winter base flow management, ramping rates, Shasta Reservoir storage planning and relevant fishery monitoring. The SRG will work closely with Reclamation and the SHOT and will use the best available science including current hydrologic forecasts, operational outlooks, fishery information, and modeling information.

The SRG will begin meeting no later than March to develop a Draft Sacramento River Temperature Management Plan and will meet at least monthly through the temperature management and the winter-run Chinook salmon redd maintenance season to coordinate during implementation. The SRG may update the Final Temperature Management Plan at the request of the SHOT. At the conclusion of the temperature management season, the SRG will develop a summary report pursuant to seasonal and annual reporting requirements for fall and winter refill and redd maintenance actions, flow smoothing for rice decomposition, spring or other seasonal pulse flows, winter base flow management, ramping rates and relevant fishery monitoring.

Reclamation will coordinate through SRG to develop a protocol for agency collaboration regarding temperature and flow models and will strive to create shared understanding of model constraints, uncertainties, limitations, applied assumptions and interpretations; develop management questions and scenarios that may benefit from modeling support; develop and review early season operational scenarios to support temperature management and flow planning.

Meet and Confer Group

The SRSCs approved “A Resolution Regarding Salmon Recovery Projects in the Sacramento River Watershed, Actions Related to Shasta Reservoir Annual Operations, and Engagement in the Ongoing Collaborative Sacramento River Science Partnership Effort” (June 12, 2019). Pursuant to the resolution, during drier water years, the SRSCs will meet and confer with Reclamation, NMFS, and other agencies, as appropriate, to determine if there is any role for the SRSCs in connection with Reclamation’s operational decision making for Shasta Reservoir annual operations in those years. This determination will include consideration of what actions are feasible, consistent with the terms of the SRS Contracts. In addition to the 25% reduction during Shasta Critical Years as set forth in the SRS Contracts, the types of actions that may be considered include, but are not necessarily limited to: (1) the scheduling of spring diversions by the SRSCs; (2) voluntary, compensated water transfers by the SRSCs subject to Reclamation approval; and (3) delayed SRSC diversion for rice straw decomposition during the fall months. Any mutually agreeable operations resulting from meet-and-confer discussions must be consistent with the terms of the SRS Contracts and may also be subject to other regulatory approvals.

The Meet and Confer group will be convened at the request of Reclamation, NMFS or the SRSCs at any time during the winter or spring months. According to the SRSC’s resolution, this group may agree to invite the USFWS, CDFW, and/or the State Water Board at their discretion. As part of Upper Sacramento River Governance, SHOT managers will represent the agencies at Meet and Confer meetings. The group will establish their own meeting frequency. Agency representatives from the Meet and Confer Group will communicate discussions and voluntary SRSC actions with the SPG.

Sacramento River Division – Winter-run Action Plan

For the Winter-run Action Plan, there are four main coordination forums that will meet regularly to discuss the following collaborative science, habitat and fisheries and infrastructure programs:

- The Winter-run Action Plan Team is a policy level group that discusses and coordinates the actions and milestones for the three key programs of the Winter-run Action Plan. The Winter-run Action Plan Team will also coordinate with the SHOT on science, habitat and fisheries and infrastructure actions that may affect water operations.
- The Sacramento River Science Team will work collaboratively to advance science actions identified as highest priority to be included in a science plan.
- The Sacramento River Habitat and Fishery Team will work collaboratively to advance key fishery and habitat restoration actions.
- The Infrastructure and Planning Team will work collaboratively to engage in planning and implementing key infrastructure improvements at Shasta Dam and the Livingston Stone National Fish Hatchery.

Trinity River Division – Clear Creek

The Clear Creek component of the Trinity River Division includes the Clear Creek Technical Team and SHOT. The Clear Creek Technical Team will provide technical input to Reclamation on habitat restoration and the shaping and timing of flows released from Whiskeytown Dam to optimize biological benefits downstream and provide recommendations on operations to meet temperature criteria. SHOT will coordinate with the Clear Creek Technical Team, as needed regarding Clear Creek operations that affect Shasta Operations. Trinity River Governance on Clear Creek will use a collaborative approach to planning and decision making.

Clear Creek Technical Team

The Clear Creek Technical Team is comprised of a group of agency representatives and interested parties who will use the best available science to provide technical input to Reclamation on habitat restoration, the shaping and timing of flows released from Whiskeytown Dam to optimize biological benefits downstream and provide recommendations on operations to meet temperature criteria. The CCTT meets quarterly, or more frequently as needed. The CCTT develops a flow schedule every year and may adjust the schedule using recent monitoring information.

Delta Division

For the Delta Division water operations there are three main agency coordination forums that will meet regularly to discuss seasonal and real-time operations. These include the WOMT, the SMT and the SaMT. WOMT is a policy level group that discusses the operations actions in the Delta, American River Division and the Stanislaus/East Side Division. The SMT is a technical group that discusses Delta Operations and smelt protections. The SaMT is a technical group that discusses Delta Operations and salmon and steelhead protections. WOMT will coordinate regularly with SHOT and other work groups as appropriate. Delta Governance will use a collaborative approach to planning and decision making.

Water Operations Management Team

A WOMT will coordinate on overall water operations to oversee the implementation of various

real-time provisions for the Delta and the tributaries. The purpose of WOMT is to discuss and resolve operational questions and technical issues, as requested or elevated from Delta and tributary technical teams, and to elevate unresolved operational issues to the Directors Group. The team will develop a charter to describe membership and process. The WOMT will coordinate with the SHOT as needed on operational issues and decisions that have implications for both of their respective purviews, including but not limited to Drought Toolkit implementation and Voluntary Agreement asset management.

WOMT will meet weekly during the Old and Middle River Flow Management season (October through June), and otherwise as needed. Any agency can request a WOMT meeting outside of the OMR season for discussion or elevation items. For OMR management, Reclamation will provide operational outlooks and Proposed Action assessments on a weekly basis to WOMT, the SMT and the SaMT. WOMT will be provided the opportunity to review and discuss any applicable drought and dry year actions from the Drought Toolkit or other relevant drought planning documents. For all other assessments or elevation issues, supporting materials will be provided to WOMT by designated representatives of the applicable technical teams.

Smelt and Salmonid Monitoring Teams

The Smelt and Salmonid Monitoring Teams (SMT and SaMT, respectively) includes participants from Reclamation, USFWS, NMFS, DWR, CDFW, and the State Water Board. The SMT and SaMT review hydrologic, operational, fishery, and water quality data, and provide opportunities for engagement and discussion among biologist and operators on relevant information and issues associated with the Proposed Action and risk assessments.

Agency team leads: (1) notify their agency's WOMT representative(s) if a Proposed Action/ITP identified trigger/threshold is or will be met; (2) provide input on any assessment prepared by Reclamation and DWR ; and (3) discuss and document differing perspectives (i.e., non-consensus) on the relevant assessments.

In addition, there are also two additional groups that discuss operations that include other interested parties.

Delta Monitoring Workgroup

DWR and Reclamation will convene the Delta Monitoring Workgroup (DMW) if a real-time assessment is triggered. Interested parties may provide information and supporting documentation for DWR and Reclamation to share with WOMT. If WOMT does not reach consensus on an operational outcome, interested party supporting documentation will be provided to the Directors for consideration of their final decision. DWR and Reclamation will revise the existing Delta Monitoring Workgroup charter within six months of the ROD.

Delta Coordination Group

The DCG is comprised of two representatives each from Reclamation, NMFS, USFWS, DWR and CDFW, and one representative each from the CVP water contractors and SWP water contractors. The DCG may prepare an assessment to propose an alternative gate operation to the Suisun Marsh Salinity Control Gate action and will develop an annual monitoring plan for the action. The DCG will participate in the development of food subsidy action plans, monitoring plans, and reports.

American River Division

For the American River Division water operations there are two main coordination forums that

will meet regularly to discuss seasonal and real-time operations. These include the WOMT and ARG. The ARG is a technical group that discusses reservoir and storage planning, forecasting and seasonal operations, flow and water temperature management and monitoring programs. American River Governance will use a collaborative approach to planning and decision making.

American River Group

A group of federal, state, and local agencies, water users, and non-governmental organizations (NGOs) makes up the ARG to coordinate the shaping of releases including spring pulse flow timing and longevity, communicate upcoming releases, discuss water operations, fisheries, and other environmental concerns and to share operational and biological information with the goal of improving the technical understanding of Lower American River temperature needs and operational constraints and considerations.

The ARG meets monthly, or more frequently as needed. The ARG will (a) evaluate the equations used to calculate the MRRs in November through December to consider whether an adjustment to the maximum MRR is warranted based on habitat improvements and other relevant information, and (b) submit a recommendation to Reclamation. The ARG will provide technical input on shaping Flow volumes, with the final timing determined by CDFW, FWS, and NMFS. The ARG will provide technical input on shaping Redd Dewatering Projective Adjustments. The draft Temperature Management Plan will be shared with the ARG, and Reclamation will consider feedback from ARG participants before finalizing the plan by June 15. During plan implementation, if the water temperature threshold is exceeded for 3 consecutive days, or is exceeded by more than 3°F for a single day, Reclamation will notify NMFS and the ARG, and outline steps being taken to bring the water temperature back into compliance.

East Side Division - Stanislaus River

For the East Side Division – Stanislaus River there are two main coordination forums that will meet regularly to discuss seasonal and real-time operations. These include the WOMT and the Stanislaus Watershed Team (SWT). The SWT is a technical group that discusses reservoir and storage planning, forecasting and seasonal operations, flow and water temperature management and monitoring programs. The SWT will coordinate with other groups as appropriate. East Side - Stanislaus River Governance will use a collaborative approach to planning and decision making.

Stanislaus Watershed Team

SWT is a group of agency representatives and local interested parties (including conservation groups and other organizations working directly on Stanislaus River issues) having direct interest on the Stanislaus River. The SWT will provide technical input to Reclamation on the shaping and timing of monthly or seasonal flow volumes to optimize biological benefits. The SWT will meet at least monthly to share operational information and improve technical dialogue on the implementation of the New Melones SRP.

In addition, there is one additional group that discusses operations that includes other interested parties:

Stanislaus River Forum

The Stanislaus River Forum is an open forum for all interested stakeholders to receive Stanislaus River Operations updates and to provide feedback for SWT and Reclamation consideration. The Stanislaus River Forum will meet at least monthly and prior to the SWT meeting to share operational information and improve technical dialogue on the implementation of the New Melones SRP.

2.13.4 Collaborative Decision Making

This section describes the representatives and the process for elevation, decision making, and communication. More information on the types of decisions and process for each Division can be found in the corresponding section of the LTO Proposed Action.

Directors

Directors from Reclamation, DWR, USFWS, NMFS and CDFW will meet as requested by the WOMT or the SHOT when consensus cannot be reached on operations. The team that is the lead for the elevation issue will notify the other team prior to elevating to the Directors to ensure full transparency.

Director Decision Making for Shasta and Tributaries

The Regional Director for Reclamation will confer with the other Directors to determine if there is an alternative action that will be mutually agreeable. If consensus is reached, Reclamation will implement the alternative action. If the Directors do not reach a resolution on operations, Reclamation will make a decision and notify the other Directors in writing. Any Director has the opportunity to dispute a decision within 2 days, providing a written explanation of the nature of the dispute. Reclamation will respond in writing within 2 days after receiving the explanation for the disputed action and before taking an action. Any Director may request a follow-up Directors meeting if necessary.

If there is disagreement on an operational action that Reclamation determines may create a potentially high risk to CVP infrastructure or liability to the United States, then Reclamation will make the final decision as to whether or not to implement that action.

Director Decision Making for the Delta

The Regional Director of Reclamation or DWR (proposing agency or agencies) will confer with the fish agency Directors/Regional Administrator to determine if there is an alternative action that will be mutually agreeable for specific areas that rely on a risk assessment, following elevation by WOMT. If consensus is reached, the proposing agencies will implement the alternative action. If the Directors do not reach a resolution on operations, the proposing agencies will meet and confer to prioritize alignment between the SWP and CVP operations, in consideration of operational and regulatory constraints affecting either project, will make a decision and notify the other Directors in writing. Any Director has the opportunity to dispute a decision within 2 days, providing a written explanation of the nature of the dispute. The proposing agencies will respond in writing within 2 days after receiving the explanation for the disputed action and before taking an action. Any Director may request a follow-up Directors meeting if necessary.

If there is disagreement on an operational action that the proposing agency determines may create a potentially high risk to Project infrastructure or liability to the United States or State of California, then the proposing agency will make the final decision as to whether or not to

implement that action.

Once a decision has been resolved following any of the procedures described above, the Directors will designate a representative or representatives to communicate the decision to relevant parties, including operators, technical team representatives, and/or other interested parties.

Water Operations Management Team

Each agency is responsible for being informed of conditions and communicating with their respective representatives on other teams. If issues that are elevated to WOMT are resolved by WOMT, an agency representative will be designated by WOMT to communicate the decision via email to relevant technical team representatives. If the WOMT cannot reach consensus on an operational issue, the issue will be elevated to the Directors through the subdirectors. Similarly, if the SHOT or WOMT have an operational disagreement, the issue will be elevated to the Directors through the subdirectors. The elevation process will be managed collaboratively by the WOMT.

Shasta Water Operations Team

Each agency is responsible for being informed of conditions and communicating with their respective representatives on other teams. If issues that are elevated to SHOT are resolved by SHOT, an agency representative will be designated to communicate the decision via email to relevant technical team representatives. If the SHOT cannot reach consensus on an operational issue, the issue will be elevated to the Directors through the subdirectors. Similarly, if the SHOT or WOMT have an operational disagreement, the issue will be elevated to the Directors through the subdirectors. The elevation process will be managed collaboratively by the SHOT.

Consistent with the Proposed Action for the Shasta Division, the SHOT will work together, with input from the Sacramento River Settlement Contractors, to manage Sacramento River Basin Voluntary Agreement (VA) assets. The SHOT will consider the contribution of these assets to conditions that contribute toward maintaining flows and temperatures to support viable Chinook salmon populations by enhancing spawning, rearing, growth and migration corridors. Relevant operational actions that VA assets will support include, but are not limited to, Shasta cold water pool management, seasonal pulse flows and fall flow management. Fish agencies will be the final decision makers on deployment of VA assets based on what provides the best protection for the species.

Sacramento River Temperature and Flow Technical Group

Each participating agency is responsible for being informed of conditions and communicating with their respective representatives on other teams. SRG will seek to reach consensus. If consensus is not reached, at the close of SRG meetings, there will be an Agency resolution session to discuss and compose an e-mail to SHOT, summarizing the elevation topic and any supporting information and recommendation, and report the details of the elevation issue to SHOT. Each of the five agency representatives are individually responsible for communicating the issue and any background information to their SHOT representative. The decision making process will then follow the procedure described in the SHOT section above and, if necessary, the procedure in the Directors section above.

Winter-run Action Plan Team

Reclamation is committed to support a separate Winter-Run Action Plan with NMFS, FWS,

CDFW, DWR and SRSCs to pursue a science and monitoring plan, winter-run habitat and infrastructure actions, and water operations.

Clear Creek Technical Team

Each participating agency is responsible for being informed of conditions and communicating with their respective representatives on other teams. CCTT proposed flows will be routed to Central Valley Operations, who will implement the flows as proposed. If there is an operational issue that the CCTT cannot resolve, the Agency representatives will compose an e-mail to SHOT, summarizing the elevation topic and any supporting information and recommendations. Each of the agency representatives is individually responsible for communicating the issue and any background information to their SHOT representative. The decision making process will then follow the procedure described in the SHOT section above and, if necessary, the procedure in the Directors section above.

American River Group

Each participating agency is responsible for being informed of conditions and communicating with their respective representatives on other teams. If there is an operational issue that the ARG cannot resolve, the Agency representatives will compose an e-mail to WOMT, summarizing the elevation topic and any supporting information and recommendations. Each of the Agency representatives is individually responsible for communicating the issues and any background information to their WOMT representative. The decision making process will follow the procedure described in the WOMT section above and, if necessary, the procedure in the Directors section above.

Smelt and Salmonid Monitoring Teams

Each participating agency is responsible for being informed of conditions and communicating with their respective representatives on other teams. Agency team leads: (1) notify their agency's WOMT representative(s) if a Proposed Action/ITP identified trigger/threshold is or will be met; (2) provide input on the Proposed Action assessment and any assessment prepared by Reclamation and DWR; and (3) discuss and document differing perspectives (i.e., non-consensus) on the relevant assessments. If there is an operational issue that the team cannot resolve, the Agency representatives will compose an e-mail to WOMT, summarizing the elevation topic and any supporting information and recommendations. Each of the Agency representatives is individually responsible for communicating the issues and any background information to their WOMT representative. The decision making process will follow the procedure described in the WOMT section above and, if necessary, the procedure in the Directors section above.

Stanislaus Watershed Team

Each participating agency is responsible for being informed of conditions and communicating with their respective representatives on other teams. If there is an operational issue that the SWT cannot resolve, the Agency representatives will compose an e-mail to WOMT, summarizing the elevation topic and any supporting information and recommendations. Each of the Agency representatives is individually responsible for communicating the issues and any background information to their WOMT representative. The decision making process will follow the procedure described in the WOMT section above and, if necessary, the procedure in the Directors section above.

2.14 Adaptive Management

Adaptive management is a structured, iterative process for decision making when confronted with uncertainty. It emphasizes learning through management where knowledge is incomplete and provides a process for building knowledge through monitoring and science, reducing uncertainty, and improving management over time in a goal-oriented and structured way. Key components of adaptive management are establishing clear and measurable objectives, identifying action goals, and determining management options for best achieving those desired goals.

Decision support tools can be used within the adaptive management framework to identify the uncertainties that are most influential in a decision making process (management), which in turn can guide the scientific approaches deployed to reduce those uncertainties and allow better informed subsequent decisions. When correctly designed and executed, adaptive management provides a means to develop and evaluate the expected outcomes of proposed management actions, to compare actual outcomes of actions to those expectations, and to make evidence-based adjustments to future actions to improve their effectiveness if warranted. The adaptive management approach can provide a transparent and documented scientific basis for continuing, modifying, or implementing an alternative action.

DWR, CDFW, Reclamation, USFWS, and NMFS (collectively, “the Implementing Entities”) intend to utilize adaptive management to inform the long-term operations of the SWP and the CVP and related activities described herein. The Implementing Entities will approach adaptive management in an open, participatory framework. The Implementing Entities will establish the Adaptive Management Steering Committee to coordinate through individual Adaptive Management Teams responsible for evaluating each Adaptive Management Action, utilizing decision support tools such as structured decision making.

Working through the collaborative process outlined in this document, the Implementing Entities commit to reach consensus within the Adaptive Management Steering Committee to the maximum extent possible, while still retaining individual agency discretion to make decisions (as appropriate). To that end, the Implementing Entities seek to use the potential flexibility provided by an adaptive management approach in a way that balances gaining knowledge to improve future management decisions while taking actions in the face of uncertainty to improve the operation of the CVP and SWP for their project purposes.

The Adaptive Management Program is described in Appendix X. Attachment 1 to the Adaptive Management Program describes the steps required to implement the adaptive management process and explains how the process links to the operations of the SWP and CVP. Attachment 2 to the Adaptive Management Program includes a list of actions and programs in the Proposed Action (listed below), and additional details regarding the timeframe of evaluation of each action and the Adaptive Management Teams responsible for implementing them:

- Winter-run Chinook Salmon OMR Management
- Spring-run Chinook Salmon OMR Management
- Summer-Fall Habitat Action for Delta Smelt
- Tidal Habitat Restoration Effectiveness for Smelt Fishes

- Tributary Habitat Restoration Effectiveness for Salmonid Fishes
- Shasta Spring Pulse Flow Studies
- Winter-run Chinook Salmon Through Delta Survival Targets
- Longfin Smelt Science Plan Actions
- Delta Smelt Supplementation
- Steelhead JPE
- Alternative Salmonid Loss Estimation Pilot Study
- Shasta Cold Water Pool Management
- Georgiana Slough Migratory Barrier Effectiveness for Salmonid Fishes
- Spring Outflow
- Clear Creek

2.15 Framework Programmatic Outline for Sites Reservoir Project and Delta Conveyance Project

The Long-Term-Operations consultation (LTO) is a mixed programmatic action, as defined in 50 CFR 402.02¹⁵. This consultation includes a mix of standard consultation and programmatic consultation (which can include an Incidental Take Statement or defer the Incidental Take Statement to a later time associated with subsequent Federal actions). All activities addressed programmatically will be subject to a subsequent consultation in order to proceed. Additionally, some project elements and their effects on listed species or critical habitat may change as Reclamation and DWR continue to develop the Proposed Action for the programmatic elements and may require reinitiation of consultation.

This Proposed Action provides a framework for the development of future Federal actions that will be authorized, funded, or carried out at a later time and will be subject to future project-specific consultations because of these subsequent Federal actions. Reclamation will initiate these future consultations and will provide sufficient information as outlined in 50 CFR 402.12(t). The Services will complete these future consultations and that additional review will be informed by sufficient detail to allow the development of incidental take statements for each of these activities.

This Proposed Action includes a programmatic framework consultation for the operations of the Sites Reservoir Project (Sites) and the operations of the proposed Delta Conveyance Project (DCP). The use of a mixed programmatic framework consultation for these two projects

¹⁵ Mixed programmatic action means, for purposes of an incidental take statement, a Federal action that approves action(s) that will not be subject to further section 7 consultation, and also approves a framework for the development of future action(s) that are authorized, funded, or carried out at a later time and any take of a listed species would not occur unless and until those future action(s) are authorized, funded, or carried out and subject to further section 7 consultation.

provides information, to the extent possible given the information available today, to assess how these projects would operate in the context of the LTO Proposed Action along with broadly assessing the impacts of the operations of these projects in the context of the LTO Proposed Action. The use of a mixed programmatic framework consultation for these two projects provides information, to the extent possible, on how these key projects would be implemented, if approved after completing compliance with the California Environmental Quality Act (CEQA), in conjunction with the LTO operations in the future and will support subsequent regulatory processes and coordinated operations planning.

Reclamation proposes to initiate section 7 consultation for the non-operational construction and maintenance components of Sites and U.S. Army Corps of Engineers proposes to initiate section 7 consultations for the non-operational construction and maintenance components of the DCP, both separately from LTO. These construction-focused consultation efforts will proceed in-parallel with this Proposed Action.

In the future, Reclamation also proposes to initiate section 7 consultation for the operational components of Sites and DCP. As these separate future consultations are completed for each project and as Reclamation makes a decision regarding each project, each will become part of the Environmental Baseline and will need to be incorporated into the modeled baseline condition for subsequent projects, including any future reinitiations of consultation for LTO. In order to ensure effects of Sites and DCP are sufficiently addressed, those separate section 7 consultations, including construction-focused consultation efforts noted above, will reference this framework when addressing the effects of operations of each of these projects.

Reclamation will ensure that section 7(d) is adhered to by ensuring operations will not commence before completion of project-specific section 7 consultation for operations. In addition, implementation of any potential construction-related activities prior to completion of the future section 7 operations consultation would not affect the requirement for Reclamation to implement, if necessary, Reasonable or Prudent Alternatives identified during subsequent consultation.

Project descriptions for the proposed Sites and DCP, as well as the proposed approach for considering operational effects of Sites and DCP in relation to the updated LTO Proposed Action, are provided below and are proposed to be addressed programmatically.

2.15.1 Future Project Considerations and Regulatory Processes

Both the Sites and DCP projects are subject to future consultations under Section 7 of the ESA. Both projects are subject to the requirements of Section 2081 of the California Endangered Species Act (CESA) and future coordination with CDFW will likely be required to ensure consistency with compliance under both the ESA and CESA. Since it will be several years before these projects become operational, there are other factors (e.g., climate change) that will need to be addressed in future project design modifications, as feasible, and operational criteria refinements. In addition, there are other regulatory processes and approvals that could influence final operation of these projects or final design. These potential changes would need to be addressed in the future ESA consultations. These future processes include, but are not necessarily limited to:

- Completion of CEQA and a decision on whether to approve Sites, or an alternative, by the Sites Authority and the DCP, or an alternative, by DWR; additional CEQA compliance may be necessary where additional discretionary decisions require review of new information, a change in circumstances, or change in the project.

- The water rights process administered by the State Water Board for both Sites and DCP, which is expected to result in separate water rights orders that may limit how water will be diverted from the Sacramento River. DWR is not proposing to increase the existing SWP water right for DCP and will only request a change in point of diversion for the SWP water rights. Sites is petitioning the State Water Board to obtain new water rights for diversion and storage.
- Updates to the Bay-Delta Water Quality Control Plan by the State Water Board, which may result in changes in the operational parameters for both Sites and DCP.
- Consistency with the Delta Plan for DCP per the requirements of the Delta Reform Act.
- Coordinated operations agreement(s) between Reclamation and DWR (and Sites for Sites operations) which will need to incorporate DCP and Sites into the existing CVP and SWP coordinated operations system and would specify how water will be transferred, exchanged, and exported.
- Authorizations from the U.S. Army Corps of Engineers under the Clean Water Act and Rivers and Harbors Act for certain aspects of each project.

2.15.2 Qualitative Project Descriptions

Qualitative descriptions of the proposed projects and potential operational effects for both Sites and DCP individually, as well as combined, are included in this framework. Potential for effects on storage in upstream reservoirs, potential for changes in flows and temperatures upstream of Sites and DCP, changes in flows adjacent to Sites and DCP facilities, and changes in flows and hydrodynamics through, and downstream of, the Delta are all addressed at a programmatic level. These operationally driven changes in flows will be considered in the context of the Sacramento River, Delta, and downstream aquatic ecosystems, and specifically in relation to ESA listed species and critical habitat.

2.15.3 Sites Reservoir

Sites would involve the construction, operation, and maintenance of a 1.5 million acre-foot offstream surface water reservoir to provide direct and real benefits to instream flows, the Delta ecosystem, and water supply reliability. The reservoir inundation area would be in rural, unincorporated areas of Glenn and Colusa Counties, and project components would be located in Tehama, Glenn, Colusa, and Yolo counties.

The Project would use existing infrastructure to divert unregulated and unappropriated flow from the Sacramento River at Red Bluff and Hamilton City and convey the water to a new offstream reservoir west of the community of Maxwell, California. New and existing facilities would move water into and out of the reservoir. Releases from Sites Reservoir would be used locally, be conveyed to the Yolo Bypass for ecosystem benefits, or ultimately return to the Sacramento River system via existing canals and a new pipeline located near Dunnigan. Water released from the reservoir would be used to benefit local, state, and federal water use needs, including public water agencies, anadromous fish species in the Sacramento River watershed, wildlife refuges and habitats, and the Yolo Bypass to help supply food for delta smelt (*Hypomesus transpacificus*). The Authority would own and operate all newly constructed project facilities that are not already owned by another entity. There are currently 22 Storage Partners representing local and regional water delivery agencies that serve over 24.5 million people and over 500,000 acres of farmland that are paying for the Project and would receive

the resulting water supply benefits. In addition, the State of California, through the California Water Commission, and the Bureau of Reclamation are also envisioned to be Storage Partners and receive water supply benefits.

The objectives of the project are as follows:

- Improve water supply reliability and resiliency to meet Storage Partners' agricultural and municipal long-term average annual water demand in a cost-effective manner for all Storage Partners, including those that are the most cost sensitive.
- Provide public benefits consistent with Proposition 1 of 2014 and use Water Storage Investment Program funds to improve statewide surface water supply reliability and flexibility to enhance opportunities for habitat and fisheries management for the public benefit through a designated long-term average annual water supply.
- Provide public benefits consistent with the Water Infrastructure Improvements for the Nation Act (WIIN Act) by using federal funds, if available, provided by Reclamation to improve CVP operational flexibility in meeting CVP environmental and contractual water supply needs and improving cold water pool management in Shasta Lake to benefit anadromous fish.
- Provide surface water to convey biomass from the floodplain to the Delta to enhance the Delta ecosystem for the benefit of pelagic fishes in the north Delta (e.g., Cache Slough).
- Provide local and regional amenities, such as developing recreational facilities, reducing local flood damage, and maintaining transportation connectivity through roadway modifications.

Reclamation's role in the Sites Reservoir Project is as a funding partner. Reclamation would acquire a water storage account in Sites Reservoir and an additional water supply it may use to supplement its existing supplies. Reclamation's purposes for the project include the following:

- Increased water supply and improved reliability of water deliveries
- Increased CVP operational flexibility
- Benefits to anadromous fish by improving CVP operations consistent with the laws, regulations, and requirements in effect at the time of operation
- Incremental Level 4 water supply for CVP Improvement Act refuges
- Delta ecosystem enhancement by providing water to convey food resources

The operational components of the Sites Project are listed in Table 14. The Sites Project is sufficiently developed for consideration at a framework level consistent with the 1992 CVPIA and 2016 WIIN Act. Reclamation and the Sites Project Authority recently completed the Sites Reservoir Project Final Environmental Impact Report/Environmental Impact Statement ([Final Environmental Impact Report/Environmental Impact Statement - Sites Reservoir \(sitesproject.org\)](https://www.sitesproject.org)) that analyzes the impacts of the project and is included in this Biological Assessment by reference.

Table 14. Operational Programmatic Components of Proposed Sites Project

Sites Project Activity	Description
Diversions to Sites Reservoir, Operating Criteria, and Diversion Criteria	All aspects of diversion of water at Red Bluff Pumping Plant, Hamilton City Pump Station, Stone Corral Creek, and Funks Creek, including the use of excess capacity in the Tehama-Colusa Canal and Glenn-Colusa Irrigation District Main Canal to convey water to the reservoir and storage of water in Sites Reservoir. Specific descriptions of pulse protection at Bend Bridge, bypass flows at Red Bluff, Hamilton City and Wilkins Slough, and other diversion criteria are specified in Chapter 2, Section 2.5.2.1, page 2-78 through page 2-86 of the Sites Project Final EIR/EIS.
Water Conveyance and Releases from Sites Reservoir	Releases of water from Sites Reservoir into the Tehama-Colusa Canal, Glenn-Colusa Irrigation District Main Canal, Stone Corral Creek, and Funks Creek. Conveyance of water from the Tehama-Colusa Canal into the Dunnigan Pipeline and subsequent release into the Colusa Basin Drain and ultimately into the Sacramento River or Yolo Bypass. Releases from Sites Reservoir are described in Chapter 2, Section 2.5.2.1, page 2-86 through 2-88 and page 2-90 through 2-91 of the Sites Project Final EIR/EIS.
Coordination with CVP and SWP	Exchanges with Shasta Lake and Lake Oroville, including Reclamation's investment in Sites Reservoir as described in Chapter 2, Section 2.5.2.1, page 2-88 through 2-90 of the Sites Project Final EIR/EIS.
Flood Control	Flood control benefits to the communities of Maxwell and Colusa, local agricultural lands, rural residences, and Interstate 5 by impounding Funks Creek and Stone Corral Creeks as described in Chapter 2, Section 2.5.2.1, page 2-91 through 2-92 of the Sites Project Final EIR/EIS
Emergency Releases	Operation of facilities to meet Division of Safety of Dams criteria and requirements for emergency reservoir drawdown as described in Chapter 2, Section 2.5.2.1, page 2-92 of the Sites Project Final EIR/EIS
Energy Generation and Energy Use	The as described in Chapter 2, Section 2.5.2.2, page 2-92 through 2-93 of the Sites Project Final EIR/EIS generation of energy in operations and use of energy for operations
Aquatic Monitoring and Adaptive Management	Implementation of an aquatic monitoring and adaptive management plan to (1) integrate the Project's adaptive management program with existing monitoring and science programs; (2) provide the proposed framework and governance, and (3) include the process for adaptive management, including operational criteria and conservation measures as described in various spots in Chapter 2 and Appendix 2D (2D.4, 2D.5, 2D.6) of the Sites Project Final EIR/EIS
Compensatory Mitigation for Temporary and Permanent Impacts	Species-specific compensatory mitigation actions that would be completed prior to operations as may be required in the projects permits and approvals

Construction of Sites Reservoir is expected to take approximately 7 years, beginning in 2026 and concluding in 2032. Currently, the reservoir is expected to be substantially completed in 2032 with filling beginning in 2033. The amount of time it would take to fill Sites Reservoir would depend greatly on hydrology and how Storage Partners choose to use their water during initial filling. Initial filling could range from approximately 2 years to over 10 years.

2.15.4 Delta Conveyance Project

On April 29, 2019, Governor Newsom signed Executive Order N-10-19 directing the California

Natural Resources Agency, California Environmental Protection Agency, and California Department of Food and Agriculture to develop a comprehensive strategy to build a climate-resilient water system and ensure healthy waterways through the twenty-first century. After a public input period, Governor Newsom released the California Water Resilience Portfolio on July 28, 2020. The Water Resilience Portfolio identifies a suite of complementary actions to ensure safe and resilient water supplies, flood protection and healthy waterways for the state's communities, economy, and environment. One of the projects identified in the portfolio is new diversion and conveyance facilities in the Delta to safeguard the SWP, which is now proposed as the Delta Conveyance Project. DWR proposed and is evaluating the project consistent with the portfolio approach and is currently reviewing the proposed project under CEQA with a Final Environmental Impact Report and decision on approval expected by the end of 2023.

DWR's fundamental purpose in proposing the DCP is to develop new intake and conveyance facilities in the Delta is to restore and protect the reliability of SWP water deliveries and, potentially, CVP water deliveries south of the Delta, consistent with the State's Water Resilience Portfolio in a cost-effective manner. This purpose, in turn, gives rise to the following project objectives.

- To help address anticipated rising sea levels and other reasonably foreseeable consequences of climate change and extreme weather events.
- To minimize the potential for public health and safety impacts from reduced quantity and quality of SWP water deliveries, and potentially CVP water deliveries, south of the Delta as a result of a major earthquake that could cause breaching of Delta levees and the inundation of brackish water into the areas where existing SWP and CVP pumping plants operate in the southern Delta.
- To protect the ability of the SWP, and potentially the CVP, to deliver water when hydrologic conditions result in the availability of sufficient amounts of water, consistent with the requirements of state and federal law, including the CESA and ESA and Delta Reform Act, as well as the terms and conditions of water delivery contracts and other existing applicable agreements.

To provide operational flexibility to improve aquatic conditions in the Delta and better manage risks of further regulatory constraints on project operations.

The proposed DCP project includes the construction and operation of new water intake facilities on the Sacramento River in the north Delta and a single main tunnel to divert and move water entering the north Delta from the Sacramento Valley watershed to existing SWP facilities in the south Delta, which would result in a dual conveyance system for the SWP in the Delta (see Table 15 for additional details on operations of the proposed project [i.e., DCP Public Draft EIR Alternative 5, Bethany Reservoir Alignment]). DWR is not seeking to increase its existing water rights, nor is it proposing any operational changes upstream of the Delta. The DCP, if approved, would be a part of the SWP's integrated water delivery system and, therefore, would be considered within the SWP and CVP Long-Term-Operations. If the DCP is approved and implemented by DWR, it would be a part of the SWP Delta operations and subject to Reclamation and DWR COA.

DWR would implement "dual conveyance" by operating the proposed north Delta diversion in conjunction with the existing south Delta diversion system for the SWP. During winter and spring, operations of existing south Delta water export facilities would be prioritized up to what

is permitted under the existing water rights and all applicable state and federal law and regulations, before operating the proposed north Delta intakes. During summer/fall, operations would be focused on more efficient Delta salinity management. The south Delta exports and the north Delta diversions would be balanced and adjusted to meet the State Water Board D-1641 salinity requirements at the western Delta stations on the Sacramento and San Joaquin Rivers (e.g., increasing salinity at Jersey Point would cause a shift in diversions from south Delta to north Delta, whereas increasing salinity at Emmaton would cause a shift from north Delta to south Delta). This operation is expected to result in a more efficient system operation. For purposes of the USACE DCP BA, project-specific effects associated with construction and placement of DCP facilities, including in-water work, as well as both temporary and permanent impacts, will be covered under the USACE's section 7 consultation. All effects associated with the north Delta diversion intake operations, including near- and far-field effects within the river as well as potential associated effects on aquatic biological resources, are assessed through the Programmatic LTO analysis. Table 15 describes key operational programmatic components of the Proposed Project.

Table 15. Operational Programmatic Components of Delta Conveyance Project

DCP Project Activity	Description
North Delta Intake Diversions	The proposed intakes would augment the ability to capture excess flows and improve the flexibility of SWP operations (e.g., improved salinity management during the summer/fall). New operational criteria would govern the diversions at the proposed north Delta intakes to minimize effects near and downstream of the new intakes. See Section 3.16 of the DCP Public Draft EIR for additional details on project operations.
SWP Integration	The north Delta intakes would operate in conjunction with the existing SWP south Delta intakes. For example, during the winter and spring, the SWP would first use south Delta facilities to export water up to what is permitted under the existing water rights and all applicable state and federal law and regulations before diverting from the new north Delta intakes. Upstream SWP storage operations would continue to be managed to the existing and future regulatory and contractual obligations of the SWP in determining the amount of stored water available for exports. The DCP would not change operational criteria associated with upstream reservoirs (Section 3.16.3, DCP Public Draft EIR).
Coordination with CVP	Continued SWP coordination with CVP through the Coordinated Operations Agreement, consistent with applicable regulatory requirements (Section 3.16, DCP Public Draft EIR).

DCP Project Activity	Description
Adaptive Management and Monitoring Program	The Adaptive Management and Monitoring Program would be used to evaluate and consider changes in operational criteria, if necessary, based on information gained before and after the new facilities become operational. This program would be used to consider and address scientific uncertainty regarding the Delta ecosystem and potential effects of the project. In addition, an adaptive management and monitoring plan would be prepared for each mitigation site to help ensure habitat creation goals are met. (Section 3.18, DCP Public Draft EIR).
Conservation Measures	Included to avoid, minimize, and offset effects of the proposed action on listed species. This includes compensatory mitigation to be completed prior to operations at the acreages identified for each species. (Appendix 3F, DCP Public Draft EIR).

2.15.5 Combined Qualitative Description

Both DCP and Sites are designed to improve water management capabilities for SWP and CVP and collectively respond to challenges associated with future climate change. In particular, the projects would provide for facility updates and improve the ability for SWP and CVP to respond to more extreme weather, driven by climate change, by improving the ability to capture, store, and convey water associated with flashier flow events, as well as a predicted general shift in hydrograph with relatively higher flows in winter months and reductions in the spring. As described qualitatively above, both DCP and Sites incorporate operational criteria to minimize potential effects on the environment and aquatic resources both at the facilities (near-field) as well as downstream (far-field). While these criteria have been designed to integrate with existing regulations and reduce potential effects of each project individually, there are potential interactive effects which are important to further investigate and account for, mainly associated with changes to Sacramento River flows upstream of, in, and through the Delta. Potential effects on aquatic resources associated with these changes include:

- Changes to timing, magnitude, and duration of flows along the Sacramento River/Delta corridor.
- Subsequent changes to important aquatic constituents (e.g., suspended sediment, nutrients, lower trophic production) associated with the flow modifications.
- Potential changes to quantity/quality of habitat supporting listed species spawning, rearing, and migration.
- Potential changes in production of listed aquatic species.

Additionally, upstream changes (i.e., Shasta reservoir storage, upper Sacramento River flows – for Sites; Oroville reservoir storage, upper Feather River flows – indirectly for DCP) may have non-intuitive interactive effects of the combined projects and will also be explored. Generally, the effects on these locations would be improvements in upstream storage and cold water flexibility, relative to no action, based on the projects' objectives.

2.15.6 Quantitative Project Descriptions

This section contains quantitative descriptions of the modeled results comparing Sites and DCP

operational effects relative to the updated LTO. The quantitative effects analysis will focus on key indicators of biological/ecological relevance such as storage, flows, and temperatures at key locations on the Sacramento River, as well as through and downstream of the Delta.

2.15.7 Analysis and Comparative Modeling Results

Sites and DCP have assessed their operations as part of their CEQA (and also the National Environmental Policy Act for Sites) compliance efforts. This quantitative information helps inform the programmatic consideration of this framework. These analyses have led to the development of detailed operational criteria to reduce or avoid operational effects on sensitive species, and these criteria are described further below.

Sites Reservoir

Sites Reservoir would be filled through the diversion of Sacramento River water that generally originates from unregulated tributaries to the Sacramento River downstream from Keswick Dam. Diversions to Sites Reservoir could also come from flood releases from Shasta Lake. Diversions to Sites Reservoir would be made from the Sacramento River at the existing Red Bluff Pumping Plant (RBPP) (RM 243) near Red Bluff into the Tehama-Colusa Canal and at the existing Glenn-Colusa Irrigation District (GCID) Hamilton City Pump Station (RM 205) near Hamilton City into the GCID Main Canal. Water could be diverted to storage in Sites Reservoir from September 1 to June 14. Diversions would occur only when all of the following conditions are met:

- Flows in the Sacramento River exceed the minimum diversion criteria (described in Table 3-18);
- The Delta is in “excess” conditions as determined by Reclamation and DWR and would remain in excess conditions during diversions;
- Senior downstream water rights, existing CVP and SWP and other water rights diversions including Section 215 of the Reclamation Reform Act of 1992, Article 3(f) water, and SWP Article 21 (interruptible supply), and other more senior flow priorities have been satisfied;
- Flows are available for diversion above flows needed to meet all applicable laws, regulations, biological opinions and incidental take permits, and court orders in place at the time that diversion occurs. This would include but is not limited to any flow requirements in Water Right Decision 1641 (State Water Resources Control Board 2000), the 2019 biological opinions for the reinitiation of consultation on coordinated long-term operations of the CVP and SWP (ROC on LTO BiOps) (U.S. Fish and Wildlife Service 2019; National Marine Fisheries Service 2019) and any future related BiOps, and the State incidental take permit (California Department of Fish and Wildlife 2020); and
- There is available capacity at the RBPP and in the Tehama-Colusa Canal and GCID facilities to divert and convey water to Sites Reservoir, above the capacity needed for deliveries to existing Tehama-Colusa Canal users and within the GCID service area.

The RBPP would serve as the primary diversion location and would divert water from the Sacramento River to Funks Reservoir through the Tehama-Colusa Canal and into the Sites Reservoir through the Funks Pumping and Generating Plant and the Inlet/Outlet Works. A maximum of approximately 2,120 cfs would be diverted at the RBPP for the project. The

Hamilton City Pump Station would serve as the secondary diversion location and would divert water from the Sacramento River to the new Terminal Regulating Reservoir through the GCID Main Canal and into the Sites Reservoir through the Terminal Regulating Reservoir Pumping and Generating Plant and the Inlet/Outlet Works. A maximum of approximately 2,070 cfs would be diverted at the Hamilton City Pump Station for the project. Although the RBPP would be the primary diversion point, both diversion facilities would be operated simultaneously when river conditions and capacity are available for a maximum combined diversion rate of about 4,200 cfs (3,900 cfs, plus losses). Table 16 provides a summary of the Sites project minimum diversion criteria.

Table 16. Summary of Project Diversion Criteria (this is Table 2-5 from the Final EIR/EIS)

Location (Listed from North to South)	Criteria
Bend Bridge Pulse Protection	Protection of all qualified precipitation-generated pulse events (i.e., peaks in river flow rather than scheduled operational events) from October to May based on predicted hydrology and monitoring. A criterion based on the detection of migrating fish may be added if a fish monitoring method can be demonstrated as effective and reliable. A qualified precipitation-generated pulse event is determined based on forecasted flows, and pulse protection may cease after 7 days or earlier if flows at Bend Bridge exceed 29,000 cfs and Project diversions subtracted from Bend Bridge flows continue to be at least 25,000 cfs.
Minimum Bypass Flows in the Sacramento River at the RBPP	3,250 cfs minimum bypass flow at all times; rate of diversion controlled by fish screen design
Minimum Bypass Flows in the Sacramento River at the Hamilton City Pump Station	4,000 cfs minimum bypass flow at all times; rate of diversion controlled by fish screen design
Minimum Bypass Flows in the Sacramento River at Wilkins Slough	10,700 cfs from October 1 to June 14; 5,000 cfs in September (no diversions to Sites Reservoir from June 15 to August 31)
Freeport, Net Delta Outflow Index, X2, and Delta Water Quality	Operations consistent with all applicable laws, regulations, biological opinions and incidental take permits, and court orders in place at the time that diversion occurs

cfs = cubic feet per second; RBPP = Red Bluff Pumping Plant.

The Sites project diversion criteria have been analyzed extensively and are not expected to change substantially. However, criteria may be refined in actual project operations through adaptive management and in coordination with the fisheries agencies. In particular, adaptive management actions would focus on the following: Bend Bridge Pulse Protection; the Minimum Bypass Flows in the Sacramento River at Wilkins Slough; Fremont Weir Notch Protections (Big Notch Project); sediment monitoring, modeling and reintroduction; and fish monitoring and technical studies related to near-field effects.

Delta Conveyance Project

As described in the qualitative discussion, the DCP would function as a dual-conveyance SWP

facility in conjunction with existing SWP Delta facilities through construction and operation of two new north Delta intakes with a combined diversion capacity of 6,000 cfs on the Sacramento River near the town of Hood. The north Delta diversion (NDD) would not alter operating criteria for existing facilities (e.g., upstream reservoirs or south Delta diversions), would be subject to existing and updated Delta water quality requirements (e.g., D-1641), and would not alter SWP/CVP water right permits (beyond the addition of new points of diversions). Existing south Delta diversions would be operated preferentially, with use of the NDD focused on periods of excess flow conditions in the Delta and to optimize salinity management in the summer and fall. Specific operational criteria focusing on minimizing potential effects on aquatic resources and listed fish would further govern NDD operations. Tables 17, 18, and 19 describe the proposed DCP operational criteria.

Table 17. Delta Conveyance Project Preliminary Proposed Operations Criteria (North Delta Diversion Operations)

Parameter	Delta Conveyance Project Criteria
Bypass Flow ^a (specifies bypass flow required to remain downstream of the north Delta intakes)	- October through November: Minimum flow of 7,000 cfs required in river after diverting at the north Delta intakes. - December through June: Once the pulse protection (see below) ends, north Delta diversions would not exceed Level 1 pumping unless specific criteria have been met to increase to Level 2 or Level 3. If those criteria are met, operations can proceed as defined in table 3-20. Allowable diversion would be the greater of the following options: low-level pumping or the diversion allowed by the bypass flow rules in the following table. - July through September: Minimum flow of 5,000 cfs required in river after diverting at the north Delta intakes.
Pulse Protection (October through June)	- Low-level pumping is allowed when river conditions are adequate during the pulse protection period. - Definition: Low-level pumping of up to 6% of total Sacramento River flow at Freeport such that diversions would not reduce bypass flow below 5,000 cfs. No more than a total of 900 cfs can be diverted by all the intakes combined. Low-level pumping can occur in October–November during a pulse protection event and in December–June as defined in the following table. In addition, north Delta diversion levels at all the intakes would be subject to a maximum approach velocity of 0.2 feet per second and a minimum sweeping velocity of 0.4 feet per second at the proposed fish screens. Velocity compliance would be informed by real-time hydrological data measured at the intake locations. - Pulse triggering, duration, and conclusion is determined based on the criteria defined in the following table.

Parameter	Delta Conveyance Project Criteria
	If the initial pulse begins before December 1, the bypass flow criteria for the month (October and November) when the pulse occurred would take effect, following a pulse protection period. On December 1, the Level 1 rules defined in the following table apply unless a second pulse occurs.
Real-Time Operations	The proposed operations criteria and tidal restoration mitigation are intended to minimize and fully mitigate the potential impacts of the NDD operations. The real time decision making specific to the NDD operations would be mainly associated with reviewing real-time abiotic and fish monitoring data and ensuring proposed weekly, daily and sub-daily operations are consistent with the permitted criteria and within the effects analyzed in the permits.
Adaptive Management	The Operations Adaptive Management and Monitoring Program would be used to evaluate and consider changes in operational criteria based on information gained before and after the new facilities become operational. This program would be used to consider and address scientific uncertainty regarding the Delta ecosystem and to inform project operations.

cfs = cubic feet per second; NDD = north Delta diversion.

^a Sacramento River flow upstream of the intakes to be measured flow at Freeport. Bypass flow is the 3-day tidally averaged Sacramento River flow computed as flow measured at Freeport minus the diversion rate. Sub-daily north Delta intakes' diversion operations would maintain fish screen approach and sweeping velocity criteria.

Table 18. Proposed North Delta Diversion Bypass Flow and Pulse Protection Requirements

	Criteria
Pulse Protection	- Low-level pumping would be allowed when river conditions are adequate during the pulse protection period. Initiation of the pulse protection is defined by the following criteria: (1) Sacramento River daily average flow at Wilkins Slough increase by more than 45% within a 5-day period and (2) flow on the 5th day greater than 12,000 cfs. - The pulse protection continues until either (1) Sacramento River flow at Wilkins Slough returns to pre-pulse flow level (flow on first day of 5-day increase), or (2) Sacramento River flow at Wilkins Slough decreases for 5 consecutive days, or (3) Sacramento River flow at Wilkins Slough is greater than 20,000 cfs for 10 consecutive days. After pulse period has ended, operations would return to the bypass flow table (Table b).

	If the initial pulse period begins before Dec 1, then any second pulse that may occur during December through June would receive the same protection, i.e., low-level pumping, resulting in up to two pulses which would receive this protection per water year.
Bypass Flow Criteria	After initial pulse(s), allowable diversion would be subject to Level 1 bypass flow criteria (Table b) until 15 total days of bypass flows above 20,000 cfs occur. Then allowable diversion would be subject to the Level 2 bypass flow criteria until 30 total days of bypass flows above 20,000 cfs occur. Then allowable diversion would be subject to the Level 3 bypass flow criteria

Table 19. North Delta Diversion Bypass Flow Criteria

Period	Level ^a	If Sacramento River flow		The bypass is...
		Is over...	But not over...	
December through April ^b	1	0 cfs	5,000 cfs	100% of the amount over 0 cfs
		5,000 cfs	15,000 cfs	Flows remaining after low-level pumping
		15,000 cfs	17,000 cfs	15,000 cfs plus 80% of the amount over 15,000 cfs
		17,000 cfs	20,000 cfs	16,600 cfs plus 60% of the amount over 17,000 cfs
		20,000 cfs	no limit	18,400 cfs plus 30% of the amount over 20,000 cfs
	2	0 cfs	5,000 cfs	100% of the amount over 0 cfs
		5,000 cfs	11,000 cfs	Flows remaining after low-level pumping
		11,000 cfs	15,000 cfs	11,000 cfs plus 60% of the amount over 11,000 cfs
		15,000 cfs	20,000 cfs	13,400 cfs plus 50% of the amount over 15,000 cfs
		20,000 cfs	no limit	15,900 cfs plus 20% of the amount over 20,000 cfs
	3	0 cfs	5,000 cfs	100% of the amount over 0 cfs
		5,000 cfs	9,000 cfs	Flows remaining after low-level pumping
		9,000 cfs	15,000 cfs	9,000 cfs plus 50% of the amount over 9,000 cfs
		15,000 cfs	20,000 cfs	12,000 cfs plus 20% of the amount over 15,000 cfs
		20,000 cfs	no limit	13,000 cfs plus 0% of the amount over 20,000 cfs
May ^b	1	0 cfs	5,000 cfs	100% of the amount over 0 cfs
		5,000 cfs	15,000 cfs	Flows remaining after low-level pumping
		15,000 cfs	17,000 cfs	15,000 cfs plus 70% of the amount over 15,000 cfs
		17,000 cfs	20,000 cfs	16,400 cfs plus 50% of the amount over 17,000 cfs
		20,000 cfs	no limit	17,900 cfs plus 20% of the amount over 20,000 cfs
	2	0 cfs	5,000 cfs	100% of the amount over 0 cfs
		5,000 cfs	11,000 cfs	Flows remaining after low-level pumping
		11,000 cfs	15,000 cfs	11,000 cfs plus 50% of the amount over 11,000 cfs
		15,000 cfs	20,000 cfs	13,000 cfs plus 35% of the amount over 15,000 cfs
		20,000 cfs	no limit	14,750 cfs plus 20% of the amount over 20,000 cfs

Period	Level ^a	If Sacramento River flow		The bypass is...
		Is over...	But not over...	
	3	0 cfs	5,000 cfs	100% of the amount over 0 cfs
		5,000 cfs	9,000 cfs	Flows remaining after low-level pumping
		9,000 cfs	15,000 cfs	9,000 cfs plus 40% of the amount over 9,000 cfs
		15,000 cfs	20,000 cfs	11,400 cfs plus 20% of the amount over 15,000 cfs
		20,000 cfs	no limit	12,400 cfs plus 0% of the amount over 20,000 cfs
June ^b	1	0 cfs	5,000 cfs	100% of the amount over 0 cfs
		5,000 cfs	15,000 cfs	Flows remaining after low-level pumping
		15,000 cfs	17,000 cfs	15,000 cfs plus 60% of the amount over 15,000 cfs
		17,000 cfs	20,000 cfs	16,200 cfs plus 40% of the amount over 17,000 cfs
		20,000 cfs	no limit	17,400 cfs plus 20% of the amount over 20,000 cfs
	2	0 cfs	5,000 cfs	100% of the amount over 0 cfs
		5,000 cfs	11,000 cfs	Flows remaining after low-level pumping
		11,000 cfs	15,000 cfs	11,000 cfs plus 40% of the amount over 11,000 cfs
		15,000 cfs	20,000 cfs	12,600 cfs plus 20% of the amount over 15,000 cfs
		20,000 cfs	no limit	13,600 cfs plus 20% of the amount over 20,000 cfs
	3	0 cfs	5,000 cfs	100% of the amount over 0 cfs
		5,000 cfs	9,000 cfs	Flows remaining after low-level pumping
		9,000 cfs	15,000 cfs	9,000 cfs plus 30% of the amount over 9,000 cfs
		15,000 cfs	20,000 cfs	10,800 cfs plus 20% of the amount over 15,000 cfs
		20,000 cfs	no limit	11,800 cfs plus 0% of the amount over 20,000 cfs
July through September	N/A	0 cfs	5,000 cfs	100% of the amount over 0 cfs
	N/A	5,000 cfs	No limit	A minimum of 5,000 cfs
October and November	N/A	0 cfs	7,000 cfs	100% of the amount over 0 cfs
	N/A	7,000 cfs	No limit	A minimum of 7,000 cfs

cfs = cubic feet per second.

^a Level 1, Level 2 and Level 3 Bypass Flow Criteria do not apply July through November. Minimum Bypass Flow Criteria are applicable July through November as described in the table.

^b Allowable diversion would be the greater of the low-level pumping or the diversion allowed by the following bypass flow rules.

2.15.8 Guiding Principles

To ensure that future authorizations of Sites and DCP are consistent with DWR and Reclamation's policies, guidelines, and procedures for its authorization, funding, and operation of water projects, Reclamation and DWR propose the following guiding principles to avoid, minimize and offset adverse effects of the proposed operations to listed species and critical habitat.

Guiding principles inform the upfront development of operational criteria and measures to avoid or minimize effects on listed species and critical habitat, including possible adjustment

through adaptive management, that would be analyzed in the subsequent consultations. Current proposed operational criteria will be included and considered through quantitative assessments, as applicable. Potential operational refinements will be informed by the programmatic analysis (e.g., potential need for changes to the DCP Bypass Flow criteria), which will guide subsequent project-level consultations. Adaptive Management is intended to further address outstanding uncertainties up to, and throughout, the operations phase. Implementation goals are included to provide the necessary level of information to inform the programmatic section 7 analysis. The following guiding principles are relevant to both projects, with some specific application to each project noted. Note that DCP would not create changes to baseline SWP or CVP upstream reservoir operational criteria. The DCP would be operated in a manner that does not impact either DWR or Reclamation's ability to operate upstream reservoirs to meet existing and future criteria and regulations. The guiding principles for regions upstream from the Delta are therefore specific only to Sites.

Upper Sacramento River (Sites Only)

Utilize the additional water supply provided by the Sites Project to address adverse effects of the CVP on salmonid and sturgeon habitat in the Sacramento River above the Red Bluff Pumping Plant by:

1. Optimizing the use of Reclamation's storage to facilitate the following:
 - Enhancing conservation of the cold water pool in Shasta Lake for use in managing temperatures in salmonid spawning habitat downstream of Keswick Dam particularly in dry water year types
 - Enhancing pulse flows envisioned in the Biological Assessment at appropriate times, particularly in years when natural pulse events are minimal, to stimulate migration of juvenile salmon downstream toward the Delta
 - Stabilizing flow to minimize or preclude losses of salmon redds due to flow fluctuations associated with management of Shasta Lake for fall storage
2. Implementing additional mitigation actions as necessary and appropriate to improve spawning and rearing habitat for anadromous fish in the Upper Sacramento River

Sacramento River from Red Bluff Pumping Plant to Knights Landing (Sites Only)

1. Implement actions necessary to minimize potential impacts to listed species exposed to diversion facilities
2. Implement pulse flow criteria to provide migrating anadromous fish an opportunity to migrate past the diversion locations with minimum exposure to diversions
3. Utilize best available science to establish flow levels necessary to provide migratory and rearing habitat to minimize effects on juvenile anadromous fish survival and facilitate their movement out of the river toward the delta and bays

4. Find opportunities to develop and/or restore additional side channel habitat to offset adverse effects on salmonid migratory and rearing habitat associated with diversions of flow to Sites Reservoir

Below Knights Landing and in the Delta

1. Operate projects consistent with existing and/or future regulatory requirements in the Delta.
2. Implement pulse flow criteria to provide migrating anadromous fish an opportunity to migrate past the diversion locations with minimum exposure to diversions and further minimize effects on through-Delta survival.
3. Utilize best available science to establish flow levels necessary to provide migratory and rearing habitat to minimize effects on juvenile anadromous fish survival and facilitate their movement out of the river toward the delta and bays.
4. Monitor and mitigate effects of diversions on habitat for Delta pelagic fish species through identification and implementation of opportunities to develop additional habitat (i.e., tidal habitat restoration) to improve productivity of those fish populations.
5. Monitor and mitigate effects of diversions on migrating anadromous species and their habitat through identification of opportunities to develop additional habitat (i.e., tidal and channel margin restoration) to improve productivity of those fish populations.
6. Protect habitat conditions supporting listed pelagic and anadromous species, mitigate potential flow related effects of Sites and DCP with habitat restoration developed in coordination with NMFS, USFWS, and CDFW to improve productivity of those fish populations.

Sites:

7. Cooperate in the monitoring of the Fremont Weir Big Notch Project to assess what effect, if any, diversions of flow to Sites Reservoir have on the effectiveness of the Big Notch Project in the entrainment of juvenile anadromous fish through the notch on the floodplain habitat in the Yolo Bypass and the passage of anadromous fish from the Yolo Bypass into the Sacramento River. If necessary, implement operational measures to avoid diminishing the performance of the Big Notch Project.

DCP:

8. Implement project operations and maintenance consistent with the proposed project description, as an integrated component of the SWP.
 - a. Future consultation on Delta Conveyance Project Operations and Maintenance is envisioned to update and align elements of project description with conditions (e.g., regulatory, climate, status of species) in advance of operations of the north Delta diversions.

Suisun Bay, San Pablo, and San Francisco Bay

Cooperate with the fisheries resource agencies to monitor effects of diversions to the Sites Reservoir and DCP on the location of X2 and Delta outflow and, as appropriate, identify opportunities to offset adverse effects on critical habitat through appropriate mitigation measures or adaptive management actions.

2.15.9 Adaptive Management

Both Sites and DCP would have adaptive management programs that integrate with the Long-Term Operations adaptive management program and include these general principles:

1. Cooperate with and, as appropriate, participate in ongoing and planned habitat and population monitoring programs conducted by the resource agencies to ensure attainment of information pertinent to assessing the effects on endangered and threatened fish in the action area.
2. Design studies, in cooperation with resource agencies, to test modifications to operations that may be implemented to remedy or lessen unanticipated effects identified by the monitoring program.
3. Cooperate with the resource agencies to evaluate results of studies and determine whether changes in project operations are necessary and appropriate to address unanticipated adverse effects.
4. To the maximum extent possible/appropriate, integrate Sites and DCP adaptive management and monitoring with existing and proposed special studies, monitoring programs, technical teams, adaptive management and structured decision making processes associated with Long-Term-Operations.
5. Ongoing commitment to collaborative decision making processes consistent with the LTO adaptive management effort, including reliance on the LTO adaptive management wheel and structured decision making framework.

Project specific compliance efforts and monitoring would be the responsibility of the individual projects, but there would be a commitment to ongoing coordination and information sharing to support the broader monitoring and adaptive management processes.

The adaptive management program would document all activities associated with the planning phase of adaptive management and describe the process to be followed during the implementation and evaluation and response phases. Project objectives were taken into consideration in identifying where adaptive management would be most effective and applicable for the project. If the proposed project is approved, as appropriate, mitigation measures identified, such as implementation of the habitat creation and restoration actions, would integrate the concept of adaptive management in mitigation plan design, stand-alone site and/or resources specific adaptive management plans.

2.16 Other Activities

Other Activities include action components that are not specifically proposed by Reclamation but would not occur but for the action and that are reasonably certain to occur. These kinds of activities were previously referred to as “interrelated or interdependent” activities. Under the

2019 ESA regulations governing interagency coordination, a proposed action may cause other associated or connected actions, that are now called “other activities” to distinguish them from the proposed Federal action. These activities and their consequences must pass a two-part test of causation and foreseeability, meaning that they would not happen “but for” a Federally proposed action and that they are “reasonably certain to occur”.

Portions of the Winter-Run Action Plan (WRAP) meet the two-part test of “but for” and “reasonably certain to occur” for the following reasons: First, the Winter-run Action Plan is a result of agency discussions with the Sacramento River Settlement Contractors for the operations of Shasta Reservoir. Without the new Shasta Operations framework, elements of the WRAP would not have been proposed, thus it meets the “but for” standard. Next, the elements of the WRAP are reasonably certain to occur because the parties to the WRAP have a long history, either individually or together, of advancing science, implementing habitat restoration, reintroducing fish to historic habitats, improving system infrastructure and adaptively managing hatcheries for long-term species needs.

2.16.1 Winter run action plan

Introduction

Sacramento River winter-run Chinook Salmon (winter-run) are an iconic species on the Sacramento River, beloved by a wide variety of communities with deep connections to the Sacramento Valley, including local landowners and residents, fishing groups, Native American tribes, and environmental NGOs. Historically, winter-run migrated into the upper Sacramento River and spawned in high elevation tributaries with consistently cold water temperatures throughout the spring, summer, and fall. Prior to the construction of Shasta and Keswick dams, upper tributary dams and diversions above Shasta Dam and Battle Creek were constructed for power generation that limited access to parts of these high-elevation habitats. Construction of Shasta and Keswick dams and changes on Battle Creek further limited access through impaired passage, and only a single population of winter-run remains to spawn at much lower elevations on the Sacramento River below Keswick Dam. Currently, one remaining population of winter-run persists on the Sacramento River downstream of Shasta Dam and is exposed to a wide variety of stressors, including limitations of the availability of cold water release from Shasta Reservoir during the summer and fall spawning and rearing seasons. Winter-run have been selected as a “species in the spotlight” by NMFS to highlight their status among protected species with the greatest risk of extinction in the near future.

The challenges and threats faced by winter-run are diverse and complex. Some of the threats to the species include: changes in flow regime, climate variability, lost and degraded spawning habitat, removal/lack of access to rearing habitat (along the Sacramento River and in the Delta), recurring droughts and related impacts on reservoir storage and temperature management, thiamine deficiency, entrainment into water diversions, pathogens, predation by non-native species, and commercial and recreational fisheries. The extent of threats to winter-run is such that even under periods with good storage and favorable water temperatures, juvenile survival in the Sacramento River can be poor.

This Winter-run Action Plan has been developed collaboratively among representatives from Reclamation, NMFS, USFWS, DWR, CDFW, and the Sacramento River Settlement Contractors as an integrated plan to improve the survival and viability of winter-run that functions alongside planned operation of Shasta Reservoir. The intention is to implement the

Winter-run Action Plan with other partners including Native American Tribes and NGOs.

Plan Priorities

Inspired by the list of threats above, this plan prioritizes implementation of six actions to reduce stressors to the species through a combination of science, fishery actions, infrastructure improvements, and improved habitat quality and access:

1. Thiamine Deficiency Complex Management
2. Reintroduction into Battle Creek and McCloud River
3. Early Life Stage Survival Science
4. Temperature Control Device Infrastructure Improvement at Shasta Dam
5. Modernization of the Livingston Stone National Fish Hatchery
6. Habitat restoration and facility improvements

These high priority actions are described in additional detail in Appendices 1-6. Each appendix provides a brief description of the action, a statement of purpose, an overview of past and current work potential challenges for implementation, milestones, deliverables, permitting requirements, resource needs and commitments, and funding sources. To avoid duplicating effort and maximize efficiency, each of the appendices draws upon existing plans and implementation processes and identifies relevant areas of expertise. These priorities represent the current thinking on actions to reduce winter-run stressors. However, the Winter-run Action Plan is intended to adapt and address other stressors and threats that are identified in the future. The expectation is that collectively these actions will improve the status of winter-run over the next ten years.

Goals

The Winter-run Action Plan has been developed as an interdisciplinary and collaborative approach to addressing some of the priority threats to the species. The overarching goals of this plan are:

- Develop a structured and collaborative partnership that includes State and Federal agencies (Reclamation, NMFS, USFWS, DWR, and CDFW), the Sacramento River Settlement Contractors, non-governmental conservation and fishery groups, tribes, and universities;
- Elevate the prominence of priority actions, in addition to operations of Shasta Dam, that are expected to enhance our understanding of winter-run ecology, address key threats to the species, and move forward key infrastructure improvements to support the species;
- Increase abundance, improve population growth rates, maximize diversity, improve resiliency, and prevent extinction of winter-run through implementation of identified actions;
- Collaboratively assess funding needs to implement each of the priority actions, identify available funding sources, and pursue additional funding sources, as needed;

- Work together at a technical and project management level develop plans and implement each priority action, meet the established milestones, and provide timely deliverables.
- Identify resource needs to actively engage and make progress on each identified action according to milestones;
- Communicate early about permitting needs anticipated for each priority action and coordinate throughout permitting processes; and
- Consider links and potential co-benefits to other Chinook salmon runs, as well as other native fishes, during the process to plan and implement priority actions.

Partnerships and Governance

As described in Section 2.13, the agencies and partners will dedicate managers from each organization to participate on a Winter-run Action Plan policy team that will coordinate on plan implementation. The purpose of the policy team is to establish policy level coordination and processes for tracking plan goals, priorities, funding, resource needs, milestones and deliverables. The Winter-run Action Plan recognizes that some of the action plan components may be part of separate planning processes and the policy team will evaluate opportunities to utilize existing efforts.

Winter-run Action Plan Policy Team

A Winter-run Action Plan Policy Team (WRAP Policy Team) consisting of Agency subdirectors and Partner managers will serve as the policy group for implementing the Winter-run Action Plan. The purpose of the WRAP Policy Team is to establish policy level coordination, leadership and direction for tracking plan goals, priorities related to the WRAP, coordination on resource needs, milestones and deliverables. The WRAP Policy Team will do the following:

1. Coordinate efforts for consultation and/or coordination agreements with Tribes, NGOs and Universities on WRAP action components
2. Identify opportunities to leverage the ongoing work of existing scientific, habitat and fishery management teams and programs
3. Review budget annually to identify potential gaps in funding
4. Track and meet established milestones and deliverables
5. Track and adjust, as necessary, plan goals and priorities
6. Identify where sub-teams require additional guidance so that managers may that provide that direction to their participating staff where appropriate
7. Participants are responsible SHOT members are aware of activities under the WRAP
8. Coordinate on alternative actions to evaluate

9. Provide quarterly updates to agency Directors and partner Principals and elevate matters as described under Collaborative Decision Making

Science Facilitation and Program Support

The WRAP Policy Team will work together to hire a program manager and an independent scientific facilitator to promote scientific collaboration and to address scientific debate and divergent scientific perspectives related to implementation of the WRAP. The WRAP program manager and scientific facilitator will have strong program management skills and a scientific background and/or understanding of the scientific matters related to water resource and protected species management.

The WRAP program manager with direction from the WRAP Policy Team will:

- Implement the WRAP
- Track milestones and deliverables
- Manage meeting schedules and logistics
- Coordinate WRAP-specific working groups
- Identify and track the implementation through existing working groups

The scientific facilitator will work with the WRAP Policy Team to:

- Develop processes to help streamline the development of research proposals and study plans
- Foster an environment of scientific coordination and knowledge exchange between researchers, agencies, and partners
- Organize and facilitate regular meetings, workshops, and seminars to promote scientific discussions and idea exchange
- Coordinate the development of briefing materials by researchers
- Identify and bridge gaps between scientific research and effective collaboration
- Summarize the status of discussions by researchers for the WRAP Policy Team
- Help the WRAP Policy Team coordinate with other science programs to leverage opportunities and avoid duplication
- Coordinate independent review of work products.

3 Effects of Proposed Action on Pacific Coast Salmon Essential Fish Habitat

The effects of the Proposed Action are based on the analyses contained within Reclamation's the 2021 Consultation on the Long-Term Operation of the Central Valley Project and State Water Project Biological Assessment (Reclamation BA 2024) and the 2021 Long-Term Operation of the Central Valley Project and State Water Project Final Environmental Impact

Statement, Alternative 2 impact analysis, to be released 15 November (Reclamation FEIS 2024) and incorporated here by reference. Proposed Action conservation measures included in the 2024 Biological Assessment that would not impact EFH are not addressed in this report.

For a description of the species subject to this consultation under Magnuson-Stevens Act, please see Chapters 5 *Winter-Run Chinook Salmon* and Chapter 6 *Spring-Run Chinook Salmon* of the 2021 Consultation on the Long-Term Operation of the Central Valley Project and State Water Project Biological Assessment (Reclamation BA 2024). In addition, please also see Chapter 12 *Fish and Aquatic Resources* Sections 12.1.2 *Sacramento River*, 12.1.3 *Clear Creek*, 12.1.4 *American River*, 12.1.5 *Stanislaus River*, 12.1.7 *Bay-Delta*, and associated appendices of the 2021 Consultation on the Long-Term Operation of the Central Valley Project and the State Water Project Environmental Impact Statement for information of the Proposed Action activities and No Action Alternative analysis (Reclamation FEIS 2024). For the purposes of analysis of Pacific Coast Salmon EFH, analyses of potential effects of the Proposed Action on Central Valley fall-run/late fall-run Chinook salmon evolutionary significant unit (ESU) are included.

3.1 Sacramento River – Water Quality, Flow Variables, and Habitat Parameters

Reclamation operates Shasta Dam to meet multiple demands in the Sacramento River and in the Delta as described in Section 2.1.

Dissolved oxygen and water temperature are generally related with warmer waters causing decreased dissolved oxygen. Reductions in dissolved oxygen and elevated temperatures can negatively impact salmon spawning, rearing, and holding habitats. Sacramento River (Red Bluff to Knights Landing) is on the State Water Resources Control Board (SWRCB)'s Clean Water Act (CWA) Section 303(d) list as impaired by dissolved oxygen (DO). The Water Quality Control Plan (Basin Plan) for the California Regional Water Quality Control Board Central Valley Region established a DO objective of 9.0 mg/L¹⁶ from June 1 to August 31 in the Sacramento River from Keswick Dam to Hamilton City (CVRWCB 2019a) to protect the beneficial uses of the Sacramento River, including fish spawning and cold freshwater habitat. Impacts to depth and velocity habitat values under the Proposed Action are often closely tied to the amount of water in the system and being released from Keswick Dam into the Sacramento River. Sufficient flow is required to inundate and create complex channels and floodplain habitat and maintain suitable spawning habitat. Under the Proposed Action, average flows in the Sacramento River below Keswick Dam could decrease between 9% and 13% during some months of critically dry water years compared to the No Action Alternative. However, flow in the Sacramento River is expected to increase between 19% and 33% during certain months of critically dry water years. Pacific salmon in the Sacramento River during these critical months include adult fall, winter, and spring-run Chinook salmon, as well as incubating and juvenile fall-run/late fall-run, winter, and spring-run Chinook salmon. Despite the change in flow from the No Action Alternative during these months, minimum flow remains well above baseflow conditions during critically dry water years. Flow decreases are not expected to be large enough to adversely impact depth or velocity.

¹⁶ When natural conditions lower DO below this level, the concentrations shall be maintained at or above 95% of saturation (Central Valley Regional Water Quality Control Board 2019a).

Modeling was used to estimate the water temperature at the Clear Creek temperature compliance gage to illustrate the impact of the Proposed Action on thermal refugia and spawning habitat for Sacramento River Pacific salmon where it differs from the No Action Alternative. Modeled water temperature maximums are reduced, the same, or less for all months under the Proposed Action when compared to the No Action Alternative except, August. Pacific salmon in the Sacramento River in these months include adult fall and spring-run Chinook salmon and fall-run/late fall-run, winter and spring-run Chinook salmon eggs and juveniles. Impacts to listed species from changes in water temperature under the Proposed Action are covered in species-specific chapters of the Biological Assessment. Differences in water temperature under the Proposed Action for fall-run/late fall-run Chinook salmon EFH are expected to have minimal adverse effects on spawning habitat and thermal refugia. Conservation measures including ramping rates, smoothing, spring pulses, minimum baseflow, and the adult migration and holding temperature objectives will help protect EFH year-round.

The HAPCs, which occur within this segment of the Sacramento River include complex channels and floodplain, thermal refugia, and spawning habitat. Listed fish species using these habitats are winter and spring-run Chinook salmon, and these fishes have been addressed in species-specific chapters of the 2021 Consultation on the Long-Term Operation of the Central Valley Project and State Water Project Biological Assessment. Non-listed Pacific salmon using these habitat areas include fall-run/late fall-run Chinook salmon. The Proposed Action conservation measures for the Sacramento River are outlined below.

3.2 Sacramento River Proposed Action Conservation Measures

3.2.1 Sacramento River seasonal operations (Complex Channels and Floodplain Habitats, Thermal Refugia, and Spawning Habitat Areas of Potential Concern)

Seasonal operation of Shasta and Keswick dams, as described by the Proposed Action, include storing and releasing water to control flows, which affects complex channel and floodplain habitat as well as spawning habitat components of EFH in the Sacramento River. The seasonal flows modeled under the Proposed Action in the Sacramento River below Keswick Dam show high summer and early fall flows with lower managed flows in the winter and spring. Modeling of the Proposed Action throughout the water year show average flows are only slightly augmented (above & below) or unchanged from current operations for all water year types.

Depending on the time of year, higher flows may negatively impact spawning habitat. Too high of flows during spawning, could result in depths and flow velocities above suitable levels for redd construction. Increasing flows may also scour the river channel, impacting existing redds limiting egg and juvenile viability (NMFS 2017). Flow values above ~10,000 cfs are predicted to reduce spawning area and scouring may begin to occur above ~ 18,000 cfs in areas (NMFS 2019; Bureau of Reclamation 2020). Average flow values above ~10,000 cfs in the months February and July may reduce spawning area for late-fall and winter-run Chinook salmon. When compared to the No Action Alternative, the Proposed Action is estimated increase in flows during some months with little expected change in suitable redd habitat. Modeled estimates of the Proposed Action expect the maximum flow to reach 40,000 cfs in the late

winter and early fall months. However, these maximum flows are identical or less than the No Action Alternative during these months; therefore, scour risk is not expected to adversely change under the Proposed Action.

Low flow conditions during the late fall and winter within the spawning reaches of the upper Sacramento River, could have adverse effects on spawning habitat, complex channel, and floodplain habitats. As described by Windell et al. (2017), potential adverse effects of low flows include reduced spawning area, and redd dewatering. These reduced flow effects are expected when average flow is less than ~3,500 cfs (Bureau of Reclamation 2020). There are zero months when average flow is below 3,500 in both the No Action Alternative and Proposed Action. However, estimated minimum flows for September through May could temporarily reduce spawning area for winter and spring-run Chinook salmon. Modeling of the Proposed Action shows a difference in minimum and average flows that could be less than current operations during these months, suggesting minimal adverse effects from minimizing releases from Shasta and Keswick dam during the fall and winter.

Seasonal operation of Shasta and Keswick dams, as described by the Proposed Action, include storing and releasing water to blend different temperatures of water in Shasta and Keswick Reservoirs, which affects thermal refugia in the upper Sacramento River. Increased water temperatures may potentially adversely affect thermal refuge for eggs, juveniles, and adult Pacific salmon. Blending of water for temperature control releases from Shasta Reservoir may begin as early as April as storm frequency decreases and air temperatures and system-wide demands increase.

Reclamation operates for temperature management targets of 56.0° F, daily average at the Sacramento River Red Bluff Diversion Dam and 53.5° F below Clear Creek during winter-run Chinook salmon spawning months (May-August). Modeled average temperature typically remains below the threshold of 56.0° F, in all months for all water year types. During winter-run Chinook salmon spawning, average temperatures at Clear Creek are estimated to remain below the threshold in June and July with no change in the current operations for May and August. Increases in temperature above the 56.0° F target will occur only to conserve storage under drought conditions, however, continued temperature control will occur during critical periods to support fish health and habitat protection. Further, seasonal operations are managed by Reclamation in cooperation with the Shasta Operations Team (SHOT), and in support of the Winter-run Action Plan with National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Service (USFWS), California Department of Fish and Wildlife (CDFW), California Department of Water Resources (DWR) and Sacramento River Settlement Contractors (SRSC).

3.2.2 Sacramento River Ramping Rates (Spawning Habitat Areas of Potential Concern)

Seasonal operation of Shasta and Keswick dams, as described by the Proposed Action, include storing and releasing water to control flows, which affects complex channel and floodplain habitat as well as spawning habitat components of EFH in the Sacramento River. Releases from Keswick Dam may fluctuate from base flows to accommodate changes in seasonal operations, pulse flows, flood control, and other management activities.

3.2.3 Sacramento River Fall and Winter Baseflows for Shasta Refill and Redd Maintenance (Thermal Refugia, and Spawning Habitat Areas of Potential Concern)

Potential redd dewatering or stranding of juveniles could occur if minimum base flows are reduced. Minimum baseflows of 3,200 cfs will occur for End of September Storage equal to or less than 2.4-million-acre feet. The Proposed Action shows a minimal decrease in flows for December through February under all water year types suggesting minimal adverse effects to spawning habitat areas from flow management.

3.2.4 Sacramento River Minimum Instream Flows (Complex Channels and Floodplain Habitats, Thermal Refugia, and Spawning Habitat Areas of Potential Concern)

Expected changes in flow under this Proposed Action would occur most often in the winter months, possibly impacting fall-run/late fall-run, winter, and spring Chinook salmon. However, modeled minimum winter flows (December through February average) show a minimal difference between the Proposed Action and the No Action Alternative. The largest change in minimum flow is projected to occur in December, January, and February, with no change in temperature or the minimum baseflow during those same months. The Proposed Action shows minimal adverse effects to fall-run/late fall-run, winter, and spring Chinook salmon. In addition, modeling of the increased storage attained through this Proposed Action supports it aids in operational temperature and flow objectives benefitting ESA-listed species.

3.2.5 Sacramento River Pulse Flows (Complex Channels and Floodplain Habitats, and Spawning Habitat Areas of Potential Concern)

Spring pulse flows are designed to benefit Pacific salmon within the watershed by triggering an outmigration response in juveniles and increasing both river velocity and turbidity, which may reduce predation pressures. These pulses are modeled after historic spring freshet (snowmelt) flows, which would have occurred annually during this time. The timing of spring pulse flows may overlap with outmigrating juvenile spring and fall-run Chinook salmon, late-fall Chinook salmon spawning and incubation, and winter-run Chinook salmon adult migration. Increasing flows for a spring pulse may negatively impact spawning habitat for late-fall Chinook by mobilizing sediment or increasing water velocity and depth measurements outside of suitable redd values. However, there is no change from the No Action Alternative for this management activity and risk to any EFH is not expected to increase under the Proposed Action.

3.2.6 Sacramento River Water Temperature and Storage Management (Thermal Refugia, and Spawning Habitat Areas of Potential Concern)

Effects of the Shasta Management Plan on EFH have been outlined in the Proposed Action. Modeling of the Proposed Action shows that during the temperature compliance period, average temperatures at CCR California Data Exchange Center gage are estimated to remain below the threshold in June and July with below or no change in the current operations for May, August, September, and October. Modeled temperature maximums at the CCR compliance point suggest that water temperatures are reduced, the same, or less when compared to the No Action Alternative for most months with no change or a reduction in the average temperature.

Increased water temperatures in August and October may impact migrating adult fall and spring-run Chinook salmon, spawning fall and spring-run Chinook salmon, rearing and outmigrating late-fall and winter-run Chinook salmon. Maintaining fall and winter baseflow

and water temperature compliance will help to mitigate these temporary temperature maximums. Reclamation may also request that the SRSC employ some of their voluntary actions identified in their resolution to help improve water temperature management and/or protect against winter-run Chinook salmon redd dewatering and fall-run Chinook salmon stranding. In addition, the SRSCs are expected to have an action under the VA to make water available for the purposes of benefiting aquatic species in the upper Sacramento River.

3.2.7 Sacramento River Rice Decomposition Smoothing (Spawning Habitat Areas of Potential Concern)

This action benefits listed and unlisted Pacific salmon species in the Sacramento River and is unaltered from the No Action Alternative.

3.2.8 Sacramento River Adult Migration and Holding Water Temperature Objectives (Complex Channels and Floodplain Habitats, and Thermal Refugia Habitat Areas of Potential Concern)

Spring temperatures can impact winter-run Chinook salmon adults in multiple ways (gamete viability, spawning initiation, temperature shock, adult migration, disease risk, interaction with thiamine deficiency) as well as late fall-run Chinook salmon (impacts to redds). Water temperatures in the March through May period (prior to the start of the typical temperature management season) are typically well under any thresholds of concern for adult migration and adult holding. It is possible that high air temperatures and/or an intentional warm-water power bypass could cause warmer temperatures than normal and may require additional protective measures. Under a circumstance where these conditions may cause water temperatures to rise to concerning levels prior to the final temperature management plan, Reclamation will begin temperature management as early as March 1st to target water temperatures of 58.0° F daily average at the Sacramento River above Clear Creek gage (CCR) to ensure thermal refugia habitat areas. There is no change from the No Action Alternative for this management activity under the Proposed Action and risk to any EFH is not expected to increase.

Reclamation, through the SRG and SHOT, may propose a different temperature based on potential impacts to winter-run Chinook salmon spawning and egg incubation in the developing temperature management plan. Section 3.14 Adaptive Management includes a proposal to look more closely at these pre-spawning temperature objectives and may eventually refine the standard. Additional details on a potential warm-water power bypass to aid in temperature management are included in the drought tool kit and described further in the drought operations priority framework.

3.2.9 Sacramento River Flow and Non-Flow Measures from the Voluntary Agreements (Complex Channels and Floodplain Habitats, and Thermal Refugia Habitat Areas of Potential Concern)

The Shasta Management Plan proposes to integrate Sacramento Basin flow and non-flow measures that are part of the VAs to update and implement the Bay-Delta Water Quality Control Plan. VAs offer a watershed-wide approach that includes new flows, habitat restoration, and a governance and science program that would be deployed adaptively. Specifically, under the VAs, flow and non-flow actions covered under this Proposed Action are not intended to conflict with the State Water Board's Narrative Salmon Objective of the Narrative Viability Objective once adopted. Integration of VA measures will increase complex channels and floodplain habitats and risks to this HAPC is expected to decrease. There is no change from the No Action Alternative for this alternative regarding thermal refugia and risk to

this HAPC is not expected to increase.

3.2.10 Wilkins Slough Minimum Flow Criteria Relief (Complex Channels and Floodplain Habitats, Thermal Refugia and Spawning Habitat Areas of Potential Concern)

During certain conditions and seasons, Shasta releases provide a substantial portion of the flow passing Wilkins Slough. In a dry year, summer flows at Wilkins Slough would be lower than 5,000 cfs as part of the Wilkins Slough Minimum Flow Criteria Relief conservation measure. In these years, Reclamation will target a minimum flow of 3,400 cfs. Starting in October, fall flows may vary due to demands, water transfer operations and protection of winter-run Chinook salmon redds and are likely to be in the 3,250 – 5,000 cfs range although higher flows may be necessary at times. After the irrigation season, Reclamation expects to begin ramping down to the minimum release of 3,250 cfs as soon as possible given deliveries, Delta conditions and winter-run Chinook salmon redd dewatering concerns. Reclamation, through coordination with the SHOT, will determine the appropriate ramp down date after evaluating tradeoffs between Shasta Reservoir storage, next year's water temperature management, winter-run Chinook salmon redd dewatering and fall-run Chinook salmon stranding and redd dewatering. This action may potentially increase thermal refugia and potential risk to this HAPC is expected to decrease. This action may potentially decrease spawning habitat and potential risk to this HAPC is expected to increase. There is no change from the No Action Alternative regarding complex channel and floodplain habitats and risk to this HAPC. is not expected to increase.

3.2.11 Rebalancing between other CVP Reservoirs (Complex Channels and Floodplain Habitats, and Thermal Refugia Habitat Areas of Potential Concern)

Under the Rebalancing between other CVP Reservoirs conservation measure, Sacramento River releases may decrease in dry years as one approach to conserving storage in Shasta Reservoir. In these years, the primary management goals are to target meeting 53.5F at CCR during the winter-run Chinook salmon spawning and egg incubation period and to manage water supply to support a carryover that provides some drought protection. The temperature management objectives may be shaped through SRG and SHOT based on forecasted and/or real-time meteorologic and hydrologic conditions and best available science. Reclamation will consider water supply (CVP allocation) reductions and, through coordination with the SHOT, will identify moderate system-wide tradeoffs and potential transfer modifications with the goal of meeting both of these temperature and storage goals. Moderate system wide tradeoffs general include, but are not limited to, rebalancing between other CVP reservoirs with moderate impacts to other parts of the system. This conservation measure is likely to not change the quantity of complex habitats and potentially increase thermal refugia habitat areas.

3.2.12 Limitation on CVP Allocations for End of September Storage (Complex Channels and Floodplain Habitats, and Thermal Refugia Habitat Areas of Potential Concern)

Under the Limitation on CVP allocations for End of September Storage conservation measure, Reclamation's water supply reductions may occur in dry water years, with the goal of conserving storage and meeting minimal water temperature objectives. Limitation on allocations may increase end of September storage which may provide increased coldwater pool in the following year; Reclamation will consider water supply (CVP allocation) reductions and, through coordination with the SHOT, will identify moderate system-wide tradeoffs and

potential transfer modifications with the goal of meeting both temperature and storage goals. Moderate system wide tradeoffs general include, but are not limited to, rebalancing between other CVP reservoirs with moderate impacts to other parts of the system. This action will likely increase thermal refugia habitat and risk to this HAPC is expected to decrease. This action will not change from the No Action Alternative for this alternative regarding complex channels and floodplain habitats and risk to this HAPC is not expected to increase.

3.2.13 Modifications to Water Transfers (Complex Channels and Floodplain Habitats, and Thermal Refugia Habitat Areas of Potential Concern)

Under the Modifications to Water Transfers conservation measure, Reclamation may request that the SRSC shift timing of delivery of transfer water during the typical irrigation season (April through September) to help improve water temperature management and/or protect against winter-run Chinook salmon redd dewatering and fall-run Chinook salmon stranding. Sacramento River flows would increase, and storage in Shasta Reservoir would be reduced. If the SHOT denies water transfers, the water would be delivered, and Shasta Reservoir would have less coldwater pool. Essential Fish Habitat effects from this conservation measure would be minimal or would not change during the spring and summer relative to the No Action Alternative.

3.2.14 Situation-Specific Adjustments to Delta Water Quality Standards (Complex Channels and Floodplain Habitats, and Thermal Refugia Habitat Areas of Potential Concern)

Under the Situation-specific Adjustments to Delta Water Quality Standards under D-1641 conservation measure, Sacramento River flows may decrease in dry years as one approach to conserving storage in Shasta Reservoir. Relaxation of Delta outflow and salinity requirements historically occur in the winter, spring, and summer. Essential Fish Habitat effects from this conservation measure would not change during the summer relative to the No Action Alternative. During the winter and spring, EFH effects from this conservation measure would be minimal relative to the No Action Alternative.

3.2.15 Limitations in Sacramento River Settlement Contractors Water Available Under Contract (Complex Channels and Floodplain Habitats, and Thermal Refugia Habitat Areas of Potential Concern)

Under the Limitations in SRSC Water Available Under Contract conservation measure, Sacramento River flows may decrease in the spring, summer, and fall of dry years as one approach to conserving storage in Shasta Reservoir. Essential Fish Habitat effects from this conservation measure would not change during the spring and summer relative to the No Action Alternative. During the fall, EFH effects from this conservation measure would be minimal relative to the No Action Alternative.

3.2.16 Refuge Coordination for Instream Flow, Lake Levels, and Refuge Needs (Complex Channels and Floodplain Habitats, Thermal Refugia and Spawning Habitat Areas of Potential Concern)

Under Refuge Coordination for Instream Flow, Lake Levels and Refuge Needs conservation measure, Shasta Reservoir releases to refuges in the summer and fall may decrease during the driest of years as a way to increase Shasta Reservoir storage. Essential Fish Habitat effects from this conservation measure would be minimal during the summer and fall relative to the No Action Alternative.

3.2.17 Egg Incubation and Emergency Water Temperature Objectives (Complex Channels and Floodplain Habitats, Thermal Refugia, and Spawning Habitat Areas of Potential Concern)

Water temperature management generally occurs from May 15 through October 30th; however, start and end dates may be adjusted through coordination with the SRG and SHOT based on the winter-run Chinook salmon spawning and emergence. Water temperature management would target 53.5°F at locations identified in the Proposed Action. The application of Victorian Objectives will be applied to support a greater habitat extent, duration and frequency on the Sacramento River below Keswick Dam, when storage resources allow, water temperature management will expand habitat for early or later spawners, spawners further downstream, and juveniles rearing.

3.2.18 Drought Operations Priority Framework (Complex Channels and Floodplain Habitats, Thermal Refugia, and Spawning Habitat Areas of Potential Concern)

Under certain conditions, such as prolonged drought or unexpected hydrologic conditions, the February 90% forecast may indicate that EOS is projected to be less than 2.0 MAF. Under these conditions, Reclamation will develop a drought emergency plan that, at a minimum, will include the following actions with the goal of achieving a projected EOS storage as close to 2.0 MAF as possible:

- Evaluation of system priorities.
- Plan to continue to pursue all applicable 3B actions.
- Full assessment of hydrologic and ecosystem conditions.
- Assessment of Public Health and Safety needs.
- Managing salinity to meet basic public health and safety needs.
- Ability to meet demands for public health and safety water deliveries.
- Enhanced coordination between the SHOT, Directors and SRSCs.
- After exploring all applicable 3B actions, develop a Temperature Management Plan which accounts for the drought emergency plan and applies the best available approaches for managing the available coldwater supply to best balance tradeoffs between the spatial and temporal extent of winter-run Chinook salmon suitable habitat while considering impacts to other species.

All actions in the Drought Toolkit will also be considered. Over the long-term additional actions are being considered or implemented to provide improved conditions for species during future droughts in addition to the actions identified in this plan:

- Designing habitat projects with drought refugia and resilience in mind
- Investments in other habitats for salmon spawning
- Consider objectives when planning for and implementing other water projects

Management Rationale: In these circumstances, all of the relevant Bin 3B actions will be considered but there is a low likelihood that taking all of the actions would increase forecasted EOS conditions above 2.0 MAF and therefore, Reclamation, in coordination with the SHOT

and WOMT, will develop a drought emergency plan that establishes system priorities and a temperature management plan that seeks to provide winter-run Chinook salmon spawning temperatures to avoid catastrophic losses related to summer temperature management. Essential Fish Habitat effects from this conservation measure would be minimal during the summer and fall relative to the No Action Alternative.

3.3 13.3.2 Clear Creek – Water Quality, Flow Variables, and Habitat Parameters

Reclamation operates and maintains Whiskeytown Dam on Clear Creek as described in Section 2.5 above.

The overall water quality including dissolved oxygen and temperature within Clear Creek's EFH is dependent on releases from the Whiskeytown Reservoir in addition to inflow from tributaries and urban and agricultural runoff. Flows within the Clear Creek watershed can be highly variable from year to year, dependent on drought cycles, the state of existing water storage in Whiskeytown lake, and available inflows. These variations in flow are a source of uncertainty in Clear Creek's water quality. The maximum change in flows is expected to occur during critically dry water years. During the summer and early fall, Reclamation operates to provide lake elevations as full as practical for recreation. This strategy helps to maintain Whiskeytown Lake elevations, which provide cool water releases to Clear Creek for temperature control objectives. Seasonal operation of Whiskeytown Reservoir includes storing and releasing water to control flows, which may affect complex channels and floodplain habitat as well as spawning habitat and thermal refugia components of EFH within Clear Creek.

Dissolved oxygen and water temperature are generally related, with warmer waters supporting decreased dissolved oxygen. Reductions in dissolved oxygen and elevated temperatures can adversely impact salmon spawning, rearing, and holding habitats. Changes in flow in Clear Creek under the Proposed Action would generally increase in the winter and spring months and decrease during the summer and fall months as compared to the No Action Alternative. During periods of reduced flow (June - October) temperature and dissolved oxygen may be adversely affected and impact EFH and thermal refugia and spawning HAPCs. Pacific salmon in Clear Creek during these critical months include adult fall, winter, and spring-run Chinook salmon, as well as incubating and juvenile fall-run/late fall-run, winter, and spring-run Chinook salmon. Impacts to listed species from changes in temperature under the Proposed Action are covered in species specific chapters of the 2021 Consultation on the Long-Term Operation of the Central Valley Project and State Water Project Biological Assessment. Differences in water temperature under the Proposed Action for fall-run/late fall-run Chinook salmon EFH are expected to be similar to the No Action Alternative for spawning habitat and juvenile thermal refugia, but minimally adverse for adult thermal refugia. Flows under the Proposed Action may beneficially affect spawning habitat with a potential increase in wetted usable area for fall-run/late fall-run Chinook salmon EFH. Changes in flow may minimally affect complex channel and floodplain habitat for holding and migrating fall-run/late fall-run Chinook salmon.

The HAPCs, which occur within Clear Creek include complex channels and floodplain, thermal refugia, and spawning habitat. Listed fish species using these habitats are spring-run Chinook salmon, these fishes have been addressed in species specific chapters of the 2021 Consultation on the Long-Term Operation of the Central Valley Project and State Water Project Biological Assessment. Non listed Pacific salmon using these habitat areas include fall-

run/late fall-run Chinook salmon. The Proposed Action conservation measures for Clear Creek are outlined below.

3.4 Clear Creek Proposed Action Conservation Measures

3.4.1 Seasonal Operations: Minimum Instream Flows and Ramping Rates (Complex Channels and Floodplains Habitat, thermal refugia, and spawning habitat Areas of Potential Concern):

Impacts to depth and velocity habitat values under the Proposed Action are often closely tied to the amount of water in the system and being released from Whiskeytown Dam into Clear Creek. Sufficient flow is required to inundate and create complex channels and floodplain habitat and maintain suitable spawning habitat.

Reclamation will release water through Whiskeytown Dam to provide intra-annual variation to emulate natural processes. Flows will oscillate over a one-year period, with releases transitioning from 300 cfs in the winter, down to 100 cfs in the summer, and back to 300 cfs by the following winter. In critical years, Reclamation will target an average 150 cfs based on available water from Trinity Reservoir and attempt to maintain above 100 cfs. Reclamation, through the CCTT, may modify the timing and flow rates by February 1 and updated through May on a case-by-case basis. The flow schedule is subject to agreement by Redding Electric Utility for use of their facilities.

Modeling of the Proposed Action throughout the water year shows average monthly flows are generally above or unchanged from the No Action Alternative for all months in all water year types except the months of February and June through October when Reclamation begins rebuilding storage. Modeled average flows are reduced in the late summer and fall but remain above the target flow (150 cfs) for most months.

Low flow conditions during the summer, may affect Pacific salmon EFH within Clear Creek, impacting spawning habitat as well as complex channel and floodplain habitats. Lower than historic flows may reduce the amount of suitable spawning area available and create conditions where some water depths and velocities are below suitable levels for redd construction. Reductions in flows after spawning has occurred may also result in redd dewatering or decreased dissolved oxygen levels, which both limit the viability of incubating eggs. Lower flows may also disconnect floodplain or side channel habitats reducing the extent and complexity of adult holding and juvenile rearing habitats. Pacific salmon in Clear Creek during these months include spawning adult spring-run and occasionally adult winter-run Chinook salmon, as well as rearing or outmigrating juvenile late-fall, winter, and spring-run Chinook salmon.

To limit adverse effects on spawning EFH in Clear Creek and in consideration of listed species, Reclamation will use down ramping rates of up to 25 cfs per hour and schedule these reductions in consideration of listed species behavior (e.g., diel movement patterns). These rates may discourage redd construction during flow reductions. The Clear Creek Ramping Rates conservation measure addresses the stranding risk stressor by minimizing the rate of flow decreases during controlled flow reduction.

Reclamation may vary from these ramping requirements during flood control. Reclamation,

through Clear Creek Technical Team (CCTT), may develop a faster or slower down ramping rate on a case-by-case basis. Seasonal operation of Whiskeytown Dam includes storing and releasing water to control flows, which may affect complex channels and floodplain habitat as well as spawning habitat and thermal refugia components of EFH within Clear Creek.

3.4.2 Clear Creek Pulse Flows (Complex Channels and Floodplains Habitat Areas of Potential Concern):

Spring pulse flows in Clear Creek are designed to benefit Pacific salmon within the watershed by triggering adult migration into Clear Creek and providing geomorphic stream maintenance including mobilizing injection gravel and fostering wood recruitment, benefiting spawning habitat and increasing channel complexity. Increases in flow often also provide reduced temperatures, which may improve thermal refugia and adult Chinook Salmon holding and spawning habitat within Clear Creek. The threatened status of this species and limited available habitat in the upper reaches of the Sacramento River necessitates management provisions including spring pulses, to support and protect the population. In addition to improving spring-run Chinook salmon habitat, the timing of spring pulse flows may overlap with late-fall-run Chinook salmon spawning and incubation, fall-run/late fall-run Chinook salmon juvenile outmigrations, and winter-run Chinook salmon adult migration. These pulses may coordinate or alternate with pulse flows on the mainstem Sacramento River, possibly providing an additive benefit for mainstem populations including winter-run Chinook salmon. However, increasing flows for a spring pulse may adversely impact spawning habitat for late-fall-run Chinook by mobilizing sediment or increasing water velocity, and depth to measurements outside of suitable values for redd construction. These actions, however, are temporary and overall expected to benefit both listed and non-listed fish species. There is no change from the No Action Alternative for this management activity under the Proposed Action and risk to EFH is not expected to increase.

3.4.3 Clear Creek Water Temperature Management (Thermal Refugia Habitat Areas of Potential Concern):

Flow changes completed for temperature management in the late-summer or fall, implemented at 25-cfs increments, would be maintained until the base flow of the seasonal hydrograph rises to meet the elevated temperature release. For example, if flows were increased to 150 cfs on September 10 to decrease water temperatures, they would remain there until October 23 when the hydrograph would normally increase to 175 cfs. This relieves the need to down ramp during spawning and potentially dewater redds. If additional flows are needed to meet temperature in late spring or summer during a hot spell for instance, ramp-down to base flow would occur when meteorological conditions allow. This action will likely not change thermal refugia habitat and risk to this HAPC is not expected to increase.

3.4.4 Clear Creek Segregation Weir (Spawning Habitat Areas of Potential Concern):

There is no change from the No Action Alternative for this management activity under the Proposed Action and risk to any EFH is not expected to increase.

3.5 American River - Water Quality, Flow Variables, and Habitat Parameters

The overall water quality including dissolved oxygen and temperature within the American

River's EFH is dependent on releases from Folsom and Nimbus Dams in addition to inflow from tributaries, urban and agricultural runoff and other reservoirs. Flows within the American River watershed can be highly variable from year to year, dependent on drought cycles, the state of existing water storage, and available inflows. These variations in flow are a source of uncertainty for the American River's water quality. Seasonal operation of Folsom Reservoir includes storing and releasing water to control flows, which may affect complex channels and floodplain habitat as well as spawning habitat and thermal refugia components of EFH within the American River. Impacts to depth and velocity habitat values under the Proposed Action are often closely tied to the amount of water in the system and being released from the Folsom/Nimbus Dam complex into the American River. Sufficient flow is required to inundate and create complex channels and floodplain habitat and maintain suitable spawning habitat. Modeling of the Proposed Action throughout the water year shows the maximum change in flow is expected to occur during critically dry water years. Complex channel and spawning habitats are accessible across the expected range of flows, and flow decreases are not expected to be large enough to adversely impact depth or velocity.

Dissolved oxygen and water temperature are generally related, with warmer waters supporting decreased dissolved oxygen. Reductions in dissolved oxygen and elevated temperatures can adversely impact salmon spawning, rearing, and holding habitats. Reclamation operates the Folsom/Nimbus Dam complex and blends releases through the water temperature control shutters at Folsom Dam to maintain a daily average water temperature of 65°F or lower at Watt Avenue Bridge from May 15 through September 30, reduced to 60°F by October 15, and 56°F by November 1. During periods of elevated air temperatures or reduced flow, water temperature and dissolved oxygen may be adversely affected and impact water quality EFH.

Modeling was used to estimate the temperature at the American River temperature compliance gage to illustrate the impact of the Proposed Action on thermal refugia and spawning habitat for American River Pacific salmon and where it differs from the No Action Alternative. Modeled temperature maximums at the Watt Avenue temperature compliance point are projected to be below, the same, or less than the No Action Alternative for all months. Differences in water temperature under the Proposed Action are expected to be similar to the No Action Alternative for fall-run Chinook salmon juvenile and adult thermal refugia, and spawning habitat.

The HAPCs, which occur within the American River include complex channels and floodplain, thermal refugia, and spawning habitat. Listed fish species using these habitats are occasional winter and spring-run Chinook salmon passing into the lower American River from other rearing streams, these fishes have been addressed in species specific chapters of the 2021 Consultation on the Long-Term Operation of the Central Valley Project and State Water Project Biological Assessment. While no winter or spring-run Chinook salmon habitat has been designated in the American River the presence of juveniles utilizing the lower river has been documented, as such they may also benefit from American River conservation measures. Non listed Pacific salmon using these habitat areas consist of fall-run Chinook. The Proposed Action conservation measures for the American River are outlined below.

3.6 American River Proposed Action Conservation Measures

3.6.1 Seasonal Operations Minimum instream flows and Ramping rates, (Complex Channels and Floodplain Habitats, Thermal Refugia, and Spawning Habitat Areas of Potential Concern):

Under the American River Minimum Instream Flows conservation measure, Reclamation will operate to minimum release requirements (MRRs) ranging from 500 to 2,000 cfs based on time of year and annual hydrology. The flow schedule is intended to provide suitable habitat conditions fall-run Chinook salmon. Modeling of the Proposed Action throughout the water year shows average monthly flows are similar to the No Action Alternative for all months in all year types except critically dry years when flows are either greater than or less than the No Action Alternative. Modeled average flows are reduced in the late summer and fall but remain above the minimum baseflow (500 cfs) for all months in all year types. In addition, the increased storage attained through the Proposed Action may aid in operational temperature and flow objectives benefiting EFH. This action will likely increase thermal refugia habitat and risk to this HAPC is expected to decrease. This action will not change from the No Action Alternative for this alternative regarding complex channels and floodplain habitats, thermal refugia, and spawning habitats and risk to these HAPCs is not expected to increase. Low flow conditions during the fall, may affect Pacific salmon EFH within the lower American River, impacting spawning, thermal refugia, and complex channel and floodplain HAPCs. Lower than historic flows may reduce the amount of suitable spawning area available and create conditions where some water depths and velocities are below suitable levels for redd construction. Reductions in flows after spawning has occurred may also result in redd dewatering or decreased dissolved oxygen levels, which both limit the viability of incubating eggs. Lower flows can disconnect floodplain or side channel habitats reducing the extent and complexity of adult holding and juvenile rearing habitat. The American River Minimum Instream Flows conservation measure may also decrease thermal refugia in some years by decreasing water storage in support of minimum instream flows, which could in turn reduce the available coldwater pool later in the season. Pacific salmon in the lower American River during the fall months are migrating and spawning adult fall-run Chinook salmon.

To limit adverse effects on spawning EFH in the lower American River and in consideration of listed species, Reclamation will limit down-ramping rates. These rates may discourage redd construction during flow reductions. Reclamation will ramp down releases in the American River below Nimbus Dam as described in the Proposed Action.

3.6.2 American River Pulse Flows (Complex Channels and Floodplains Habitat Areas of Potential Concern):

Spring pulse flows in the lower American River are designed to benefit Pacific salmon within the watershed by triggering juvenile outmigration and providing some geomorphic stream maintenance including mobilizing injection gravel and fostering wood recruitment, benefiting spawning habitat and channel complexity. A spring pulse flow provides the juvenile salmonid emigration cue before relatively low water flow and associated unsuitable thermal conditions occur later in the spring, which may help to reduce thermal refugia stressors. In addition to improving fall-run Chinook salmon habitat, the timing of spring pulse flows may overlap with juvenile winter-run Chinook salmon migration and the migration of adult and juvenile steelhead. There is no change from the No Action Alternative for this management activity

under the Proposed Action and risk to EFH is not expected to increase.

3.6.3 Folsom Reservoir Flow and Temperature Management (Thermal Refugia Habitat Areas of Potential Concern):

Implementation of the ATSP supports fall-run and limits the water temperature stressors on steelhead during suitable year types. In years with unsuitable temperatures for rearing or spawning in the lower American River, Reclamation would meet with fisheries agencies to consider modification to the ATSP to minimize temperature impacts to fisheries. There is no change from the No Action Alternative for this management activity under the Proposed Action and risk to EFH is not expected to increase.

3.6.4 American River Redd Dewatering Protective Adjustment (Spawning Habitat Areas of Potential Concern):

As described in the Proposed Action, to reduce impacts to and potential dewatering of fall-run Chinook salmon redds, Reclamation will adjust the required baseflow in the lower American River based on the current minimum release requirements during spawning months. There is no change from the No Action Alternative for this management activity under the Proposed Action and risk to EFH is not expected to increase.

3.7 Stanislaus River- Water Quality, Flow Variables, and Habitat Parameters

The overall water quality including dissolved oxygen and temperature within the Stanislaus River's EFH is dependent on releases from New Melones and Goodwin reservoirs, natural accretions, in addition to urban and agricultural runoff. Flows within the Stanislaus River watershed can be highly variable from year to year, dependent on drought cycles, the state of existing water storage, and available inflows. These variations in flow are a source of uncertainty in the Stanislaus River's water quality. Modeling suggests monthly average flows below Goodwin Dam under the Proposed Action are higher in December, February, July, and August and lower in April compared to the No Action Alternative. Seasonal operation of Eastside Reservoir includes storing and releasing water to control flows, which may affect complex channels and floodplain habitat as well as spawning habitat and thermal refugia components of EFH within the Stanislaus River.

Dissolved oxygen and water temperature are generally related, with warmer waters supporting decreased dissolved oxygen. Reductions in dissolved oxygen and elevated temperatures can adversely impact salmon spawning, rearing, and holding habitats. Reclamation is required to maintain applicable dissolved oxygen standards on the lower Stanislaus River for species protection. The 7.0 milligrams per liter (mg/L) dissolved oxygen requirement at Ripon applies year-round but is most often controlling (requiring additional releases from Goodwin Dam) from June 1 to September 30. During periods elevated air temperatures or reduced flow, water temperature and dissolved oxygen may be adversely affected and impact EFH HAPCs. Modeled temperature maximums at the Orange Blossom Bridges Temperature Compliance Point are projected to be below, the same, or less than the No Action Alternative for all months.

Other contributors to reduced water quality in the Stanislaus River include water inputs contaminated by mercury from legacy mining runoff, and pesticides, as well as unknown toxic substances. Differences in water temperature and quality under the Proposed Action are

expected to be similar to the No Action Alternative for fall-run Chinook salmon juvenile and adult EFH. However, any adverse changes in flow and temperature may affect dissolved oxygen, complex channel, thermal refugia, and floodplain habitat for migrating, spawning, and rearing fall-run Chinook salmon.

The HAPCs, which occur within the Stanislaus River include complex channels and floodplain, thermal refugia, and spawning habitat. Non listed Pacific salmon using these habitat areas consist of fall-run Chinook salmon. The Proposed Action conservation measures for the Stanislaus River are outlined below.

3.8 Stanislaus River Proposed Action Conservation Measures

3.8.1 Seasonal Operations: Minimum instream flows and Ramping rates (Complex Channels and Floodplain Habitats, Thermal Refugia, and Spawning Habitat Areas of Potential Concern):

In the winter and spring, Reclamation will operate to State Board Decision-1641 and for flood control in accordance with the USACE Standard Operation and Maintenance Manual for the Lower San Joaquin River Levees Lower San Joaquin River and Tributaries Project, California (April 1959). However, operating to flood control constraints is relatively infrequent because New Melones is a larger reservoir relative to its annual inflow.

Minimum instream flows will be in accordance with the 2023 New Melones Stepped Release Plan (2023 SRP). Modeling of the Proposed Action throughout the water year shows average monthly flows are generally above, unchanged, or less than the No Action Alternative for all months.

Low flow conditions during the fall, may affect Pacific salmon EFH within the Stanislaus River, impacting spawning, thermal refugia, and complex channel and floodplain HAPCs. Lower than historic flows may reduce the amount of suitable spawning area available and create conditions where some water depths and velocities are below suitable levels for redd construction. Reductions in flows after spawning has occurred may also result in redd dewatering or decreased dissolved oxygen levels, which both limit the viability of incubating eggs. Lower flows can disconnect floodplain or side channel habitats reducing the extent and complexity of adult holding and juvenile rearing habitat. Pacific salmon in the Stanislaus River during the fall months are migrating and spawning adult fall-run Chinook salmon. Differences in seasonal operations in the Stanislaus River under the Proposed Action and the No Action Alternative during spawning and incubation periods potentially have generally similar or beneficial impacts on fall-run Chinook salmon habitat.

To limit adverse effects on spawning EFH in the Stanislaus River, Reclamation will limit down-ramping rates. These rates may discourage redd construction during flow reductions. The Stanislaus River Ramping Rates conservation measure addresses the stranding risk stressor by minimizing the rate of flow decreases during controlled flow reduction. Reclamation, through the Stanislaus Watershed Team (SWT), may develop a faster down-ramping rate on a case-by-case basis to implement temporary flow reductions for critical monitoring or maintenance needs. Consideration for ramping rates that promote recruitment of native riparian vegetation on floodplain surfaces should be implemented when instream flow budgets are sufficient.

3.8.2 Spring pulse flows, fall pulse flows, and winter instability flows (Complex Channels and Floodplains Habitat Areas of Potential Concern):

Under the Stanislaus River Spring Pulse Flows conservation measure, Reclamation will release additional flows starting as early as March through as late as June. Reclamation, through the SWT, will schedule spring pulse flow volumes consistent with volumes in the SRP. The Spring Pulse Flows conservation measure may increase the migratory and shallow-water habitat and increase temperature buffering for Pacific salmonid EFH.

Under the Fall Pulse Flows conservation measures, Reclamation will release additional flows in October and/or November. Reclamation, through the SWT, will schedule fall pulse flow volumes consistent with the volumes in the SRP, and considering other system objectives. Fall pulse flows improve instream conditions and provide an attraction cue for adult fall-run Chinook salmon returning to spawn.

Under the Winter Instability Flows conservation measure, Reclamation releases additional flow in February, as provided in the SRP, to simulate natural variability in the winter hydrograph and to enhance access to varied rearing habitats. Reclamation, through the SWT, schedules the winter instability flow volume. Whenever possible, the pulse is scheduled to coincide with a natural storm event, which may naturally cue outmigration. In some years, natural rain events may provide sufficient natural variability in the hydrograph and an additional pulse may be determined necessary. Reclamation, through the SWT, will prepare an assessment when rain events meet the need for winter instability flows reducing the need for additional releases. The Winter Instability Flows conservation measure may increase thermal refugia habitat for fall-run Chinook salmon.

Pulse Flows conservation measures may increase the water temperature and dissolved oxygen stressors by decreasing storage of water in the reservoir. However, these conservation measures for the Stanislaus River are consistent with those that occur under the No Action Alternative, resulting in no change in EFH. The measures provide benefits to complex channels and floodplain HAPCs and benefit to thermal refugia.

3.8.3 Stanislaus River Water Temperature Management (Thermal Refugia Habitat Areas of Potential Concern):

Water temperatures and flows are similar between No Action Alternative and Proposed Action, no change in thermal refugia habitat is expected. Reclamation will continue to study approaches to improving temperature for listed species on the lower Stanislaus River, to include evaluating the utility of conducting temperature measurements/profiles in New Melones Reservoir.

3.9 San Joaquin River

Reclamation would operate the Friant Division consistent with the San Joaquin River Restoration Program Record of Decision, which is a related action not included in this consultation.

3.10 Delta – Water Quality, Flow Variables, and Habitat Parameters

The Delta region includes the lower Sacramento and San Joaquin Rivers, multiple channels, with inputs from many upstream tributaries and tidally from the San Francisco Bay.

Primary factors affecting water quality in the Delta, Suisun Bay, and Suisun Marsh include patterns of land use in the upstream watersheds; inter-annual hydrologic variations; operations of the SWP, CVP, and flow control gates within the Delta and Marsh; and activities and sources of pollutants within and upstream of these water bodies. Point and nonpoint pollutant sources include drainage from inactive and abandoned mines and related debris/sediment from headwaters, industrial and municipal wastewater treatment plant discharges, agricultural return flows, urban storm water runoff, atmospheric deposition, recreational uses, and metabolic waste from wildlife and livestock. Natural erosion, in-stream sediments, and atmospheric deposition also affect water quality. The magnitude of each source's effect correlates with the relative contribution from each source at a given location and can differ by constituent or with hydrologic and climatic conditions during different times of year, and from year-to-year. Further in-depth water quality modeling for the Delta has been included in Appendix G: *Water Quality*, of the 2021 Consultation on the Long-Term Operation of the Central Valley Project and State Water Project Biological Assessment.

The Proposed Action will result in differences in the Sacramento River and San Joaquin River inflow rates into the Delta, when compared to the No Action Alternative, although velocities and depths are tidally driven. These changes are not likely to affect these flow variables from the No Action Alternative for this alternative and risk to flow variables is not expected to increase. DO levels in Delta, Suisun Bay and Marsh, and San Francisco Bay waters are primarily affected by water temperature, flow velocities, nutrients, and the photosynthesis, respiration, and decomposition of aquatic organisms. The Proposed Action is not expected to result in substantial effect on water quality (e.g. DO and water temperature) when compared to the No Action Alternative and risk to this HAPC is not expected to increase.

The HAPCs, which occur within the Delta include complex channels and floodplain, estuary, and marine and estuarine aquatic vegetation. Listed Chinook salmon using these habitats are winter and spring-run Chinook salmon, these fishes have been addressed in species-specific chapters or attachments of the 2021 Consultation on the Long-Term Operation of the Central Valley Project and State Water Project Biological Assessment. Non listed Pacific salmon using these habitat areas include fall-run/late fall-run Chinook salmon. The Proposed Action conservation measures for the Delta are outline below.

3.11 Delta Proposed Action Conservation Measures

3.11.1 Seasonal Operations: Complex Channel and Floodplain, estuary, and marine and estuarine aquatic vegetation Habitat Areas of Potential Concern's impacted by changes in flow, local hydrodynamics, turbidity and suspended sediments):

Reclamation's seasonal operations affect estuarine water quality and EFH for salmonid species through changes in salinity and flow from changes in Delta outflow. There is no change from the No Action Alternative for this management activity under the Proposed Action and risk to EFH is not expected to increase.

3.11.2 Delta cross channel gates closures

The Delta Cross Channel (DCC) Gates Closures conservation measure addresses the outmigration cues and entrainment risk stressor for Chinook Salmon by protecting out-migrating salmonids from entering the interior Delta. Reclamation closes the Delta Cross

Channel during the late fall, winter, and spring to reduce straying of Mokelumne River fall-run Chinook salmon, protect out-migrating salmonids from entering the interior Delta, facilitate the State Water Board D-1641 Rio Vista flow objectives for fish passage, and reduce potential scouring and flooding that might occur in the channels on the downstream side of the gates when Sacramento River flows exceed 20,000 cfs on a sustained basis. DCC closure will continue to occur as described in the Proposed Action. Species potentially impacted by the DCC gates closures conservation measure include fall-run/late fall-run, winter, and spring Chinook salmon. There is no change from the No Action Alternative for this management activity under the Proposed Action and risk to EFH is not expected to increase.

3.11.3 Old and Middle River Flow Management

Under the Old and Middle River (OMR) Flow Management conservation measure, Reclamation will reduce exports to achieve a 7-day average OMR value no more negative than -5,000 cfs for seven consecutive days when the genetically verified 7-day rolling sum of winter-run Chinook salmon early season migration and spring-run Chinook salmon loss, calculated daily, exceeds the calculated thresholds.

If the 7-day rolling sum of winter-run and spring-run Chinook salmon loss, calculated daily, is exceeded during a period of reduced exports, DWR and Reclamation will continue to reduce exports to achieve a 7-day average OMR value no more negative than -5,000 cfs until 7 days after the most recent exceedance. Reclamation and DWR will restrict exports in response of meeting the threshold above based on initial length-at-date identification of natural older juvenile Chinook Salmon.

The OMR management season starts any time after December 1 if an Adult Longfin Smelt Entrainment Protection Action, if appropriate, or First Flush Action occurs (i.e., immediately following completion of the First Flush Action) or any time after December 20 if the turbidity threshold in the Adult Delta Smelt Entrainment Protection Action is reached. If neither the Adult Longfin Smelt Entrainment Protection Action or First Flush Action occurs or the Adult Delta Smelt Entrainment Protection Action is reached, the OMR management season starts automatically on January 1. Once initiated, the OMR index on a 14-day running average will be no more negative than -5,000 cfs until the end of the OMR management season. A reduction in exports to achieve a new OMR index will occur within three days of an action that requires a change in OMR.

3.11.4 Old and Middle River Management Real Time Operations

Differences in hydrology in the Delta under the Proposed Action compared with the No Action Alternative may have effects on flow routing into junctions and the hydrodynamic footprint of the export facilities, which may impact complex channel and floodplain as well as estuary HAPCs for fall-run/late fall-run Chinook salmon.

Under the OMR Management Real Time Operation conservation measure, Reclamation and DWR will manage diversion rates from the South of Delta modified based on abiotic and biotic factors for several listed species in real time and will restrict exports in response of meeting the threshold above based on initial length-at-date identification of natural older juvenile Chinook Salmon. There are changes from the No Action Alternative for this management activity under the Proposed Action, but risks to any EFH is not expected to increase and could be a benefit to sustaining suitable habitat if species are present, by real time operations of the CVP.

3.11.5 Summer and Fall Delta Outflow and Habitat

The Summer and Fall Delta Outflow and Habitat conservation measure is comprised of two components, the Fall X2 action and the operation of the Suisun Marsh Salinity Control Gates. Under the Summer and Fall Delta Outflow and Habitat conservation measure, Reclamation and DWR will maintain a 30-day average $X2 \leq 80$ km for September through November in wet and above normal years. In addition, DWR will operate the Suisun Marsh Salinity Control Gates (SMSCG) for 60 days using a 7 day tidal 7 day open operation (7-7) schedule to maximize the number of days that Belden's Landing three-day average salinity is equal to, or less than, 4 psu in Suisun Marsh and Grizzly Bay from June through October during above normal, below normal years, and dry years following wet or above normal years. Operation of the SMSCG will end by December 1. In dry years following below normal years, DWR will operate SMSCG for 30 days using 7-7 operation to maximize the number of days Belden's Landing three-day salinity is equal to, or less than 6 psu. DWR and Reclamation, through the Delta Coordination Group (DCG), may prepare an assessment to propose an alternative gate operation if modeling of hydrological and/or existing D-1641 conditions indicate the action can achieve the same habitat benefits in an equal or better manner within the range of effects analyzed. Reclamation and DWR, through the DCG, will develop an annual monitoring plan that responds to uncertainties in the performance metrics to evaluate action performance. Reclamation and DWR, through the LTO AMP's Summer-Fall Habitat Action for Delta Smelt, may develop an alternate seasonal X2 action that responds to uncertainties in the performance of the Fall X2 action. DWR and Reclamation will also produce an annual report that summarizes monitoring findings and assesses action performance.

There is no change in flows or salinity from the No Action Alternative for this management activity. The adaptive management action modification under the Proposed Action may modify Delta outflows during the summer and fall, however risk to any EFH is not expected to increase.

3.11.6 Spring Delta Outflow

Under the Spring Delta Outflow conservation measure, Reclamation and DWR will take actions intended to supplement Delta outflow per the terms of the VAs approved by the SWRCB and executed agreements by VA Parties. Actions that will support the additional Delta outflow include the following: (1) Reclamation and DWR south of Delta export modifications; (2) Reclamation reoperating upstream reservoirs to advance and allow for scheduling of water made available by contractors in CVP watersheds; and (3) passing Delta inflow from water made available by VA Parties.

Reclamation Early Implementation: Reclamation, after coordination through WOMT, will provide the CVP Foregone Exports, along with other VA parties taking actions similar to those contemplated by the VAs only if: (i) Reclamation issues a Record of Decision for the coordinated operation of the CVP and SWP that are the subject of the consultation, and (ii) the SWRCB has not updated the Water Quality Control Plan. These early implementation actions are intended to develop data that could assist decisions whether to implement the VAs or decisions how to implement the VAs. Delta outflow from Reclamation actions described above would be in March through May and prioritized during the period of April 1 through May 31. These early implementation actions will continue until the SWRCB updates the Water Quality Control Plan or for two years, whichever occurs first.

Reclamation Post Early Implementation: After Reclamation's two-year early implementation

period:

- Reclamation will operate consistent with the VAs only if (a) the SWRCB incorporates the VAs, as proposed by the VA parties, into the Water Quality Control Plan, and (b) the VA parties execute the agreements contemplated by the VAs, or
- Reclamation will operate as described by the alternative but without any of the actions contemplated for “early implementation” of the VAs if (i) the SWRCB does not incorporate the VAs, as proposed by the VA parties, into the Water Quality Control Plan, or (ii) the VA parties do not execute the agreements contemplated by the VAs.

DWR Implementation: DWR will operate pursuant to Section 3.3.3.2 Early Voluntary Agreement Implementation of their *November 2023 Incidental Take Permit Application, Long-Term Operations of the State Water Project*. DWR’s early implementation actions will continue until the SWRCB approves the VAs.

There is no change from the No Action Alternative for this management activity under the Proposed Action and risk to EFH is not expected to be reduced in the spring.

4 Effects of Proposed Action on Coastal Pelagic Species Essential Fish Habitat

4.1.1 Essential Fish Habitat Affected by the Project

HAPCs for the coastal pelagic species that occur within the Delta are not defined specifically in the FMP. The analysis of potential effects to coastal pelagic species focuses on Northern anchovy as it is the main representative of the coastal pelagic species that could be affected by the Proposed Action. Factors affecting Northern anchovy production are mostly natural influences, such as ocean temperature (CDFG 2001). Offshore within the California current, temperature, upwelling, and stable stratification of the water column are believed to work together to produce conditions that are favorable to anchovy larvae (Lasker 1975). In San Francisco Bay it is thought that salinity, or freshwater outflow variability may influence conditions. In North San Francisco Bay, conditions have become less than optimal due to the grazing of the overbite clam upon food sources of larval and adult anchovy (Kimmerer 2006).

4.1.2 Seasonal Operations (estuaries, rocky reefs, canopy-forming kelp, seagrasses):

Reclamation’s seasonal operations affect estuarine water quality and EFH for coastal pelagic species through changes in salinity from changes in Delta outflow. However, the effects on salinity in estuarine and marine EFH would be small relative to the salinity tolerance of Coastal pelagic species such as Anchovy (Baxter et al. 1999). Kimmerer et al. (2009) showed for Northern anchovy that neither indices of habitat extent nor indices of abundance were related to X2, an index of Delta outflow and its effects. Likewise, changes in Delta outflow may affect the attributes of Coastal pelagic species utilization of Delta and San Francisco Bay estuary habitats as to the upstream extent of their movements.

The coastal pelagic species are predominantly seaward in areas dominated by ocean conditions as opposed to freshwater influences therefore changes in estuarine habitat for coastal pelagic species are not anticipated.

Rocky Reefs, canopy-forming kelp, and seagrasses occur seaward of areas substantially affected by freshwater flows therefore effects of water operations on these habitats are not anticipated to occur.

The Proposed Action could change the outflow in the spring, however, risks to coastal pelagic species EFH is not expected to increase.

4.1.3 Summer and Fall Delta Outflow and Habitat

The Summer and Fall Delta Outflow and Habitat conservation measure is comprised of two components described above, the Fall X2 action and the operation of the Suisun Marsh Salinity Control Gates. There is no change in flows or salinity from the No Action Alternative for this management activity. The adaptive management action modification under the Proposed Action may modify Delta outflows during the summer and fall, however risk to any EFH is not expected to increase.

5 Effects of Proposed Action on Pacific Coast Groundfish Essential Fish Habitat

5.1.1 Essential Fish Habitat Affected by the Project

EFH for Pacific coast groundfish is defined as the aquatic habitat necessary to allow groundfish production to support long-term sustainable fisheries for groundfish and for groundfish contributions to a healthy ecosystem. Factors affecting Pacific coast groundfish production are mostly flow related as migratory pathways of juveniles could be disrupted from flow modifications within the waters of the western Delta. Flow Alterations in the location of the low salinity mixing zones of the Delta and estuary from flow modifications could result in changes in the areas of primary and secondary productivity that support Pacific coast groundfish species.

The Pacific coast groundfish species HAPCs that occur within the Delta include estuaries, seagrasses, and rocky reefs. There are changes from the No Action Alternative for outflow and the low salinity zone. The Pacific Coast groundfish species are predominantly seaward in areas dominated by ocean conditions as opposed to freshwater influences so changes in estuarine habitat for Pacific Coast groundfish are not anticipated.

5.1.2 Seasonal Operations (estuaries, rocky reefs, and seagrasses Habitat Areas of Potential Concern's):

Seasonal operations could affect the Pacific coast groundfish EFH as it pertains to Delta outflow and its effect on the salinity field. However, the effects on salinity would be small relative to the salinity tolerance of Pacific coast groundfish EFH such as starry flounder (Baxter et al. 1999), and indices of habitat availability of starry flounder are not related to Delta outflow (expressed as X2; Kimmerer et al. 2009). Kimmerer et al. (2009) found a significant negative relationship between annual mean March–June X2 (an index of Delta outflow) and annual mean starry flounder bay otter trawl abundance indices, which they suggested could be related to an increase in residual circulation in the San Francisco Estuary with increasing Delta outflow; if such an increase translates to more rapid or more complete entrainment of starry flounder early life stages into the estuary, or more rapid transport to their rearing grounds, then

presumably survival from hatching to settlement would be higher under high-flow conditions (Kimmerer et al. 2009: 385).

Reclamation's seasonal operations affect estuarine water quality for Pacific Coast groundfish through changes in salinity. The Pacific Coast groundfish species are predominantly seaward in areas dominated by ocean conditions as opposed to freshwater influences so changes in estuarine habitat for Pacific Coast groundfish are not anticipated. Rocky Reefs, canopy-forming kelp, and seagrasses occur seaward of areas affected by freshwater flows. Effects of water operations on these habitats are not anticipated to occur.

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UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
501 West Ocean Boulevard, Suite 4200
LONG BEACH, CA 90802

Refer to NMFS No: WCRO-2024-02917

April 14, 2025

Mr. Adam Nickels
Acting Regional Director
Bureau of Reclamation
Mid-Pacific Region
2800 Cottage Way
Sacramento, California 95825

Re: Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat
Consultation for the Reinitiation of Consultation on the Long-Term Operations of the
Central Valley Project and State Water Project

Electronic transmittal only

Dear Mr. Nickels:

Thank you for your request for consultation with NOAA's National Marine Fisheries Service (NMFS) on essential fish habitat (EFH) for the Long-Term Operations of the Central Valley Project and State Water Project. NMFS reviewed the proposed action for potential effects on EFH pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), implementing regulations at 50 CFR 600.920, and agency guidance for use of the ESA consultation process to complete EFH consultation.

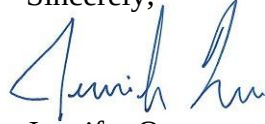
Based on the best available information, NMFS has concluded that the proposed action would adversely affect EFH designated under the Pacific Coast Salmon, Pacific Coast Groundfish, and Coastal Pelagic Species Fishery Management Plans (FMPs). Therefore, in the enclosed, NMFS provides Conservation Recommendations.

As required by Section 305(b)(4)(B) of the MSA, Reclamation 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 timeframes 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)].



Reclamation 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(1)]. We appreciate your consideration of our Conservation Recommendations. If you wish to discuss this consultation further or have questions concerning our recommendations, please contact Cathy Marcinkevage, of my staff, at (916) 930-3600.

Sincerely,

A handwritten signature in blue ink, appearing to read "Jennifer Quan", is positioned above the printed name.

Jennifer Quan
Regional Administrator

Enclosure

cc: File: ARN: 151422-WCR2021-SA00122

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NATIONAL MARINE FISHERIES SERVICE
MAGNUSEN-STEVENSON FISHERY CONSERVATION AND MANAGEMENT ACT
ESSENTIAL FISH HABITAT CONSULTATION

Section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) directs federal agencies to consult with NOAA’s National Marine Fisheries Service (NMFS) on all actions or proposed actions that may adversely affect essential fish habitat (EFH). Under the MSA, this consultation is intended to promote the conservation of EFH as necessary to support sustainable fisheries and the managed species’ contribution to a healthy ecosystem. For the purposes of the MSA, EFH means “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity,” and includes the associated physical, chemical, and biological properties that are used by fish (50 CFR 600.10). Adverse effect means any impact that reduces quality or quantity of EFH, and may include direct or indirect physical, chemical, or biological alteration of the waters or substrate and loss of (or injury to) benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects may result from actions occurring within EFH or outside of it and may include direct, indirect, site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) of the MSA also requires NMFS to recommend measures that can be taken by the action agency to conserve EFH. Such recommendations may include measures to avoid, minimize, mitigate, or otherwise offset the adverse effects of the action on EFH (50 CFR 600.905(b)).

Background

This EFH consultation on the proposed reinitiation of consultation on the long-term operation (LTO) of the Central Valley Project (CVP) and State Water Project (SWP) was written in accordance with section 305(b)(2) of the MSA (16 U.S.C. 1801 et seq.) and implementing regulations at 50 CFR 600.

NMFS has completed pre-dissemination review of this document using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (DQA) (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). The document will be available within 2 weeks at the NOAA Library Institutional Repository (<https://repository.library.noaa.gov/welcome>). A complete record of this consultation is on file at the Sacramento NMFS Office.

Consultation History

- On September 30, 2021, the Bureau of Reclamation (Reclamation) provided a letter to NMFS requesting reinitiation of consultation on the LTO of the CVP and SWP pursuant to the Endangered Species Act (ESA) section 7 and EFH.
- On October 31, 2024, Reclamation provided NMFS with an EFH Assessment (Reclamation 2024c). On this date, NMFS initiated the EFH consultation.

Proposed Action

The purpose of the proposed action is to continue the operation of the CVP in coordination with the SWP, for their authorized purposes. Reclamation operates the CVP for the congressionally authorized purposes of (1) river regulation, improvement of navigation, and flood control; (2) irrigation and domestic uses, and fish and wildlife mitigation, protection, and restoration; and (3) power, and fish and wildlife enhancement. The California Department of Water Resources (DWR) operates the SWP for the primary purpose of water supply deliveries and flood control, and the SWP provides additional benefits including power generation and environmental stewardship. Conservation measures were included to avoid and minimize or compensate for CVP and SWP effects, and included actions that benefit listed species (Appendix H, Reclamation 2023-2024). Effects to EFH from the proposed action are described in Reclamation's EFH Assessment (Reclamation 2024c). For a full description of the proposed action, we incorporate by reference here, Reclamation's final Biological Assessment (BA, Reclamation 2024d) for the reinitiation of consultation on the LTO of the CVP and SWP, provided to NMFS on October 23, 2024 (Appendix A to the NMFS Biological Opinion, NMFS 2024).

Action Area

The action area for this EFH consultation includes habitat within areas expected to be affected directly or indirectly by the Federal action and not merely the immediate habitat area involved in the action. Specifically, the EFH action area includes (1) the Sacramento River from Keswick Dam downstream to the Sacramento-San Joaquin Delta; (2) Clear Creek from Whiskeytown Dam to its confluence with the Sacramento River; (3) the American River from Lake Natoma Dam downstream to its confluence with the Sacramento River; (4) the Stanislaus River from New Melones Dam to its confluence with the San Joaquin River; (5) the San Joaquin River from the confluence of the Stanislaus River downstream to the Sacramento-San Joaquin Delta; and (6) the Sacramento-San Joaquin Delta, which includes the region of waterways bounded by the Sacramento River downstream from the I Street Bridge in Sacramento, the San Joaquin River downstream from the Airport Way Bridge near Vernalis, waters bounded on the east approximately by the alignment of Interstate 5, and westwards to nearly the western tip of Chipps Island. The action area also includes Spring Creek from Spring Creek Debris Dam to Keswick Reservoir. The action area for this EFH consultation does not extend past Chipps Island since effects of the proposed action are not expected to adversely affect EFH for managed species beyond this point. This EFH consultation also does not include effects to Trinity River, since future Trinity River operations are expected to be addressed in a separate consultation.

Essential Fish Habitat Affected by the Proposed Action

This EFH analysis is based on the EFH assessment provided by Reclamation, the analysis in the NMFS Biological Opinion (NMFS 2024), and descriptions of EFH for various species and life stages of Pacific Coast salmon (Pacific Fishery Management Council [PFMC] 2024c), Pacific Coast groundfish (PFMC 2024b), and coastal pelagic species (PFMC 2024a) contained in the fishery management plans (FMPs) and that occur in the action area. These FMPs were developed by the PFMC and approved by the Secretary of Commerce. Table 1 provides details associated

with this EFH analysis. This consultation also describes conservation measures Reclamation proposes in their BA (Appendix H, Reclamation 2023-2024) to avoid, minimize, mitigate, or otherwise offset potential adverse effects resulting from the proposed action on EFH.

Table 1. Fishery Management Plans and effects by the Proposed Action in the action area.

Fishery Management Plan That Identifies EFH in the Action Area	Does Action Have an Adverse Effect on EFH?	Does Action Have an Adverse Effect on HAPC?	Are EFH Conservation Recommendations Provided?	Portion of the Action Area where EFH is present
Pacific Coast Salmon (PFMC 2024c)	Yes	Yes	Yes	Sacramento River, Clear Creek, American River, Stanislaus River, San Joaquin River, Sacramento-San Joaquin Delta
Pacific Coast Groundfish (PFMC 2024b)	Yes	Yes	Yes	Sacramento-San Joaquin Delta, and portions of the lower Sacramento River and American River
Coastal Pelagic Species (PFMC 2024a)	Yes	No	Yes	Sacramento-San Joaquin Delta

All evolutionarily significant units of Chinook salmon in the Central Valley (Sacramento River winter-run Chinook salmon, Central Valley [CV] spring-run Chinook salmon, CV fall-run Chinook salmon, and CV late fall-run Chinook salmon) are managed under the Pacific Coast Salmon FMP (PFMC 2024c), and all occur within the action area.

EFH for Pacific Coast salmon includes those waters and substrate necessary for salmon production needed to support a long-term sustainable salmon fishery and salmon contributions to a healthy ecosystem. Freshwater EFH for Chinook salmon includes streams, lakes, ponds, wetlands, and other water bodies currently, or historically accessible to salmon in Washington, Oregon, Idaho, and California, except areas upstream of certain impassable man-made barriers (as identified by the PFMC [2024]) and longstanding, naturally-impassable barriers (i.e., natural waterfalls in existence for several hundred years).

EFH for Pacific Coast groundfish is defined as the aquatic habitat necessary to allow groundfish production to support long-term sustainable fisheries for groundfish and for groundfish contributions to a healthy ecosystem ((PFMC 2024b). Descriptions of Pacific Coast groundfish EFH for each species and their life stages result in more than 400 EFH identifications. Species most likely to occur in the action area include starry flounder (*Platichthys stellatus*) and English sole (*Pleuronectes vetulus*). The Pacific Coast groundfish EFH in the action area includes all waters from the mean higher high water line, and the upriver extent of saltwater intrusion in river mouths.

EFH for coastal pelagic species is described in the Coastal Pelagic Species FMP (PFMC 2024a) and explains the habitat requirements of five pelagic species: Northern anchovy, Pacific sardine, Pacific (chub) mackerel, jack mackerel, and market squid. These four finfish and market squid are treated as a single species complex because of similarities in their life histories and habitat requirements. Species most likely to occur in the action area include Northern anchovy (*Engraulis mordax*) and Pacific sardine (*Sardinops sagax*).

Along the West Coast, the PFMC identifies habitats that fall within “Habitat Areas of Particular Concern” (HAPC) and recommends these to NMFS consistent with the MSA. HAPCs are considered high priority areas for conservation, management, or research because they are important to ecosystem function, sensitive to human activities, stressed by development, or are rare. These areas provide important ecological functions and/or are especially vulnerable to degradation and can be designated based on either specific habitat types or discrete areas. HAPCs are a discrete subset of EFH. This EFH consultation focuses on addressing any adverse effects the proposed action may incur on EFH and in the following designated HAPCs:

- HAPCs for Pacific Coast salmon are: complex channels and floodplain habitats, spawning habitat, thermal refugia, estuaries, and marine and estuarine submerged aquatic vegetation, as described in Appendix A to the Pacific Coast Salmon FMP (PFMC and NMFS 2014b). The marine and estuarine submerged aquatic vegetation HAPC is not present within the action area.
- HAPCs for Pacific Coast groundfish are: estuaries, canopy kelp, seagrass, rocky reefs, and areas of interest, as described in the Pacific Coast Groundfish FMP (PFMC 2024b). Only the HAPC for estuaries is present within the action area.

EFFECTS ON EFH AND EFH CONSERVATION RECOMMENDATIONS

This section provides information by watershed and includes a brief description of the proposed action, adverse effects to EFH, and conservation recommendations. The proposed action includes conservation measures to avoid, minimize, mitigate, or otherwise offset potential CVP and SWP effects and include actions that benefit MSA-managed species. For a full description of the proposed action, we incorporate by reference Reclamation’s October 23, 2024, final BA (Reclamation 2024d).

Sacramento River/Shasta Division Proposed Action

For the Sacramento River, the proposed action includes Sacramento River Pulse Flows, Adult Migration and Holding Temperature Objectives, Water Temperature and Storage, Egg Incubation and Emergence Temperature Objectives, Ramping Rates, Base Flows for Shasta Refill and Redd Maintenance including Minimum Instream Flows and Rice Decomposition Smoothing (Table 2). The proposed action also includes conservation measures to minimize potential negative effects (Table 3). We incorporate by reference here the proposed action and its project components found in Reclamation’s final BA (Reclamation 2024d).

Within the Sacramento River Division, Reclamation operates Shasta and Keswick dams year-round in coordination with the other facilities of the CVP and SWP. These operations are seasonal in their nature, as Reclamation operates in the winter for flood control, including both the channel capacity within the Sacramento River and Shasta Reservoir flood conservation space. Releases for flood control will vary, depending on the current storage, the forecasted inflow, and the flow in the mainstem Sacramento River at Bend Bridge where flows are held below 100,000 cfs. When not operating for fall and winter flood control, Shasta Dam is operated primarily to conserve storage while meeting minimum flows both down the Sacramento River and in the Delta. During the winter to spring period, there are natural accretions (flows from unregulated creeks) into the Sacramento River below Shasta Dam. In wetter water year types, Reclamation may be able to operate mostly for flood control and minimum instream requirements because of the large volumes of accretions to the Sacramento River. In drier years, these accretions may be lower and, therefore, require Reclamation to release a higher level of releases from the upstream reservoirs to meet state permit requirements as well as project exports in the Delta.

In the spring, reservoir releases are relatively stable until flows are needed to support instream demands on the mainstem Sacramento River and Delta Outflow requirements. When Delta regulatory constraints are reduced, exports can increase during periods of excess flow and Reclamation can build additional storage south of the Delta, in San Luis Reservoir, without increasing releases from upstream reservoirs. An overarching goal for Reclamation when operating the CVP is to fill the reservoirs as much as possible by the end of the flood control season (end of May), while still meeting all other authorized project purposes. An action component in the proposed action is the inclusion of spring pulse releases, where under certain hydrological conditions, Reclamation will make reservoir releases to simulate natural springtime freshets events that stimulate and facilitate juvenile salmonid emigration.

During the summer, operational considerations are mainly flows sufficient to meet Delta outflow requirements, instream demands, temperature control, and exports. A particularly challenging aspect of summer operations is the Cold-Water Pool Management in Shasta Reservoir, where during summer months, Reclamation releases large volumes of water to meet downstream agricultural demands while also providing suitable temperatures for winter-run Chinook salmon spawning and incubation. To meet these competing demands, Reclamation proposed to use a bin strategy that allows for strategically selected temperature compliance locations, based on projected total storage and cold-water pool. Temperature management continues into the fall, and by late fall, the remaining cold-water pool in Shasta Reservoir is usually very limited.

In the fall and with decreasing agricultural demands, Reclamation reduces its reservoir releases, to begin again the process of building storage for the following summer. However, early in the fall, upper Sacramento River flows cannot be too low, as there are still significant instream diversion demands on the mainstem between Keswick Dam and Wilkins Slough, and depending on conditions, SWRCB Delta requirements may require upstream reservoir releases which may include from Shasta Reservoir. This necessitates maintaining higher releases to support the instream demands until they decrease later in the season. To manage that change between higher early-fall releases with the lower releases in the late fall and winter, Reclamation will consider the potential for dewatering redds with a risk analysis of the remaining winter-run Chinook

salmon redds, the anticipated fall-run Chinook salmon redds, and the probability of sufficient cold water in a subsequent year.

The proposed action also includes a number of conservation measures intended to avoid, minimize, mitigate, or otherwise offset CVP and SWP project effects as well as contribute to the recovery and enhancement of species and their habitats (Table 3). These conservation measures include non-flow actions that benefit listed species.

Table 2. Action Components of the Proposed Action for the Sacramento River.

Action Component	Proposed Action
Sacramento River Pulse Flows	To increase the out-migration survival of Chinook salmon, Reclamation would release up to 150 TAF in pulse flow(s) each water year, typically in the spring to benefit Chinook salmon in the Sacramento River watershed, when the pulse “does not interfere with the ability to meet temperature objectives or other anticipated operations of the reservoir” (Reclamation 2023-2024).
Adult Migration and Holding Temperature Objectives	Under circumstances where these conditions may cause water temperatures to rise to concerning levels prior to the completion of the final temperature management plan, Reclamation will begin temperature management as early as March 1 to target water temperatures of 58.0°F daily average at the Sacramento River at the CCR (Sacramento River above Clear Creek) gauge. Reclamation, through coordination, may propose a different temperature based on the potential impacts to winter-run Chinook salmon spawning and egg incubation.
Water Temperature and Storage	The Shasta Reservoir Management Plan (Shasta Management Plan) that will use a system of management “Bins” to administer water temperature and storage levels. There are three Bins (1, 2, and 3) based on the expected End of April storage. Each Bin has two categories: A (standard) and B (drought protection). The letter of the Bin (A or B) is primarily driven by the expected demands on the reservoir which are a function of hydrology, meteorology, system-wide conditions, contractual requirements and other conditions. Bin A years are when the expected demand on the reservoir is lower, meaning it is likely to result in better drought protection should the following year be dry. Bin B years are intended to increase the priority of storage conservation to address the possibility that the ensuing year could be a drought. Bin B years may be when there is limited water supply in the Shasta system, or the system as a whole is more stressed and additional actions are necessary to reach the objectives of that Bin.
Egg Incubation and Emergence Temperature Objectives	An average daily water temperature of 53.5°F is targeted in Bin 1 (Enhance) downstream of the CCR gauge, in Bin 2 (Recover/Maintain) at the CCR gauge, and in Bin 3 (Protect) upstream of the CCR gauge. Bins 1 and 2 target temperature dependent mortality of $\leq 3\%$ while Bin 3 targets $\leq 30\%$.

Action Component	Proposed Action
Ramping Rates	Rapid changes in river elevation from ramping reservoir releases up or down can impact aquatic biota. Sudden flow decreases can strand fishes and macroinvertebrates. Ramping rates to limit how quickly releases are reduced can lessen or minimize these impacts. Under Water Rights Order 90-5, the change in the release rate (ramping) from Keswick Dam from September through February shall not decrease more than the rates noted in the PA, in order to minimize stranding of salmon. In addition to the requirements under Order 90-5, the ramping rates for Keswick Dam between July 1 and March 31 would be reduced between sunset and sunrise, as described in the PA.
Base Flows for Shasta Refill and Redd Maintenance including Minimum Instream Flows	Reclamation proposes to set target base flows from Keswick Dam for the winter (December 1 through the end of February) based on Shasta Reservoir End of September storage. These base flows consider historical performance in building Shasta Reservoir's cold-water pool. Fall and winter base flows support fall-run and Central Valley spring-run Chinook salmon, address winter-run Chinook salmon redd dewatering stressors, and support cold water pool management.
Rice Decomposition Smoothing	Rice decomposition smoothing could minimize impacts to both winter-run Chinook salmon and fall-run Chinook salmon by minimizing fry stranding and redd dewatering as flows drop in the winter. The Sacramento River Settlement Contractors (SRSC) and CVP Water Service Contractors will synchronize their diversions to lower peak rice decomposition demand. Starting in August, Reclamation and the SRSC, through the Sacramento River Group (SRG), will develop a delivery schedule based on dewatering risk for winter-run Chinook salmon redd locations and update as conditions warrant.

Table 3. Proposed Conservation Measures for the Sacramento River. Actions are summarized from Appendix H of Reclamation (2023-2024), unless duplicative with items listed above in Table 2.

Conservation Measure	Description/Objective
Sacramento River Settlement Contractors (SRSC) Delaying or Shifting Spring Diversions to Maximize Storage	Reclamation may request that the SRSC delay diversions in the spring to increase the likelihood that Shasta Reservoir elevations reach the upper gates on the Temperature Control Device.
SRSC Shifting Timing of Delivery of Transfer Water	Reclamation may request that the SRSC shift timing of delivery of transfer water to increase the amount of water in Shasta Reservoir through the water temperature management season.
Wilkins Slough Minimum Flow Criteria Relief	Under this conservation measure, summer flows would be lower than 5,000 cfs in the driest of years. As a default, Reclamation will target a minimum flow of 3,400 cfs under these conditions. October flows may vary due to demands, water transfer operations and protection of winter-run Chinook salmon redds and are likely to be in the 3,250 - 5,000 cfs range, although higher flows may be necessary at times. After the irrigation season, Reclamation expects to begin ramping down to the minimum flow of 3,250 cfs as soon as possible given deliveries, Delta conditions and winter-run Chinook salmon redd dewatering concerns. Reclamation, through coordination with the Shasta Operations Team (SHOT), will determine the appropriate ramp down date after evaluating tradeoffs between Shasta Reservoir storage, next year's water temperature management, winter-run Chinook salmon redd dewatering and fall-run Chinook salmon stranding and redd dewatering.
Rebalancing between other CVP Reservoirs	Under this conservation measure, Sacramento River flows may decrease in dry years as one approach to conserving storage in Shasta Reservoir and operate the temperature control device (TCD) to target 53.5° F upstream of CCR for the most critical period during the winter-run Chinook salmon spawning and egg incubation period to avoid critical loss of winter-run Chinook salmon population. Reclamation will reduce Shasta Reservoir releases for water supply (CVP allocations) to only that needed for meeting public health and safety demands, including minimum salinity levels in the Delta.
Limitation on CVP Allocations for End of September Storage	Under this conservation measure, Reclamation may consider water supply reductions in dry water years. Reclamation will reduce Shasta Reservoir releases for water supply (CVP allocations) to only that needed for meeting public health and safety demands, including minimum salinity levels in the Delta. Reclamation, through coordination with the SHOT, will identify moderate and heavy system-wide tradeoffs with the goal of conserving storage and meeting minimal water temperature objectives. This action attempts to increase end of water year storage for Shasta Reservoir by reducing spring and summer flows. In extremely dry years or in multi-year droughts, it is possible that these actions will not achieve an End-of-September storage above 2.0 million-acre feet (MAF).

Conservation Measure	Description/Objective
Modifications to Water Transfers	Under this conservation measure, Reclamation may request that the SRSC shift timing of delivery of transfer water during the typical irrigation season (April through September) to help improve water temperature management and/or protect against winter-run Chinook salmon redd dewatering and fall-run Chinook salmon stranding. Sacramento River flows would increase, and storage in Shasta Reservoir would be reduced. If the SHOT denies water transfers, the water would be delivered, and Shasta Reservoir would have less cold-water pool.
Limitations in SRSC Water Available Under Contract	Under this conservation measure, Sacramento River flows may decrease in the spring, summer, and fall of dry years as one approach to conserving storage in Shasta Reservoir. Listed species potentially impacted by this action include winter-run Chinook salmon, spring-run Chinook salmon, steelhead, and green sturgeon.
Refuge Coordination for Instream Flow, Lake Levels, and Refuge Needs	Under this conservation measure, Shasta Reservoir releases to refuges in the summer and fall may decrease during the driest of years as a way to increase Shasta Reservoir storage. Listed species potentially impacted by this action include winter-run Chinook salmon, spring-run Chinook salmon, steelhead, and green sturgeon.
Annual Winter-Run Chinook Salmon Broodyear Assessment	Based on the outcome of the broodyear assessment prepared by the Winter-run JPE sub-team, Reclamation, NMFS, United States Fish and Wildlife Service (USFWS) and California Department of Fish and Wildlife will convene appropriate technical staff to make recommendations if it is necessary to increase the production of winter-run Chinook salmon associated with the Integrated-Recovery Supplementation Program or take other actions to protect production of winter-run Chinook salmon at the Livingston Stone National Fish Hatchery. USFWS, through coordination with the SHOT, will implement measures as appropriate. The outcome of the broodyear assessment may also be considered in implementing actions within the drought toolkit as described in Section 3.12 Drought of the Proposed Action.
Drought Operations Priority Framework	Under this conservation measure, Reclamation will develop a Drought Emergency Plan that establishes system priorities and a water temperature management plan that seeks to provide winter-run Chinook salmon spawning water temperatures to avoid catastrophic losses related to summer water temperature management with the goal of achieving a projected End-of-September storage as close to 2.0 MAF as possible. Some of the actions that will be included in the Drought Emergency Plan could occur in any month of the year. Sacramento River flows into the Delta would be reduced to conserve storage in Shasta Reservoir. Listed species potentially impacted by this action include winter-run Chinook salmon, spring-run Chinook salmon, steelhead, green sturgeon, Delta smelt and longfin smelt.

Effects on Essential Fish Habitat in the Sacramento River

Pacific Coast Groundfish and Coastal Pelagic Species EFH is limited in the mainstem Sacramento River upstream of the Delta. Specifically, the upstream extent of Coastal Pelagic Species EFH is delineated around river mile 4, near Sherman Island, well within the legal Delta. Pacific Coast Groundfish EFH extends further upstream to river mile 144, near Colusa, California. The downstream portions are more tidally influenced (e.g., river mile 46, near Freeport, California). HAPCs for Pacific Coast groundfish are estuaries, rocky reefs, canopy-forming kelp, seagrasses, and areas of interest (PFMC 2024b), with only the former of those, the estuaries HAPC, existing in the lower Sacramento River. Of the species managed under the FMP, Elasmobranchs are generally limited to San Francisco Bay, and groundfish and rockfish are nearly exclusively marine. Even euryhaline species, such as Starry flounder, which can be found in the spring as young-of-year in salinities less than 2 parts per thousand (ppt), have not been found more than 75 miles from the ocean. Therefore, estuarine habitat, a crucial environment for groundfish in inland areas, is generally absent in the Sacramento River upstream of the San Francisco Bay Delta, except under very specific flow conditions. Consequently, groundfish species, which rely on these habitats, are unlikely to inhabit the marginal EFH that might exist in these upstream locations. Given the lack of suitable habitat and the low probability of groundfish presence there, NMFS has determined that the proposed action will not result in adverse effects to Pacific Coast groundfish EFH.

The Chinook salmon HAPCs that occur within the Sacramento River include complex channels and floodplain habitats, thermal refugia, and spawning habitat. Various HAPCs are present from Keswick Dam, river mile 302, downstream through the San Francisco Bay Delta, and additionally found in some tributaries and watersheds adjacent to the mainstem Sacramento River. Complex channels are rare on such a heavily managed river, but present in flood bypasses. Thermal refugia is most prevalent upstream, influenced by cold water releases in the spring and summer from Shasta Reservoir. Based on the best available information, NMFS concludes that the following adverse effects on EFH designated for Chinook salmon are reasonably certain to occur:

Effects to Redd Quality

Seasonal operation of Shasta and Keswick dams, as described in the final PA (Reclamation 2024d), include controlling flow and water temperatures in the upper Sacramento River where all runs of Chinook salmon spawn. These operations affect the complex channels and floodplain habitats, and spawning HAPCs. The seasonal flows modeled under the proposed action in the Sacramento River at Keswick Dam are very similar to the observed managed flows in most months under current operations, which both show high summer and early fall flows with lower flows in the winter and spring. Depending on the time of year, higher flows may negatively impact spawning and egg/alevin incubation. If flows are too high, they may result in depths and flow velocities in excess of suitable flows for constructing redds, and for redds that were already constructed, which may be at risk of being scoured from the bed (NMFS 2017). In addition, adults may construct redds under high flow conditions and in areas that are later dewatered or isolated from the main river channel when the flows decline.

Likewise, low flow conditions during the late fall and winter in the spawning reaches of the upper Sacramento River could have a number of negative effects on spawning, egg incubation, and alevins. As described by Windell et al. (2017), potential adverse effects of low flows on eggs and alevins include: an insufficient area of riverbed with suitable attributes to accommodate redds for all spawning-ready fall-run and late fall-run Chinook salmon adults; inadequate flow velocities to flush sediments from the redds; insufficient flow to maintain adequate levels of dissolved oxygen in contact with eggs and alevins in the redds and to flush metabolic wastes from the redd; and insufficient water depths for redds, such that minor reductions in flow result in redd stranding and dewatering.

Overall, NMFS considers the effects of seasonal operations on EFH as being both positive and negative. Seasonal operations where Reclamation builds storage enables Reclamation to make summer releases at a suitable temperature for winter-run Chinook salmon spawning and egg incubation. Conversely, reducing releases in the fall, winter, and spring can limit the available spawning and rearing habitat for fall-run and late fall-run Chinook salmon, negatively impacting EFH. Central Valley spring-run Chinook salmon adults are less frequently detected spawning in the Sacramento River, but juveniles emerging from tributaries can benefit from proposed action flows in the complex channels and floodplain habitats in the mainstem for rearing and outmigration.

Effects to Outmigration Cues

Reclamation proposes to implement spring pulse flows under certain hydrologic conditions to improve the survival of out-migrating juvenile salmon, especially CV spring-run, fall-run, and late fall-run Chinook salmon. These actions affect the complex channels and floodplain habitats, and spawning HAPCs. A spring pulse flow is expected to result in increased survival of juvenile salmon by mimicking the natural hydrologic cues that trigger salmon outmigration (Kjelson *et al.* 1981). NMFS considers this action component to provide a benefit to Chinook salmon EFH, as it would increase survival of out-migrating juveniles by improving the migration corridor function of the mainstem Sacramento River. However, in years with low End of September storage, the prescribed low flows during the late fall and winter can have a negative effect on downstream migration of juvenile salmon. An assessment of mark-recapture survival model runs in the mainstem Sacramento River revealed that of the numerous mortality factors considered, spanning multiple spatial scales, increasing flow correlated most strongly with increasing out-migration success (Iglesias *et al.* 2017). This assessment focused on hatchery-origin Chinook salmon, but it provides additional evidence that flow is one of the most important factors affecting overall survival of Chinook salmon in the Central Valley (Kjelson and Brandes 1989, Zeug *et al.* 2014, Michel *et al.* 2015).

Water Temperature

Temperature management actions affect the thermal refugia, and spawning HAPCs. The temperature targets, associated with implementation of the Shasta Management Framework bin strategy, are described in Table 4.

Table 4. Shasta Management Framework Goals, Objectives and Indicators. Source: summarized from Reclamation (2023-2024). See also Section 3.2 Framework Approach of the BA for descriptions of Bins (Reclamation 2024d)

	Bin 1a	Bin 1b	Bin 2a	Bin 2b	Bin 3a	Bin 3b
Estimated Frequency	80% of Years		~11.5% of Years		~8.5% of Years	
Biological Objective	Enhance		Recover	Maintain	Protect	
Biological Goals	• Maximize species recruitment opportunities • Increase spatial diversity • Maximize floodplain linkages • Enhance ecological flows • Increase available habitat for fall-run Chinook salmon in the fall and winter months		• Maintain or maximize species recruitment opportunities with some reduction in spawning habitat compared to Bin 1 • Maintain or restore river function and key floodplain linkages • Restore key ecological flows		• Avoid critical loss of population • Maintain key refuges of spawning and early rearing habitat • Avoid catastrophic changes to habitat and impacts to the broodyear	
Temperature Management for Sacramento River winter-run Chinook salmon	Manage spawning habitat		Manage the majority of spawning habitat		Manage spawning habitat during the critical periods of the spawning and egg incubation period	
Temperature Target	average daily water temperature of 53.5°F					
Compliance Point	Downstream of the CCR (Sacramento River above Clear Creek) gauge		At the CCR gauge		Upstream of the CCR gauge	
Temperature Dependent Mortality Target	≤3%				≤30%	

NMFS acknowledges that the limited cold-water pool is maximized each year to ensure that suitable spawning and incubation conditions are available to endangered winter-run Chinook salmon in the upper Sacramento River from May 15 through October 31. Relative to current operations, the proposed action and the Cold-Water Pool Management action component would provide a benefit to winter-run Chinook salmon and Chinook salmon EFH generally during the time that Reclamation is able to provide suitable temperatures. However, the use of cold-water reserves for winter-run Chinook salmon through the summer would impact those spring-run and fall-run Chinook salmon spawning later in the season in October and beyond, since the cold water is typically used up by the end of the temperature management season. The effect of the Cold-Water Pool Management on Chinook salmon EFH is both positive and negative, where Reclamation is able to selectively improve access to spawning habitat and thermal refugia during the specific periods of winter-run Chinook salmon spawning in the spring, but where late-summer and fall periods would be subject to reduced access and degraded thermal refugia for spring-run and fall-run Chinook salmon spawning.

Stranding and Dewatering

Under the proposed action, Reclamation proposes to adjust fall flows based on Shasta Reservoir storage to avoid dewatering winter-run Chinook salmon redds and cold-water pool impacts. Higher flows during the October to November period could increase the available spawning habitat that would benefit fall-run Chinook salmon redds. These actions affect the thermal refugia, and spawning HAPCs. Currently, Reclamation lowers flows in the early fall period in order to conserve water for spring cold-water pool. This can result in dewatering fall-run Chinook salmon redds that were constructed at higher flows when Reclamation was keeping flows higher to minimize dewatering winter-run Chinook salmon redds. Therefore, this action component could potentially benefit fall-run Chinook salmon in years where Reclamation ends the water year with high storage in Shasta Reservoir.

Additionally, as part of the Fall and Winter Refill and Redd Maintenance proposed action component, Reclamation would assess the water demands of the upstream CVP contractors and the Sacramento River Settlement Contractors to better coordinate water deliveries and minimize significant flow fluctuations. Typically, Sacramento Valley rice growers will flood their fields in the fall after the year's harvest to help decompose crop residue (e.g. rice hulls and straw) which can otherwise impede seedbed preparation and contribute to disease and weed problems. The water required for rice decomposition can pose a sudden demand on the system, which in turn can cause significant fluctuation in river flow. Coordinated (i.e. smoothed) diversions in late October and early November could provide increased reliability that target flows would be met according to the Fall and Winter Refill and Redd Maintenance operations. Because NMFS assumes that the minimum flows identified in the proposed action for this season would be achieved, this action component would, therefore, provide greater certainty that Reclamation would be able to reduce releases gradually to meet the base flows according to the Fall and Winter Refill and Redd Maintenance action component. Considering that this action component would contribute to stabilizing flows and increase the reliability of the Fall and Winter Refill and Redd Maintenance action component, the effects of the Rice Decomposition Smoothing are positive for Chinook salmon EFH.

Essential Fish Habitat Conservation Recommendations for the Sacramento River

As described in the above effects analysis, NMFS has determined that the proposed action would adversely affect EFH for Chinook salmon in Sacramento River. NMFS provides the following conservation recommendations to avoid, minimize, mitigate, or otherwise offset the effects of the proposed action on the spawning, complex channels and floodplain habitats, and thermal refugia HAPCs.

Sacramento River Conservation Recommendation 1

To address the potential adverse effects to Chinook salmon spawning habitat related to seasonal operations, NMFS recommends Reclamation operate facilities to maintain flow conditions adequate enough to provide for a properly functioning channel, geomorphology, and spawning conditions. This could include future spawning bed quality surveys, identifying geomorphic flows to achieve gravel transport and full-scale bed mobilization, and leveraging the latest bathymetric data in order to identify Keswick releases that could improve spawning habitat.

Sacramento River Conservation Recommendation 2

NMFS recommends that Reclamation works with the Fish Agencies and Sacramento River Group (SRG) to consider fall-run Chinook salmon needs, specifically the spawning habitat HAPC, in Shasta operations. For example, Reclamation could request that the SRG water operations consider needs of fall-run Chinook salmon spawning and incubation when setting temperature compliance points, flows to avoid redd dewatering, and system-wide tradeoffs. Decision support tools, such as incorporating characterization of fall-run Chinook salmon egg-to-fry survival and redd dewatering can help inform temperature management plans. In addition, to address impacts to the thermal refugia HAPC, Reclamation could coordinate with the SRG to explore late summer and early fall pulse flows from Keswick and Shasta dams to reduce water temperatures. These pulse flows are intended to temporarily break downstream thermal barriers in the adult migratory corridor to allow fish passage upstream to existing cooler areas of the river and increase natural origin fall-run Chinook salmon juvenile survival (Michel *et al.* 2023). A related pulse flow has been implemented to support juvenile spring-run Chinook salmon survival in late spring; this action could potentially be modified to also increase survival of fall-run Chinook salmon.

Sacramento River Conservation Recommendation 3

NMFS recommends Reclamation establish a process through the SRG to reduce the potential for redd dewatering for winter-run Chinook salmon and fall-run Chinook salmon. For example, preventing higher mid-summer flows than necessary during the peak of winter-run Chinook salmon spawning both reduces winter-run Chinook salmon redd dewatering later in the season and thereby makes it easier to stabilize flows for fall-run Chinook salmon spawning and prevent their subsequent redd dewatering. This planning and smoothing out of peak summer flows, when possible given other operational constraints, would benefit the spawning HAPC for winter-run and fall-run Chinook salmon.

Clear Creek Proposed Action

Clear Creek, originating in the Trinity Mountains, is a tributary to the Sacramento River downstream of Keswick Dam. Whiskeytown Reservoir and Dam demarks the Upper and Lower Clear Creek. Lower Clear Creek provides spawning habitat for Chinook salmon that no longer have access to Upper Clear Creek, including spring-run, fall-run, late fall-run, and occasionally winter-run Chinook salmon.

The proposed action components for Clear Creek include a new seasonal flow schedule and revised temperature management (Table 5), as well as ongoing channel maintenance and spring attraction pulse flows (Table 6).

Reclamation proposes to provide seasonally variable instream Clear Creek flows from Whiskeytown Dam to emulate natural processes. Reclamation, with input from the Clear Creek Technical Team (CCTT), will schedule the hydrograph to maximize multi-species benefits, with low flows of approximately 100 cfs in the summer to 300 cfs in the winter. During Critical water year types, flows may be reduced based on available water from Trinity Reservoir.

Reclamation proposes to manage Whiskeytown Dam releases to meet a daily average water temperature of 61°F from June 1 through August 15, 60°F from August 16 through September 15, and 56°F or less from September 16 through November 15 at the Igo stream gauging station on Clear Creek. During Critical water years, Reclamation will operate to as close to these temperatures as possible, but acknowledges temperature criteria may not be met.

Reclamation proposes to release up to 10 thousand acre-feet (TAF) from Whiskeytown Dam for both spring attraction and channel maintenance (during dry or wetter years) pulse flows, except in years with significant uncontrolled spill. We incorporate by reference here the more detailed explanation of the proposed action in Reclamation's final PA (Reclamation 2024d).

Table 5. Action Components of the Proposed Action for Clear Creek.

Action Component	Proposed Action
Water temperature management	Reclamation proposes to manage Whiskeytown Dam releases to meet the following daily average water temperatures at the U.S. Geological Survey (USGS) Igo stream gauge station: • 61°F from June 1 through August 15 • 60°F from August 16 through September 15 • 56°F from September 16 through November 15
Minimum instream (seasonally oscillating) flows	Seasonally oscillating flows, generally between 100 and 300 cfs. Refer to section 3.5 of the final proposed action for more details (Reclamation 2024d).
Channel maintenance and spring attraction pulse flows	Reclamation will release up to 10 thousand acre-feet from Whiskeytown Dam for a channel maintenance pulse flow, spring attraction pulse flows, and other physical and biological objectives (except in years with significant uncontrolled spill). The pulse flows (scheduled on or after February 1) will not exceed the current safe outlet works capacity of 840 cfs.
Temporary weir	A temporary weir is placed in late-August to early-November to physically separate fall-run from spring-run Chinook salmon during spawning to minimize hybridization and redd superimposition.

Table 6. Proposed Conservation Measures for Clear Creek (Appendix H, Reclamation 2023-24)

Conservation Measures	Description/Objective
Down ramping rate of no more than 25 cfs per hour	Down ramping rates would minimize the rate of flow decreases during controlled flow reduction, minimizing the risk of juvenile and yearling salmonids being stranded.
Minimum instream flows	Providing minimum instream flows would help provide refuge habitat, food availability and quality, and reduce predation and competition for juvenile and yearling salmonids.
Pulse flows	Reclamation and Department of Water Resources propose to continue channel maintenance and spring attraction pulse flows. However, the total volume available for channel maintenance pulse flows will be reduced and will not occur in Dry and Critical water year types.
Water temperature management	Provide suitable water temperatures for spawning, holding, and rearing Chinook salmon.

Effects on Essential Fish Habitat for Clear Creek

Chinook salmon EFH impacted by the proposed action includes Lower Clear Creek to the confluence with the Sacramento River. The Pacific Coast salmon HAPCs that occur within Lower Clear Creek include: (1) complex channels and floodplain habitats, (2) thermal refugia, and (3) spawning habitat. Based on the best available information, NMFS concludes that the proposed action would adversely affect EFH for Pacific Coast salmon in Clear Creek. We conclude that the following adverse effects on EFH designated for Chinook salmon are reasonably certain to occur.

Impacts to Substrate Quality and Quantity from Managed Flows

The operation of Whiskeytown Dam contributes to the decrease in magnitude and frequency of flood flows and decreases the downstream movement of sediment and large woody debris. Those effects are expected to continue under the proposed action, with the decreases in the magnitude and frequency of flood flows largely being attributed to proposed operations. The reductions in sediment and large woody debris recruitment limits the natural creation of complex channels and floodplain habitats important for spawning and rearing by trapping sediment, nutrients, and organic matter, creating pools, sorting gravels, and providing cover for salmon (Appendix A to the Pacific Coast salmon FMP, PFMC and NMFS 2014a). Physical responses to altered flow regimes include the deposition of fine sediments in gravel; channel stabilization and narrowing; reduced channel complexity such as the formation of point bars, secondary channels, oxbows, and changes in channel planform; downstream channel erosion; and reduced floodplain connection (Poff *et al.* 1997). These hydrologic effects are expected to continue as a result of proposed action operations. Although these effects are somewhat offset during temporary pulse flows, these responses continue to adversely affect the complex channels and floodplain habitats HAPC.

Due to proposed channel maintenance pulse flows, the adverse effects on the complex channels and floodplain habitats HAPC will be reduced over time as a result of enhancements of riparian floodplain habitat. Channel maintenance pulse flows are likely to improve the salmon spawning HAPC by mobilizing and dispersing gravel, and reducing fine sediment, depending on the frequency of occurrence and magnitude of flow. Spring attraction pulse flows are expected to improve conditions for adult spring-run Chinook salmon migrating upstream towards spawning grounds.

Water Temperature Effects from Water Operations

The thermal refugia HAPC provides areas to escape warm water temperatures, and is critical to Chinook salmon survival. These areas include cool water tributaries, lateral seeps, side channels, tributary junctions, deep pools, areas of groundwater upwelling and other areas that are cooler than surrounding waters. They can occur at spatial scales ranging from entire tributaries to highly localized pockets of water embedded within larger rivers (Appendix A to the Pacific Coast salmon FMP, PFMC and NMFS 2014a).

Reservoir operations are expected to affect water temperatures in Clear Creek, including the thermal refugia HAPC. Controlled reservoir releases minimize large flood events and other

natural flows that would inundate floodplain habitat, recharge groundwater, and would aid in maintaining cooler water temperatures. The proposed action includes summer water temperature management ($\leq 61^{\circ}\text{F}$ from June 1 to August 15 and $\leq 60^{\circ}\text{F}$ from August 16 to September 15) and fall water temperature management ($\leq 56^{\circ}\text{F}$ from September 16 to November 15). Daily average water temperatures have historically remained below 60°F at Igo during the summer temperature management period. With the new proposed flow schedule, flows will be lower during the summer, and it may be more difficult to keep water temperatures below 60°F . Increased water temperatures are likely to result in reduced dissolved oxygen. Typically, during the fall spawning period, water temperatures have exceeded 56°F in most years. The 56°F daily average water temperature has been determined to be suboptimal, and would likely lead to mortality of incubating eggs and reduced survival (Myrick and Cech 2004, Martin *et al.* 2017). During the beginning of the 56°F water temperature objective period, the proposed action is expected to adversely affect the spawning HAPC for Chinook salmon.

NMFS expects the proposed change in minimum instream flows, which includes decreasing flows in summer and increasing flows in winter and spring, to improve the availability of cooler water in Clear Creek during the 56°F water temperature objective period, which starts in mid-September. This threshold will be most difficult to meet during Critical years. Typically, in October and November, the 56°F water temperature objective is more readily met due to decreasing air temperatures. Although the proposed action will continue water temperature management releases, available thermal refugia and spawning HAPCs for Chinook salmon in Clear Creek will likely continue to be limited by controlled reservoir releases.

Benthic Disturbance and Passage Blockage

A temporary weir is installed between the Gorge Cascade and Clear Creek Road Bridge (approximately river mile 8) each year to physically separate fall-run Chinook salmon from spring-run Chinook salmon, to minimize the risk of hybridization and redd superimposition. Installation of the weir is expected to disturb the benthic community in a small portion of the creek where the weir will be placed and where crew will be entering the creek while placing the structure. Habitat restoration activities are also likely to result in disturbance to the creek channel bottom. These disturbances could physically impact the benthic community and reduce foraging organisms in the immediate area. After the weir is removed, benthic organisms are expected to recover rapidly in the disturbed area due to the small footprint. NMFS expects that the effects of disturbance to the benthic community from the Project's weir installation will be minor.

Although the weir minimizes the risk of hybridization between fall-run and spring-run Chinook salmon, the weir physically blocks fall-run Chinook salmon adults from accessing upstream spawning habitat. This results in fall-run Chinook salmon spawning below the weir, in waters which may be less suitable than in reaches further upstream. This benefits the spawning HAPC for spring-run Chinook salmon, but negatively impacts the spawning HAPC for fall-run Chinook salmon. Fall-run Chinook salmon adults are likely to be exposed to warmer water temperatures and may not have access to suitable spawning substrate. Substrate in Lower Clear Creek is still recovering from debris from the 2018 Carr Fire, and spawning habitat throughout Lower Clear Creek is still limited for both fall-run and spring-run Chinook salmon (Reclamation 2024b).

We incorporate by reference here, Section 3.13.3.3 of the final PA (Reclamation 2024d), which mentions habitat restoration on Clear Creek. Any construction related to restoration projects have the potential to temporarily disturb the creek channel and benthic community, as well as potentially limit passage, depending on the timing and duration of construction activities.

Spawning Habitat Availability

Spawning habitat typically consists of low gradient stream reaches, containing clean gravel with low levels of fine sediment and high intergravel flow. The natural recruitment of spawning habitat substrate has been impacted by Whiskeytown Dam. Maximum available spawning habitat for fall-run Chinook salmon is achieved at approximately 300 cfs (USFWS 2015). Under the proposed action, flows will be low during August to mid-November (100 to 200 cfs released from Whiskeytown Dam) (section 2.5.3, Reclamation 2023-2024). Since flows would be increasing in the fall, spring-run Chinook salmon eggs and emerging fry would experience increased habitat and cooler temperatures, as described in section 7.2.1.3. of the Biological Opinion (NMFS 2024).

Proposed channel maintenance and spring attraction pulse flows under the proposed action represent less than 30% of the flow needed to transport sediment in the absence of flows from downstream tributaries (Whiskeytown releases up to approximately 840 cfs). As a result, effects of these flows are expected to be of low magnitude and occur with low frequency. Based on redd timing, fall-run and late fall-run Chinook salmon eggs and emerging fry would be exposed to the effects of these pulse flows, which could affect the spawning HAPC for fall-run and late fall-run Chinook salmon. Pulse flows may displace incubating eggs from redds, resulting in exposure to predation, abrasion, and increased water temperature if transported out of suitable habitat. For more details on the effects analysis of salmonid critical habitat in Clear Creek, refer to section 7.2.2 of the Biological Opinion (NMFS 2024).

Essential Fish Habitat Conservation Recommendations

As described in the above effects analysis, NMFS has determined that the proposed action would adversely affect EFH for Chinook salmon in Clear Creek. NMFS provides the following conservation recommendations to avoid, minimize, mitigate, or otherwise offset the effects of the proposed action on the spawning, complex channels and floodplain habitats, and thermal refugia HAPCs.

Clear Creek Conservation Recommendation 1

NMFS recommends that Reclamation work with Fish Agencies and the CCTT to determine how to manage releases from Whiskeytown Dam to provide suitable water flows for all life stages of Chinook salmon, including fall-run Chinook salmon, to reduce stranding and isolation, protect incubating eggs from being dewatered, promote habitat quality and availability, and assess whether Clear Creek flows or pulse flows should be further modified to reduce adverse impacts on Chinook salmon. For example, Reclamation, with input from the CCTT, could explore releasing pulse flows in the late summer-early fall to improve conditions for fall-run Chinook salmon. Providing adequate flows for migration, mobilization of spawning gravels, and

providing suitable water temperatures would improve spawning and thermal refugia HAPCs, and would increase the likelihood that Chinook salmon populations persist.

Clear Creek Conservation Recommendation 2

NMFS recommends Reclamation develops water temperature models to improve Clear Creek water temperature management, as described in section 6.1.4.1.2 of the BA (Reclamation 2023-2024), to improve fall water temperature management closer to optimum water temperatures for all life stages of all Chinook salmon in Clear Creek.

Clear Creek Conservation Recommendation 3

NMFS recommends Reclamation develop a new spawning gravel budget and implement a long-term gravel augmentation plan in Clear Creek, including acquisition of a long-term gravel supply, which would benefit Chinook salmon EFH, including spawning HAPC. Gravel augmentation increases the quality and quantity of salmon spawning habitat, and would help address fine sediment deposition in gravel caused by the proposed action. This would also benefit fall-run and late fall-run Chinook salmon spawning habitat.

Clear Creek Conservation Recommendation 4

For construction effects associated with habitat restoration, NMFS recommends implementing appropriate BMPs for Clear Creek using the BMPs described in NMFS's Biological Opinion for the NOAA Restoration Center's Program to Facilitate Implementation of Restoration Projects in the Central Valley of California (NMFS 2018). Reclamation should implement the BMPs that are most protective of aquatic habitats, such as minimizing disturbance to existing riparian vegetation, minimizing the application of herbicide, and providing fish passage during construction.

Clear Creek Conservation Recommendation 5

NMFS recommends that Reclamation develop a plan that identifies and prioritizes projects that restore the creek channel closer to natural conditions, and submit that plan to NMFS. Restoration projects would ideally include incorporating large woody debris that would naturally occur in Clear Creek without the proposed action. Implementing projects that have restoration components would improve the spawning and the complex channels and floodplain habitats HAPCs for all Chinook salmon that spawn and rear in Clear Creek.

American River Proposed Action

Reclamation operates and maintains the American River Division of the CVP for flood control, municipal, industrial and agricultural water supplies, hydroelectric power generation, fish and wildlife protection, recreation, and Delta water quality. Facilities include Folsom Dam, its reservoir (977 TAF capacity), power plant, temperature control shutters on the power plant, and the Joint Federal Project auxiliary spillway, as well as the Nimbus Dam, Lake Natoma, Nimbus Power Plant, and Folsom South Canal. Folsom Reservoir is the largest storage and flood control reservoir on the American River.

Reclamation proposes to meet water rights, contracts, and agreements that are both specific to the American River Division as well as those that apply to the entire CVP, including the Delta Division. For Lower American River flows (below Nimbus Dam), Reclamation proposes to adopt the American River Minimum Flow Schedule (ARMFS). Flows range from 500 to 2,000 cfs based on time of year and annual hydrology. Notably, the Minimum Release Requirement (MRR) for January will be determined using the Sacramento River Index, while the American River Index will be used for the remaining months, both with a 90% exceedance forecast. These indices will be based on the first Bulletin 120 of each year, in February, then updated with each subsequent month's Bulletin 120, until a final MRR is calculated in May for the remainder of the year. When developing the operational forecast, Reclamation will evaluate an end-of-December Folsom storage of at least 300 TAF, though Reclamation acknowledges that in some years, operational constraints may result in an end-of-December storage of less than 300 TAF.

Key differences between the ARMFS and the Modified Flow Management Standard include using a 90% exceedance forecast for MRR calculations instead of 50% or 75%, establishing a defined timeframe for implementing monthly MRRs, evaluating and potentially adjusting MRR calculations in November and December, and removing the offramp and volume offset in the spring pulse flow to provide more flexibility for flow shaping.

The proposed action for the American River in the EFH Assessment (Reclamation 2024c) includes the ARMFS, as well as conservation measures, to mitigate and offset potential negative effects, to listed species and their critical habitats (Table 7 and Table 8). We also incorporate by reference here the more detailed description of the proposed action provided by Reclamation for the ESA consultation on October 23, 2024 (Reclamation 2024d).

Table 7. Action Components from the Proposed Action for the American River.

Action Component	Proposed Action
Minimum Release Requirements and Redd Dewatering Protective Adjustments	Reclamation's American River operations include the American River Minimum Flow Schedule (ARMFS) which is intended to provide water supply reliability and water temperature management for fisheries. The ARMFS uses two hydrological indices to determine Reclamation's Minimum Release Requirement (MRR) from Nimbus Dam. The Sacramento River Index, a monthly forecast of the total unimpaired water year flow volume for key rivers in the region, is used to determine the January MRR. From February to December, the American River Index (ARI) is used to determine the MRRs. The ARI measures the unimpaired inflow to Folsom Reservoir minus certain spilled water. The MRR curves are based on inflection points, and corresponding index values are determined through an iterative process, while target flows are established based on biological considerations. The ARMFS also incorporates Redd Dewatering Protective Adjustments (RDPA) to safeguard the spawning habitats of fall-run Chinook salmon and California Central Valley (CCV) steelhead from redd dewatering due to reductions in MRR.
Spring Pulse Flows	Reclamation will implement a spring pulse flow when the March MMR falls between 1,000 and 1,500 cfs. This pulse flow will peak at three times the March MRR, not exceeding 4,000 cfs, and last for 2 days. The American River Group will provide technical input on flow volumes, while the final timing will be determined collaboratively by California Department of Fish and Wildlife (CDFW), USFWS, and NMFS. Reclamation, through the American River Group, may facilitate additional pulse flows if water is available from non-CVP sources or if release schedules allow for greater flexibility.
Ramping Rates	Reclamation proposes to ramp down releases in the American River below Nimbus Dam at night, if possible. The maximum allowable decrease within a 24-hour period (ranging from 500 to 4,000 cfs) and the maximum change per step (from 100 to 1,350 cfs) vary depending on the starting flow rate (specified in 10 bins from <5,000 to 20,000). As the flow rate decreases, so do the allowable changes, reflecting a more cautious approach at lower flows to minimize impacts on aquatic life. Specifically, daily decreases of 10% or less are allowed under the lowest flow conditions (e.g., 500 out of 5,000 cfs), but that percentage can be as high as 25% (4,000 out of 16,000 cfs) at the upper end.
Water Temperature Management	The Temperature Management Plan aims to maintain optimal water temperatures for both CCV steelhead and fall-run Chinook salmon in the Lower American River. Ideally, daily average temperatures between Nimbus Dam and Watt Avenue would not exceed 65°F for CCV steelhead rearing, especially during the active temperature management season from May 15 to October 31. While temperatures below 56°F are ideal for Chinook salmon spawning, which typically occurs from mid-October to January, the Automated Temperature Selection Procedure prioritizes CCV steelhead rearing during summer months. This system sets monthly water temperature targets at Watt Avenue, ranging from 63°F to 72°F depending on the schedule. Schedule 78 has a water temperature limit of 72°F from May through November. Schedules 2 through 77 each represent a change in a single month's upper-temperature limit by 1°F.

Table 8. Proposed Conservation Measures for the American River (page 24, Appendix H, Reclamation 2023-2024)

Conservation Measure	Description/Objective
Temperature Management Study	Reclamation would manage the Folsom/Nimbus Dam complex and the water temperature control shutters at Folsom Dam to select the lowest schedule given the available quantity and quality of water in Folsom Reservoir, ideally to maintain a daily average water temperature of 65°F (or other water temperature as determined by the temperature modeling) or lower at Watt Avenue Bridge from May 15 through October 31, to provide suitable conditions for juvenile steelhead rearing in the Lower American River, if cold water is available.

Effects on Essential Fish Habitat for American River:

The American River lacks estuarine habitat, a critical component for groundfish survival in inland areas, rendering the river unsuitable for these species. Consequently, groundfish are unlikely to occupy the marginal EFH designated in the American River roughly downstream of Howe Avenue. This absence of suitable habitat and the low probability of groundfish presence leads to the conclusion that the proposed action will not measurably impact Pacific Coast Groundfish EFH. Furthermore, no HAPCs for Pacific Coast groundfish exist in the American River. Additionally, coastal pelagic species EFH does not extend as far upstream as the American River. Therefore, NMFS anticipates no adverse effects on Pacific Coast groundfish EFH or coastal pelagic species EFH from the proposed action.

The Pacific Coast salmon EFH impacted by the proposed action includes the American River from below the Nimbus Dam complex to the confluence with the Sacramento River. The Chinook salmon HAPCs that occur within the American River include complex channels and floodplain habitats, thermal refugia, and spawning habitat. Fall-run Chinook salmon are the most abundant run of Chinook salmon in the American River and all life stages can be found at different times of the year. The American River also supports non-natal rearing of juvenile winter-run and spring-run Chinook salmon (Phillis *et al.* 2018, Day and Morris 2023). Based on the best available information, NMFS concludes that the proposed action would adversely affect EFH for Chinook salmon in the American River. We conclude that the following adverse effects on EFH designated for Chinook salmon are reasonably certain to occur.

Managed Flows

The complex channels and floodplain habitats and spawning HAPCs are affected by reductions in sediment and large woody debris recruitment is also largely a result from the existence of Folsom and Nimbus dams, which are part of the environmental baseline. Those effects are expected to continue under the proposed action, with proposed operations. The current operations of the Folsom and Nimbus dam complex contribute to a decrease in the magnitude and frequency of flood flows and decrease the downstream movement of sediment and large

woody debris. Specifically, the proposed reservoir system operations reduce the movement of sediment and large woody debris downstream. The hydrologic effects of proposed action operations are expected to result in geomorphic responses including the deposition of fine sediments in gravel; channel stabilization and narrowing; reduced channel complexity such as the formation of point bars, secondary channels, oxbows, and changes in channel planform; downstream channel erosion; bed armoring; and reduced floodplain connection (Poff *et al.* 1997, Graf 2006). All of these operations adversely affect the complex channels and floodplain habitats and spawning HAPCs.

Analysis indicates that, due to natural fluvial geomorphic processes, even well-constructed habitat enhancement sites erode quickly because there is no possibility of any recruitment of suitable spawning material from upstream sources (Fairman 2007, Reclamation 2024a). The Lower American River gravel budget must be regularly augmented to sustain the amount of suitable spawning gravel that is available, and more action is needed to increase habitat extent.

Water Temperature

The presence of and role that thermal refugia may play in the quantity and quality of Chinook salmon habitat in the Lower American River is not well understood. Thermal refugia typically include cool water tributaries, lateral seeps, side channels, tributary junctions, deep pools, areas of groundwater upwelling, and other mainstem river habitats that are cooler than surrounding waters ($\geq 3.6^\circ$ F cooler). Among those habitats, the Lower American River includes side channels and deep pools, but it is unclear if they act as thermal refugia. Given the evidence that Chinook salmon in the Lower American River show signs of thermal stress, it is likely that thermal refugia are lacking. The specific effect that the proposed action will have on thermal refugia is not clear, but stressful water temperatures for adult Chinook salmon in the American River are expected to continue under the proposed action.

Adult fall-run Chinook salmon females experience egg retention or pre-spawning mortality in the American River in most years when water temperatures in the fall migration and staging period are sub-optimal. From 1993 to 2017, the proportion of unspawned females ranged from 3% to 67% and averaged 20%, and the proportion that retained greater than 30% of their eggs ranged from 6% to 80% with an average of 33% (Reclamation 2019). More recent observations have continued this trend, for example, 26% of female carcasses recovered in October 2021 through January 2022 were partially spawned or unspawned (Grimes and Galinat 2022). To help address this impact to fall-run Chinook salmon adults and EFH, the Automated Temperature Selection Procedure (ATSP) aims to provide suitable conditions, to the extent possible, for fall-run Chinook salmon staging and early spawning. However, due to temperature management throughout the summer for juvenile steelhead rearing and limitations of the Folsom-Nimbus selective withdrawal system, providing cool water temperatures below Nimbus Dam for adult Chinook salmon holding and spawning is challenging. For example, historical data show that water temperatures just below Nimbus Dam at the gage near Hazel Avenue seldom fall below 53.5°F before December (for fall-run Chinook salmon in this location it's understood to be a conservative measure below which no temperature dependent mortality is accrued), when seasonal conditions (cooler air temperatures and shorter days) help to bring water temperatures down (Figure 1). Daily average temperatures at the same location and time period also frequently exceed 56.0°F (the lowest October and November target temperature in the ATSP) (Figure 2).

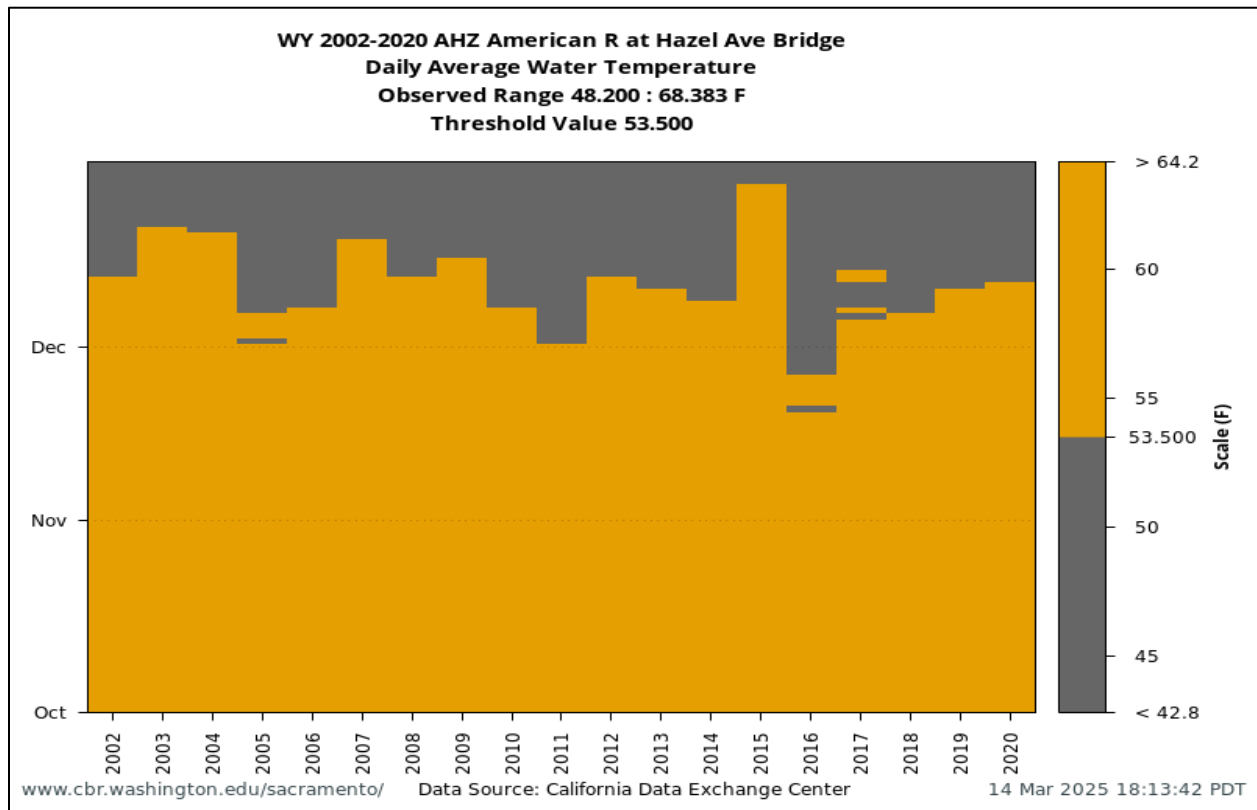


Figure 1. October through December daily average water temperatures in the Lower American River for 2002 through 2020. The color scale indicates water temperature values above (orange) or below (gray) 53.5°F.

Source: SacPAS (University of Washington Columbia Basin Research 2025)

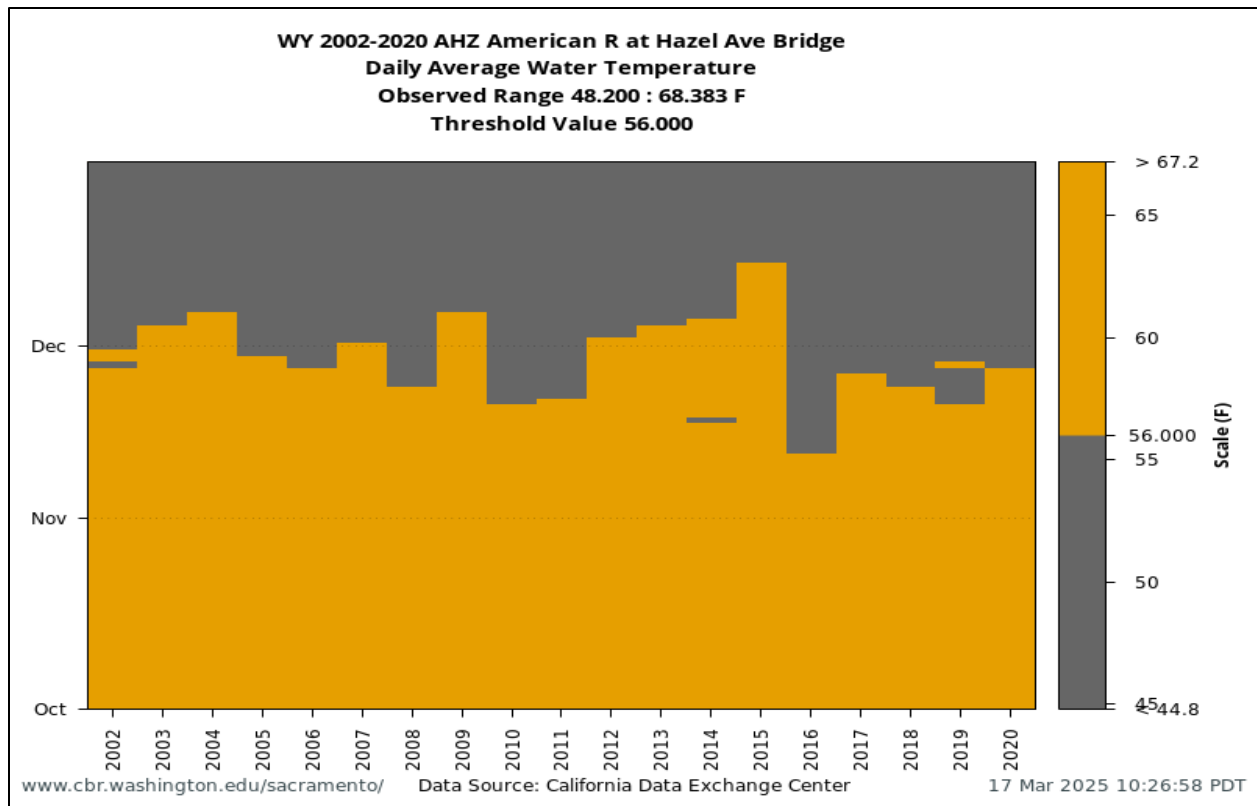


Figure 2. October through December daily average water temperatures in the Lower American River for 2002 through 2020. The color scale indicates water temperature values above (orange) or below (gray) 56° F.

Source: SacPAS (University of Washington Columbia Basin Research 2025)

Spawning Habitat Effects

Spawning habitat consists of the combination of several components including, but not limited to, gravel, depth, flow, temperature, and dissolved oxygen. Among those components, water temperature is the one that the proposed action will have the greatest impact on EFH for Chinook salmon. The proposed action is expected to result in stressful, lethal water temperatures for a relatively large proportion of Chinook salmon spawning and embryo incubation during October and November in the Lower American River. Chinook salmon egg mortality increases as water temperatures warm above 53.5°F (Martin *et al.* 2017, Martin *et al.* 2020). The Lower American River is rarely, if ever, cooler than 53.5°F at Watt Avenue during October and November (Figure 1). In most years, water temperatures at Watt Avenue are above 60°F well into October. The combination of egg retention, pre-spawning mortality, and embryo mortality from warm water temperatures in the Lower American River likely greatly impacts Chinook salmon production. Poor quality spawning habitat is expected to occur under the proposed action because, despite best efforts to protect Chinook salmon spawning, water temperatures in October and November are stressful and lethal every year; and the modeling results presented in the BA (Appendix M Attachment M, Reclamation 2023-2024) suggest that will continue.

The ARMFS is intended to provide suitable habitat conditions for steelhead and fall-run Chinook salmon in the Lower American River. While this element of the proposed action may at times

provide less detrimental spawning and embryo incubation habitat, the many demands affecting operations of the American River Division mean that the overall proposed action is expected to impact spawning habitat for fall-run Chinook salmon. In addition to the water temperature effects described above, salmon spawning habitat will be adversely affected due to flow fluctuations resulting in redd dewatering. Fall-run Chinook salmon eggs and alevins in the American River are vulnerable to dewatering from the time when spawning begins in October through February when fry emergence from the streambed ends (Vogel and Marine 1991, Bratovich *et al.* 2005). The redd dewatering protective adjustments included in the ARMFS help to reduce potential redd dewatering (Appendix M Attachment M, Reclamation 2023-2024).

Low dissolved oxygen levels are another component that has become an emerging stressor on the Lower American River. Dissolved oxygen plays an important role in the survival and healthy development of juvenile CCV steelhead and Chinook salmon eggs in the American River. Low dissolved oxygen levels can cause significant stress and even mortality, particularly in the vulnerable early life stages. The Central Valley Regional Water Quality Control Plan requires dissolved oxygen of at least 7.0 milligrams per liter (mg/L) from Folsom Lake to the Sacramento River. Monitoring in Lake Natoma in 2023 were below this standard, in the 5-6 mg/L range, depending on water depth. Some of the following conservation recommendations are listed to mitigate the effects of the proposed action on dissolved oxygen levels on the spawning HAPC in the Lower American River, which are similar to Term and Condition 3(a) in the Biological Opinion (NMFS 2024).

Essential Fish Habitat Conservation Recommendations for American River:

As described in the above effects analysis, NMFS has determined that the proposed action would adversely affect EFH for Chinook salmon in the American River.

NMFS provides the following conservation recommendations to avoid, minimize, mitigate, or otherwise offset the effects of the proposed action.

American River Conservation Recommendation 1

NMFS recommends that Reclamation develop a gravel budget or utilize an existing and still applicable gravel budget, and augment gravel in accordance with that budget. Gravel and large wood augmentation will help address reductions in channel complexity caused by the proposed action. By setting a consistent sediment budget, using BMPs during construction, and regularly monitoring the suitable gravel between Nimbus Dam and the Sacramento River confluence, these actions can ensure the effectiveness of habitat restoration to restore the complex channels and floodplain habitats HAPC. On a five-year interval, Reclamation should regularly monitor topographic change and evaluate the availability of suitable spawning habitat based on best available scientific methods and data.

American River Conservation Recommendation 2

NMFS recommends that Reclamation implement a power bypass at Folsom Dam in all years as necessary to provide more suitable fall spawning and egg incubation temperatures for Chinook salmon, unless annual September temperature modeling indicate 56°F average daily water

temperature, or lower, could be achieved at Watt Avenue on or before November 1st, without the bypass. NMFS recommends that Reclamation coordinate with the American River Group to develop the water temperature objectives for fall conditions. Additionally, NMFS recommends that Reclamation evaluate implementation of alternative methods to support effective water temperature management in the Lower American River, including infrastructure modifications at Folsom and Nimbus dams, including but not limited to measures evaluated during planning or value engineering studies (Reclamation et al. 2007, Thomas Cook Innovation 2014, LLC).

American River Conservation Recommendation 3

NMFS recommends that Reclamation manage operations on the American River to minimize hypoxic conditions for Chinook salmon migrating and spawning downstream of Nimbus Dam. First, NMFS recommends that dissolved oxygen gauges be installed and made publicly accessible via the California Department Exchange Center (CDEC). These should record dissolved oxygen hourly (or more frequently) and be placed at strategic locations near Nimbus Dam, including the north and south banks of the dam outflow, the hatchery ladder, and between Nimbus Basin and Sailor Bar, since these are where adult Chinook salmon enter the hatchery fish ladder and where a large portion of in-river spawning occurs (Cramer Fish Cramer Fish Sciences 2023, Reclamation 2024a). Reclamation should provide results of this dissolved oxygen monitoring to the American River Group on a monthly basis. Secondly, during the salmon spawning period, Reclamation should consider initiating spilling from Nimbus Dam if dissolved oxygen levels fall below 7 mg/L at any time (the threshold required by the Central Valley Regional Water Quality Control Board (Central Valley Regional Water Quality Control Board [2019]) and open additional gates if levels remain below this threshold after initial spilling. Third, NMFS recommends that Reclamation evaluate potential implementation of alternative methods to support effective management of dissolved oxygen levels in the Lower American River below Nimbus Dam, which could include mechanical means of increasing dissolved oxygen levels (Horne 2019), and report their findings to the American River Group.

Stanislaus River Proposed Action

The proposed action for the Stanislaus River is summarized in Table 9 and Table 10. Reclamation operates to meet water rights, contracts, and agreements that are specific to the East Side Division, including the Stanislaus River. Senior water right holders (Oakdale Irrigation District and South San Joaquin Irrigation District) will receive annual water deliveries consistent with the 1988 Agreement and Stipulation, and water will be made available to CVP contractors in accordance with their contracts and applicable shortage provisions. In high storage, high inflow conditions, Reclamation will operate for flood control in accordance with the U.S. Army Corps of Engineers flood control manual. Because New Melones is a large reservoir relative to its annual inflow, flood control is relatively infrequent; however, Tulloch Lake, located downstream of New Melones Reservoir, is subject to high local inflows, and may be in flood control operations for brief periods when New Melones Reservoir is not. During these periods, releases from Tulloch Lake may be used to meet flow objectives, schedules, or requirements on the lower Stanislaus River below Goodwin Dam.

Table 9. Action Components of the Proposed Action for the Stanislaus River.

Action Component	Proposed Action
Seasonal Operations	Releases for water rights, contracts, reservoir and flood management, other agreements.
Minimum instream flows	2023 Stepped Release Plan, with water year type determined by San Joaquin Valley “60-20-20” Water Year Hydrologic Classification based on the 90% exceedance forecast.
Ramping rates	Flow changes follow specified ramping rates, with some exceptions allowed for on case-by-case basis.

Table 10. Proposed Conservation Measures for the Stanislaus River.

Conservation Measure	Description/Objective
Minimum instream flows and Ramping rates	Implement the 2023 Stepped Release Plan and specified ramping rates.
Spring pulse flows, fall pulse flows, and winter instability flows	Implement pulse flows consistent with the 2023 Stepped Release Plan.
Stanislaus River Water Temperature Management	Reclamation will continue to study approaches to improving temperature for listed species on the lower Stanislaus River, to include evaluating the utility of conducting temperature measurements/profiles in New Melones Reservoir.

Effects on Essential Fish Habitat for Stanislaus River:

As described in Table 1, EFH for Pacific Coast groundfish and coastal pelagic species is not present in the Stanislaus River. Pacific Coast salmon EFH impacted by the proposed action includes the Stanislaus River from below Goodwin Dam to the confluence with the San Joaquin River. HAPCs that occur within the Stanislaus River include complex channels and floodplain habitats, thermal refugia, and spawning habitat. Based on the best available information, NMFS concludes that the proposed action would adversely affect EFH for Pacific Coast salmon in the Stanislaus River. We conclude that the following adverse effects on EFH designated for Chinook salmon are reasonably certain to occur:

Rearing & Migratory Habitat

Water management for flood reduction and water supply will continue to disrupt natural processes that form complex channels and inundate floodplain habitats that support juvenile Chinook salmon rearing and migration (Poff *et al.* 1997, Yarnell *et al.* 2015). Simplified channel form and managed flows also reduce the recruitment of riparian vegetation and large trees such as cottonwoods, which in turn reduces the amount of large woody debris in the river and

associated complex habitats. Potential thermal refugia such as deeper pools or shaded banks are more limited in a simpler, incised, channel. Collectively, these impacts to rearing and migratory habitat adversely affect the complex channels and floodplain habitats HAPC and the thermal refugia HAPC.

Water Temperature

Reservoir operations are expected to affect thermal conditions in the Stanislaus River downstream of Goodwin Dam, and temperatures will sometimes be unsuitable for Chinook salmon life stages. We incorporate by reference the analysis of proposed action effects on water temperatures that is provided in Section 7.4.1.3.1.1 (Tables 76, 77, and 78) of the Biological Opinion (NMFS 2024). These water temperature effects will adversely affect the thermal refugia HAPC and the spawning HAPC. As a conservation measure in the EFH Assessment (Reclamation 2024c), Reclamation proposes to study approaches to improving temperature for listed species on the lower Stanislaus River, which include evaluating the utility of conducting temperature measurements/profiles in New Melones Reservoir. This could provide some benefit to EFH for Chinook salmon if options to improve water temperature are implemented. Reclamation also includes a fall pulse flow in the 2023 Stepped Release Plan, which, by increasing thermal mass in the river, tends to cool mean daily and maximum daily water temperatures in river reaches downstream of Goodwin Canyon.

Spawning Habitat

Recruitment of spawning habitat substrate has been impacted by the operation of New Melones Dam, and the spawning HAPC will continue to be impacted by the proposed action. Under the managed hydrograph, recruitment and mobilization of sediments below Goodwin Dam, including appropriately-sized spawning gravels is disrupted (Kondolf *et al.* 2001, Yarnell *et al.* 2015).

Essential Fish Habitat Conservation Recommendations for the Stanislaus River:

As described in the above effects analysis, NMFS has determined that the proposed action would adversely affect EFH for Chinook salmon in the Stanislaus River. NMFS provides the following conservation recommendations to avoid, minimize, mitigate, or otherwise offset the effects of the proposed action.

Stanislaus River Conservation Recommendation 1

NMFS recommends that Reclamation seek to increase opportunities (through easements or other approaches to alleviate concerns related to seepage) to release flows over 1,500 cfs for more than 10 consecutive days, even when not in reservoir or flood management. This would allow extended inundation of higher-level areas at current and future restoration sites; and improve food production, and rearing and migratory habitat in the river and provide the Stanislaus Watershed Team more flexibility to shape water volumes in a manner most beneficial to Chinook salmon EFH. Improvements to rearing and migratory habitat would help to address effects of the proposed action on the complex channels and floodplain habitats HAPC and the

thermal refugia HAPC. If Reclamation accepts this recommendation, NMFS requests an update on implementation by December 31 of even years, starting in 2026.

Stanislaus River Conservation Recommendation 2

NMFS recommends that Reclamation implement gravel augmentation to maintain, or increase, the extent of suitable spawning habitat that is available between Goodwin Dam and Orange Blossom Bridge. One specific suggestion is to renew efforts to place gravel in Goodwin Canyon, either in the float tube pool or at the cable crossing. This would help to address effects of the proposed action on the spawning HAPC. If Reclamation accepts this recommendation, NMFS requests an update on implementation by December 31 of even years, starting in 2026.

Stanislaus River Conservation Recommendation 3

NMFS recommends that, on approximately a five-year interval, Reclamation monitor topographic change and evaluate the availability of suitable spawning and rearing habitat based on best available scientific methods and data. Improvements to rearing and spawning habitat would help to address effects of the proposed action on the complex channels and floodplain habitats HAPC, the spawning HAPC, and possibly (depending on project design) the thermal refugia HAPC. If Reclamation accepts this recommendation, NMFS requests an update on implementation by December 31 of even years, starting in 2026.

San Joaquin River Proposed Action

The San Joaquin River portion of the action area includes the San Joaquin River from the confluence with the Stanislaus River downstream past Vernalis to approximately Mossdale. While no action components such as releases or diversion are initiated within this area, proposed action components that affect flow in the Stanislaus River will affect flow in this area.

Effects on Essential Fish Habitat for the San Joaquin River

As described in Table 1, EFH for Pacific Coast groundfish and coastal pelagic species is not present in the San Joaquin River upstream of the statutory Delta. Chinook salmon EFH impacted by the proposed action includes the San Joaquin River from the confluence with the Stanislaus River downstream past Vernalis to approximately Mossdale. HAPCs that occur within this area include complex channels and floodplain habitats, and thermal refugia. Based on the best available information, NMFS concludes that operations under the proposed action would adversely affect EFH for Chinook salmon in this reach of the San Joaquin River. We conclude that the following adverse effects on EFH designated for Chinook salmon are reasonably certain to occur:

Rearing and Migratory Habitat

Water management for flood reduction and water supply will continue to disrupt natural processes that form complex channels and inundate floodplain habitats that support juvenile Chinook salmon rearing and migration (Poff *et al.* 1997). Simplified channel form and managed flows also reduce the recruitment of riparian vegetation and large trees such as cottonwoods,

which in turn reduces the amount of large woody debris in the river and associated complex habitats. Potential thermal refugia such as deeper pools or shaded banks are more limited in a simpler channel. Collectively, these impacts to rearing and migratory habitat adversely affect the complex channels and floodplain habitats HAPC and the thermal refugia HAPC.

Water Temperature

Thermal conditions in the San Joaquin River are often unsuitable for migrating Chinook salmon. See analysis of proposed action effects on water temperatures in Section 7.4.3.1.1. (particularly Tables 98 and 99) of the Biological Opinion (NMFS 2024). The effects of the proposed action on water temperatures will adversely affect salmon EFH, including the thermal refugia HAPC.

Essential Fish Habitat Conservation Recommendations for the San Joaquin River

As described in the above effects analysis, NMFS has determined that the proposed action would adversely affect EFH for Chinook salmon in the San Joaquin River. NMFS provides the following conservation recommendations to avoid, minimize, mitigate, or otherwise offset the effects of the proposed action.

San Joaquin River Conservation Recommendation 1

NMFS recommends that Reclamation pursue habitat restoration opportunities along the lower San Joaquin River to address effects of the proposed action on the complex channels and floodplain habitats HAPC and the thermal refugia HAPC. For example, shallower rearing areas with riparian vegetation and large woody debris would provide “rest stops” for juvenile salmonids to use for feeding and as refuges from larger visual predators during outmigration. If Reclamation accepts this recommendation, NMFS requests an update on implementation by December 31 of even years, starting in 2026.

San Joaquin River Conservation Recommendation 2

NMFS recommends that Reclamation support, specifically, habitat restoration efforts that increase food production. Since higher food supply can help to offset thermal stress, this would further address effects of the proposed action on the thermal refugia HAPC. If Reclamation accepts this recommendation, NMFS requests an update on implementation by December 31 of even years, starting in 2026.

Sacramento-San Joaquin Delta Proposed Action

The Sacramento-San Joaquin Delta (Delta) includes portions of the Lower Sacramento River and San Joaquin River as well as portions of Suisun, Honker, and Grizzly bays. It is characterized by freshwater inflows from the two main river systems (Sacramento and San Joaquin rivers) as well as numerous other tributaries, including the Mokelumne, Cosumnes, and Calaveras rivers. Salinity in the Delta region forms a continuum from full freshwater in the upper Delta locations to full marine salinity in the San Francisco Bay Estuary to the west. The estuarine portion of the Delta occurs where salinity is greater than approximately 0.5 ppt and under most hydrologic conditions occurs downstream from approximately Rio Vista on the Sacramento River, and

Jersey Point on the San Joaquin River. This spectrum of salinity gradients allows for multiple fish species to be present in the Sacramento-San Joaquin Delta and San Francisco Bay Estuary, ranging from marine species, to fully freshwater species, and includes multiple species tolerant of varying salinity habitats.

The majority of the Delta region is tidally influenced, as shown by tidally driven river stage changes, which can extend upriver for considerable distances. These changes in water surface elevations in the Delta region occur under most riverine inflow conditions, except for the very highest flood flows. The influence of tidal forcing on the direction and magnitude of flows in channels of the Delta depends on the phase of the tide (i.e., flood or ebb), lunar phase (i.e., spring versus neap tides), elevation above sea level, and riverine inflows into the Delta. In most areas of the Delta, reversal of flows within the Delta channels occurs with the changing phases of the tides. Under natural conditions in tidal regions with bidirectional flows, flood tides will cause the water within most Delta channels to move upstream, and subsequently to flow downstream upon an ebb tide. In those regions where flows are dominated by riverine conditions, flows are unidirectional but may change in magnitude during the tidal cycle.

The Delta has approximately 700 miles of waterways consisting of both natural channels and manmade-constructed channels. These waterways surround more than 60 leveed tracts and islands. Over 1,100 miles of constructed levees protect farmland, cities, and rural communities from flooding in the Delta region. However, the construction of these protective levees has disconnected the adjacent historical floodplains from their associated Delta waterways. Almost all of the shoreline habitat in the Delta consists of armored levees to prevent erosion, which has substantially reduced the presence of any riparian habitat along the waterside of the levees. The current Delta consists of highly modified aquatic habitat, most of which has severely reduced ecological function for native species, including Chinook salmon.

Reclamation proposes to continue to operate the CVP and SWP facilities in the Delta to provide for delivery of water supply to areas adjacent to, and south of the Delta (see Table 3-12 in Reclamation 2024d). We incorporate by reference here the more detailed description of the proposed action in Reclamation's final PA (Reclamation 2024d). Water rights, contracts, and agreements specific to the Delta include Decision (D)-1641, Coordinated Operations Agreement (COA) and other related agreements pertaining to CVP and SWP operations and Delta watershed users. In order to meet these agreements, Reclamation proposed to continue minimum health and safety exports at Jones Pumping Plant and Banks Pumping Plant of 1,500 cfs. Reclamation and DWR propose to continue to use the Sacramento River, San Joaquin River, and Delta channels to transport water to export pumping plants located in the south Delta (Jones, Banks, and Contra Costa Water District pumping plants) and the north Delta (Barker Slough Pumping Plant). Reclamation proposes revised operations to the Delta Cross Channel (DCC); the continuation of the seasonal installation and operation of three agricultural barriers in the South Delta; water transfers within the Sacramento and San Joaquin River basins from July through November; continued Clifton Court Forebay aquatic weed removal; and Old and Middle River flow management.

The proposed action for the Stanislaus River is summarized in Table 11 and Table 12. Conservation measures have been included in the proposed action (Appendix H, Reclamation

2023-2024). These conservation measures include non-flow actions that benefit listed species without impacting water supply. Reclamation proposes the following measures to minimize adverse effects of operations: Suisun Marsh Salinity Control Gates (SMSCG) Operation; Summer and Fall Delta Outflow and Habitat; continuing to implement existing restoration efforts, including completing 8,396.3 acres of tidal habitat restoration in the Delta by 2026; Yolo Bypass Salmonid Habitat Restoration and Fish Passage Project; and the predator hot spot removal effort in the Delta. Reclamation and DWR would continue the implementation of the following actions to reduce mortality of ESA-listed fish species: DCC Gate operations; Tracy Fish Collection Facility improvements to operating procedures; ongoing Skinner Fish Facility operations; incorporating flexibility in salvage release sites; and the Small Screen Program.

Table 11. Action Components of the Proposed Action in the Sacramento-San Joaquin Delta.

Action Component	Proposed Action
Exports	Ongoing exports at the south Delta export facilities and associated fish salvage facilities; and risk-based Old and Middle River (OMR) management incorporating real-time monitoring and models where possible.
Delta Cross Channel (DCC) Gate Operations	DCC operations based on D-1641, closures for fish protections, and operations that avoid exceeding water quality standards.
Delta Outflow	Delta Outflow: Central Valley Project (CVP): Spring Delta Outflow for approximately 2 years, in above normal/below normal/dry years. After approximately 2 years, OMR management Delta outflow to meet D-1641 requirements; Suisun Marsh Salinity Control Gate operation for up to 60 additional days between June 1 and October 31, depending on year type; increased Delta outflow in wet and above normal year types in certain conditions State Water Project (SWP): Pre-adoption of the Voluntary Agreements, implementation of the Incidental Take Permit (ITP) action for duration of permit
Old and Middle River (OMR) Management	OMR Managed Reverse flows based on species distribution, modeling, and risk analysis with provisions for capturing storm flows Early season winter-run Chinook salmon triggers Weekly distributed loss thresholds for winter-run Chinook salmon, Central Valley (CV) spring-run Chinook salmon and California Central Valley (CCV) steelhead CV spring-run Chinook salmon surrogate threshold Spring Outflow; Use of genetic identification Date and temperature offramps with additional temperature site Governance with the Salmon Monitoring Team (SaMT) and Water Operations Management Team (WOMT) coordination and 6-agency director group
Agricultural Barriers	Temporary agricultural barriers installed each year (~May to November) to maintain water levels for south of Delta agricultural water diverters.
Water Transfers	Reclamation and DWR propose to operate the CVP and SWP to facilitate transfers through providing water in streams for delivery to alternative diversion points, conveying water across the Delta for export, or storing water for delivery at a future time.
Suisun Marsh Salinity Control Gates (SMSCG)	SMSCG consists of three radial gates, a boat lock structure, and a maintenance channel operated to decrease the salinity of the water in Montezuma Slough to meet salinity standards set by the State Water Resources Control Board (SWRCB) and Suisun Marsh Preservation Agreement.

Table 12. Proposed Conservation Measures for the Delta (Appendix H, Reclamation 2023-24).

Conservation Measures	Description/Objective
DCC Gate Closure	Reduce potential scouring and flooding that might occur in the channels on the downstream side of the gates Reduce straying of Mokelumne River fall-run Chinook salmon adults and protect out-migrating juvenile salmonids from entering the interior Delta Reduce juvenile salmonid entrainment risk at the salvage facilities
Tracy Fish Collection Facility (TFCF) and Skinner Delta Fish Protective Facility	Screen fish from Jones Pumping Plant with the TFCF using behavioral barriers consisting of primary louvers and four traveling screens in the secondary channel, to guide entrained fish into holding tanks before transport by truck to release sites within the western Delta Screen fish from Banks Pumping Plant with the Skinner Delta Fish Protective Facility using behavioral barriers consisting of primary louvers and secondary screens (louvers and flat plate screens) to guide fish away from the pumps that lift water into the California Aqueduct and into holding tanks before transport by truck to release sites within the western Delta
Tidal Habitat Restoration	Tidal habitat restoration is expected to improve habitat quality and food availability long term
Old and Middle River Management	Manage diversion rates from the South of Delta modified based on abiotic and biotic factors for several listed species Decrease the entrainment risk stressor by potentially preventing adults from being entrained at the export facility
Summer and Fall Delta Outflow and Habitat	Operate the Suisun Marsh Salinity Control Gates (SMSCG) for 60 days using a 7-day tidal 7-day open operation (7-7) schedule to maximize the number of days that Belden's Landing three-day average salinity is equal to, or less than, 4 psu In dry years following below normal years, DWR will operate SMSCG for 30 days using 7-7 operation to maximize the number of days Belden's Landing three-day salinity is equal to, or less than 6 psu Decrease the entrainment risk stressor by increasing flows in the Delta and, thus, benefitting the migratory transport of juveniles to the estuary and potentially preventing entrainment at the export facility Decrease the outmigration cue and food availability stressors by increasing flow through the Delta

Conservation Measures	Description/Objective
Spring Delta Outflow	Actions that will support the additional Delta outflow include the following: (1) Reclamation and DWR south of Delta export modifications; (2) Reclamation reoperating upstream reservoirs to advance and allow for scheduling of water made available by contractors in CVP watersheds; and (3) passing Delta inflow from water made available by Voluntary Agreement (VA) Parties. Decrease the water temperature stressor by increasing flow in the migratory corridor from the Delta to the Sacramento River Water temperature stressor may also increase the following year due to higher release requirements that could deplete the cold-water pool Decrease the entrainment risk stressor by increasing migratory transport of juveniles to the estuary, potentially preventing entrainment at the export facility May decrease the outmigration cue and food availability stressors by increased flow through the Delta

Effects on Essential Fish Habitat for Sacramento-San Joaquin Delta

Pacific Coast salmon EFH impacted by the proposed action within the Delta region includes all waters of the Sacramento River and San Joaquin River within the Delta, including the multiple channels within the Delta, and tidally influenced portions of tributaries entering the Delta. The Pacific Coast salmon HAPCs that occur within the Delta include complex channels and floodplain habitats, and estuaries. The Pacific Coast groundfish HAPC that occurs within the Delta includes estuaries. No HAPCs were identified in the Coastal Pelagic Species FMP. Based on the best available information, NMFS concludes that the proposed action would adversely affect EFH for Pacific Coast salmon, Pacific Coast groundfish, and coastal pelagic species. We conclude that the following adverse effects on EFH designated for Pacific Coast salmon, Pacific Coast groundfish, and coastal pelagic species are reasonably certain to occur.

Passage Impacts

The proposed action includes operations of the temporary agricultural barriers in the south Delta and the SMSCGs on Montezuma Slough. These operations are expected to result in restricted upstream and downstream passage for adult and juvenile Chinook salmon in these areas.

Temporary agricultural barriers are in place from May to November. Flap gates are tidally operated, and are closed during ebb tides. During this time, passage is blocked for adults migrating upstream and juveniles migrating downstream, temporarily preventing access to the complex channels and floodplain habitats HAPC for Pacific Coast salmon. Juvenile Chinook salmon habitat would be subjected to warm water temperatures, resulting in poor water quality and likely increased predation near the structures. Delaying migration for both adult and juvenile spring-run and fall-run Chinook salmon is expected to reduce survival overall. See Section 7.5.1.14. of the NMFS Biological Opinion (NMFS 2024) for more details on anticipated effects.

SMSCGs are operated for 10 to 80 days per year. When operated, a boat lock is open and allows for passage of adult and juvenile Chinook salmon. However, as described in section 7.5.1.8.2. of the NMFS Biological Opinion (NMFS 2024), migrating adult Chinook salmon are typically delayed or blocked when the gates are closed. This has the potential to adversely impact adults migrating to their spawning grounds, as delays can result in reduced spawning success and reduced survival.

Contaminants

The proposed action could affect water quality within EFH habitat for Pacific Coast salmon, Pacific Coast groundfish, and coastal pelagic species, from storing and diverting water resulting in decreased inflow into the Delta in the winter and spring and increased inflow in the summer. Reduced flows may concentrate contaminants when present, while increased flows may dilute contaminants. Increased flows could also mobilize existing contaminants. Water quality degradation due to contaminant mobilization would impact the quality of the estuaries HAPC for Pacific Coast salmon by direct adverse physiological or behavioral effects on fish upon exposure to the contaminants as well as reducing the abundance and quality of lower trophic level prey resources through biological uptake of contaminants (Phipps *et al.* 1995, Fleeger *et al.* 2003). Release of contaminants in areas containing submerged aquatic vegetation could inhibit or prevent the growth of vegetation, thereby reducing habitat for invertebrates associated with this habitat. The invertebrates serve as food resources for juvenile Chinook salmon. The magnitude of these adverse effects on Chinook salmon EFH are generally expected to remain relatively low compared to contaminant mobilization that might occur without the proposed action.

These same effects would also be expected to impact Pacific Coast groundfish EFH, including effects to the estuaries HAPC (intertidal estuarine habitat in the western Delta).

Since EFH for coastal pelagic species is primarily based on water temperatures, the effects of contaminants is more tenuous on the functioning of this EFH. However, the mobilization of environmental contaminants would be expected to have a negative impact on the health of coastal pelagic species in the estuarine waters of the Delta.

Predator Control

Modification of EFH associated with engineered structures offers cover or advantageous habitat for predators of special-status species. The low spatial complexity and reduced habitat diversity (e.g., lack of cover) of channelized waterways in the Delta could reduce refuge for juvenile Chinook salmon from predators (Raleigh *et al.* 1984, 70 FR 52488 2005). The proposed action includes localized reduction of predatory fish abundance at locations such as Clifton Court Forebay and at Tracy Fish Collection Facility, and thereby reduce predation risks to juvenile salmonids; however, the efficacy of such actions is uncertain. These actions are primarily focused on reducing Chinook salmon predation, and may improve conditions in the estuaries and complex channels and floodplain habitats HAPCs for Pacific Coast salmon. They are not expected to significantly reduce predation on Pacific Coast groundfish or coastal pelagic species within the Delta.

Changes in Flows and Local Hydrodynamics

Modifications of Delta flows are expected to disrupt the migration of adult spawning Chinook salmon and rearing and migrating juvenile Chinook salmon within the complex channels and floodplain habitats HAPC for Pacific Coast salmon, as well as the estuaries HAPC for migrating juvenile Pacific Coast groundfish within the waters of the western Delta. These modifications may arise through the export of water via the CVP and SWP pumping facilities, operations of the DCC gates, water transfers, and operation of the south Delta temporary agricultural barriers. Delta inflows and outflows are anticipated to affect the rearing and distribution of Pacific Coast groundfish within the Delta and San Francisco Bay Estuary through changes in the location of the low salinity mixing zones of the Delta and estuary and the resulting changes in the areas of primary and secondary productivity that support these species. Likewise, changes in Delta outflow may affect the extent of upstream movement of coastal pelagic species within the Delta. Changes in the seasonal distribution of marine and estuarine vegetation are expected based on the amount of Delta outflow related to proposed action operations. The areas of vegetation are likely to increase or decrease, depending on the ambient salinity and the preferred habitat characteristics of the different species of aquatic plants.

Essential Fish Habitat Conservation Recommendations for the Sacramento-San Joaquin Delta

As described in the above effects analysis, NMFS has determined that the proposed action would adversely affect EFH for Pacific Coast salmon, Pacific Coast groundfish, and coastal pelagic species in the Sacramento-San Joaquin Delta. NMFS recommends the following conservation measures to avoid, minimize, mitigate, or otherwise offset the effects of the proposed action.

Delta Conservation Recommendation 1

NMFS recommends Reclamation reduces predator “hot spots” in the Delta to improve survival of juvenile Chinook salmon and juvenile groundfish with the following measures:

- Implement measures to reduce the predation intensity at the San Joaquin River Scour Hole through modifications to the channel geometry and associated habitats. Reducing predator habitat is expected to benefit Pacific Coast salmon EFH.
- Include monitoring data of fall-run and late fall-run Chinook salmon in the decision process for operations of the DCC gates to reduce potential predation associated with routes through the Delta interior. Protective actions regarding the DCC gate operations include closing the gates during periods when juvenile Chinook salmon are emigrating, regardless of run designation.
- Include monitoring data of fall-run and late fall-run Chinook salmon in the decision process for operations of the south Delta temporary barriers to reduce potential predation. Installation of the south Delta temporary barriers should be delayed until the spring emigration of fall-run Chinook salmon from the San Joaquin River basin is nearing completion. After installation of the barriers, the culverts are recommended to remain tied open to allow downstream passage of juvenile Chinook salmon until the monitoring at Mossdale indicates that there are few fish migrating downstream through the San Joaquin River system.

- If Reclamation accepts this recommendation, NMFS requests an update on implementation by December 31 of even years, starting in 2026.

Minimizing or reducing predators at these locations would improve conditions of the complex channels and floodplain habitats and estuaries HAPCs within the Delta for Pacific Coast salmon and Pacific Coast groundfish EFH.

Delta Conservation Recommendation 2

NMFS recommends Reclamation and DWR develop a plan that identifies and prioritizes projects that support riparian and floodplain habitat restoration efforts, and submit that plan to NMFS. These restoration efforts would benefit all migrating and rearing juvenile fish. Riparian and floodplain restoration would improve the quality and quantity of rearing habitat for juvenile fish by providing natural cover, enhancing stream shade, as well as helping to offset water temperature increases (Fogel *et al.* 2022). These restoration efforts are expected to improve the existing conditions of Pacific Coast salmon EFH, Pacific Coast groundfish EFH, and coastal pelagic species EFH, particularly the complex channels and floodplain habitats HAPC for Chinook salmon.

Delta Conservation Recommendation 3

NMFS recommends that if large pulses of Chinook salmon are detected migrating through the Delta or are observed in salvage, regardless of run type, protective actions should be employed to reduce the entrainment and loss of these fish at the CVP and SWP export facilities. These actions include export reductions to reduce the extent of hydraulic impacts within waterways leading to the south Delta export facilities, closure of the DCC gates to prevent routing of juvenile Chinook salmon into the interior Delta, and preferential exports from the CVP facilities to reduce loss during salvage operations. In addition, closing the DCC gates in the fall during pulse flows on the Mokelumne River designed to attract adult Chinook salmon will reduce straying of these fish into the open DCC route. These actions would benefit conditions for the complex channels and floodplain habitats HAPC for Pacific Coast salmon EFH.

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Bureau of Reclamation Responses to Essential Fish Habitat Conservation Recommendations

2024 Long Term Operation of the CVP and SWP

Sacramento River

To address the potential adverse effects to Chinook salmon spawning habitat related to seasonal operations, NMFS recommends:

- 1) Operate facilities to maintain flow conditions adequate enough to provide for a properly functioning channel, geomorphology, and spawning conditions.

Response: Reclamation continues to operate the multipurpose Central Valley Project as described in the Preferred Alternative. (Alternative 2- Multiagency Consensus Alternative) adopted in the 2025 Record of Decision (ROD). Reclamation will continue to operate consistent with the operation selected in the most current ROD and biological opinions or court-mandated actions.

- a. This could include future spawning bed quality surveys

Response: Reclamation completed the Sacramento River Gravel Augmentation Study (2020). SacramentoRiverGravelBudgetReport_Final.docx. An analysis of shields stress modeled geomorphic flows related to gravel transport and full-scale bed mobilization. This information is used to inform spawning bed projects. Annual monitoring on spawning habitat restoration projects is part of the Upper Sacramento River Anadromous Fish Habitat Restoration Project Monitoring Plan and Protocols (Monitoring Plan (final) 170831.pdf) and is reported out in the 2022-2023 and more recent annual reports (Available at Upper Sacramento River Anadromous Fish Habitat Restoration Program).

- b. Identify geomorphic flows to achieve gravel transport and full-scale bed mobilization

Response: Reclamation completed the Sacramento River Gravel Augmentation Study (2020). Microsoft Word - SacramentoRiverGravelBudgetReport_Final.docx. An analysis of shields stress modeled geomorphic Flows Related to Gravel Transport and Full-scale Bed Mobilization.

- c. Leveraging the latest bathymetric data in order to identify Keswick releases that could improve spawning habitat

Response: Reclamation operators have a good understanding of Keswick Reservoir bathymetry and operational capabilities and limitations, and do not believe that leveraging bathymetric profiles would help in real-time operations nor adds value at this time. However, Reclamation is currently developing a new temperature platform that incorporates bathymetry into the modeling. Therefore, once the Water Temperature Modeling Platform (WTMP) is complete, bathymetry will be inherently included in operational decisions for Keswick Reservoir.

- 2) Reclamation works with the Fish Agencies and Sacramento River Group (SRG) to consider fall-run Chinook salmon needs, specifically the spawning habitat HAPC, in Shasta operations.

Response: Please see below.

- a. Request that the SRG water operations consider needs of fall-run Chinook salmon spawning and incubation when setting temperature compliance points

Response : Reclamation currently discusses Shasta Dam operations temperature impacts on fall-run Chinook salmon. There are limitations to the currently used temperature model during the fall period when fall-run Chinook salmon spawn. Reclamation is planning to do a hindcast of fall-run TDM for the 2024 Shasta Cold Water Pool Report. The new temperature models are expected to perform better in the fall period.

- b. Flows to avoid redd dewatering, and system-wide tradeoffs.
- c. Decision support tools, such as incorporating characterization of fall-run Chinook salmon egg-to-fry survival and redd dewatering can help inform temperature management plans.

Response : The Proposed Action include consulted upon include considerations for fall-run Chinook salmon redd maintenance and alevin survival. Release reductions and risk analysis include fall-run Chinook salmon returns. Moreover, a goal of the Shasta Framework is to increase available habitat for fall-run Chinook salmon in the fall and winter months. Reclamation uses decision tools that consider fall-run Chinook salmon.

- d. Reclamation could coordinate with the SRG to explore late summer and early fall pulse flows from Keswick and Shasta dams to reduce water temperatures.
- e. A related pulse flow has been implemented to support juvenile spring-run Chinook salmon survival in late spring; this action could potentially be modified to also increase survival of fall-run Chinook salmon

Response: Reclamation has coordinated with agencies to help provide flows to benefit fall-run Chinook salmon.

- 3) Establish a process through the SRG to reduce the potential for redd dewatering for winter-run Chinook salmon and fall-run Chinook salmon.

Response: The Proposed Action consulted upon includes various conservation measures that address stranding and isolation and redd dewatering and promote habitat quality and availability for Chinook salmon, including fall-run Chinook salmon. These conservation measures include the Wilkins Slough Conservation Measure, the fall and winter baseflows for Shasta Reservoir Refill and Redd Maintenance Conservation Measure and the Modifications to Water Transfer Conservation Measure. In addition, the SRG implemented Sacramento River pulse flow actions to provide wild and hatchery fall-run Chinook salmon benefits. The SRG has coordinated intensively with agencies to help provide flows to increase survival of fall-run Chinook salmon hatchery fish.

- a. Preventing higher mid-summer flows than necessary during the peak of winter-run Chinook salmon spawning both reduces winter-run Chinook salmon redd dewatering later in the season and thereby makes it easier to stabilize flows for fall-run Chinook salmon spawning and prevent their subsequent redd dewatering. This planning and smoothing out of peak summer flows, when possible given other operational constraints, would benefit the spawning HAPC for winter-run and fall-run Chinook salmon.

Response: Reclamation is aware of the systemwide operational concerns that can cause the need for rebalancing of storage between reservoirs during summer and fall. Keswick Reservoir summer flow releases for this multipurpose project are dictated by various considerations. Summer operational considerations include releases for water temperature control, instream diversion demands, Delta outflows, Delta salinity, and exports. In-river temperatures downstream of Keswick Dam can be controlled via two methods. The first is thermal mass, by changing release volume or shifting releases between Trinity Basin imports and Shasta Reservoir, and the second is selective withdrawal of colder water through the Temperature Control Device. Determination of which method to use is made daily as operators balance releases from multiple reservoirs to meet downstream needs. Releases in the summer meet water temperature objectives, support essential features of critical habitat and support water supply deliveries. Releases from Shasta Reservoir typically begin increasing in April as storm frequency decreases, air temperatures increase and system-wide demands increase. Peak releases from Shasta Reservoir typically occur June through August and begin to decrease from the peak sometime in August or September. Occasionally, in very wet years, high storage levels through the summer may result in a need to release higher than normal flows in early fall to meet flood control requirements for the next year.

Consideration of fall conditions may also warrant measures for drought protection and rebalancing of storage between reservoirs.

Clear Creek

- 1) Reclamation work with Fish Agencies and the CCTT to determine how to manage releases from Whiskeytown Dam to provide suitable water flows for all life stages of Chinook salmon, including fall-run Chinook salmon, to reduce stranding and isolation, protect incubating eggs from being dewatered, promote habitat quality and availability, and assess whether Clear Creek flows or pulse flows should be further modified to reduce adverse impacts on Chinook salmon.

Response: The CCTT and Fish Agencies will continue to meet quarterly to discuss Clear Creek and Whiskeytown Dam management and to make recommendations that will provide high quality habitat for Chinook salmon. The CCTT develops an annual proposal for Central Valley Operations' considerations, which details Whiskeytown Dam operations that the team believes will promote Chinook salmon utilization of Clear Creek. This proposal incorporates the CCTT's plans to protect Chinook Salmon, such as, reducing redd dewatering, promoting quality habitat and availability, reducing stranding potential, and sustaining appropriate water temperatures.

- b. Reclamation, with input from the CCTT, could explore releasing pulse flows in the late summer-early fall to provide adequate flows for migration, mobilization of spawning gravels, and providing suitable water temperatures.

Response: The CCTT's annual proposal incorporate the CCTT's plan to best utilize 10,000 acre-feet allocated for pulse flow and other flow manipulations. Typically, the CCTT has concluded that multiple spring pulse flows are the best use of this water, but the CCTT has explored other flow manipulation plans, such as fall pulses. The CCTT will continue to evaluate and recommend actions that best meet the needs of Chinook salmon and lower Clear Creek habitat.

- 2) Reclamation develops water temperature models to improve Clear Creek water temperature management, as described in section 6.1.4.1.2 of the Biological Assessment (Reclamation 2023- 2024), to improve fall water temperature management closer to optimum water temperatures for all life stages of all Chinook salmon in Clear Creek.

Response: Reclamation developed water temperature models using HEC5Q. These models are being updated to HEC-ResSim within the Water Temperature Management Platform.

- 3) Develop a new spawning gravel budget and implement a longterm gravel augmentation plan in Clear Creek, including acquisition of a long-term gravel supply, which would benefit Chinook salmon EFH, including spawning HAPC.

Response: Reclamation has a long and successful history of gravel augmentation on Clear Creek.

- 4) For construction effects associated with habitat restoration, implement appropriate BMPs for Clear Creek using the BMPs described in NMFS's Biological Opinion for the NOAA Restoration Center's Program to Facilitate Implementation of Restoration Projects in the Central Valley of California (NMFS 2018).

Response: Reclamation, in cooperation with the Yurok Tribe, plans to implement several habitat restoration projects on Clear Creek in the coming years. Reclamation will consider the BMPs, many of which are already implemented on-going projects and projects recently completed.

- a. Reclamation should implement the BMPs that are most protective of aquatic habitats, such as minimizing disturbance to existing riparian vegetation, minimizing the application of herbicide, and providing fish passage during construction.

Response: Reclamation constructs projects using BMPs that best meet all project objectives.

- 5) Develop a plan that identifies and prioritizes projects that restore the creek channel closer to natural conditions, and submit that plan to NMFS.

Response: Reclamation, in coordination with the Yurok Tribe, is implementing projects to improve habitat conditions in Clear Creek. These projects include supplementation of beneficial materials (gravel, wood, and boulders) and a large-scale channel rehabilitation project ("Horsetown Project"). Additionally, Reclamation is implementing a new base flow regime for Clear Creek, which will more naturally follow seasonal rhythms of the local ecosystem and climate. Together these projects look to restore the form and function of Clear Creek and boost overall anadromous fish populations. Plans for each project will be submitted to NMFS through individual biological assessments. Projects are also discussed at the Clear Creek Technical Team with all participants, including NMFS.

- a. Ideally include incorporating large woody debris that would naturally occur in Clear Creek without the proposed action.

Response: Reclamation, in coordination with the Yurok Tribe, intends to continue supplementing large wood into Clear Creek efforts on an annual basis. Reclamation hopes to further expand the use of large woody debris through the incorporation of wood structure supplementation into the gravel augmentation project.

American River

- 1) Develop a gravel budget or utilize an existing and still applicable gravel budget, and augment gravel in accordance with that budget.

Response A spawning habitat assessment for the lower American River was recently completed by the Water Forum using the topobathymetric survey referenced below, a 2D model update and a recently completed substrate survey of the river. The acreage of suitable spawning habitat is variable over a range of flows (to a max of about 5K, and is dependent on depth, velocity, and substrate size habitat suitability indices (HIS) within the suitability constraints. Representing this as a range of acres is most appropriate to see acreages tied to hydraulic suitability only (HIS) and substrate + hydraulic suitability (gHSI). CVPIA Sit analysis is also currently utilized for determining areas for gravel placement where the river is deficient.

- a. On a five-year interval, Reclamation should regularly monitor topographic change and evaluate the availability of suitable spawning habitat based on best available scientific methods and data.

Response: The most recent topobathymetric surveys that cover Nimbus Dam to the Sacramento River confluence consist of airborne LiDAR and boat-based single- and multi-beam SONAR (to fill any gaps). The most recent data acquisition took place winter 2023/spring 2024. Previous data acquisition occurred in 2006/2008 and 2017. The 2006/2008 data was collected by USACE (2006 single-beam sonar) and DWR (2008 LiDAR).

The raw data referenced above are post-processed and resampled to develop a 3-foot resolution Digital Elevation Model (DEM) of the channel bed/banks, generally to the edge of the Designated Floodway boundary that loosely coincides with the American River Parkway boundary. The data is used to develop a reach-scale topographic change atlas for the river and includes 2006/2008 vs. 2017, and 2017 vs. 2023/2024. The 2017 vs. 2024 atlas is currently in QA/QC review and will be available when finalized. Ongoing, current, and future data collected, once finalized, is available for use in discussions with ARG and other stakeholders in determining areas where gravel is deficient and appropriate measures to fill in that river hole.

- 2) Implement a power bypass at Folsom Dam in all years as necessary to provide more suitable fall spawning and egg incubation temperatures for Chinook salmon, unless annual September temperature modeling indicate 56°F average daily water temperature, or lower, could be achieved at Watt Avenue on or before November 1st, without the bypass.

Response: Reclamation continues to operate the multipurpose project as described in the Preferred Alternative. (Alternative 2- Multiagency Consensus Alternative) as adopted in the 2025 Record of Decision and consistent with the 2019 Central Valley Power Initiative. In years when the lower American River will have temperatures unsuitable for rearing or spawning, Reclamation, will meet with fisheries agencies (likely to occur in August and September) to evaluate actions that can be taken to minimize temperature impacts to fisheries. This evaluation could include evaluations of a power bypass in the fall if temperatures are greater than 56 degrees at Hazel Avenue in November.

- a. Coordinate with the American River Group to develop the water temperature objectives for fall conditions.

Response: Reclamation continues to operate the multipurpose Central Valley Project as described in the Preferred Alternative. (Alternative 2- Multiagency Consensus Alternative) as adopted in the 2025 Record of Decision which includes that Reclamation, through ARG, to annually prepare a Temperature Management Plan for the summer through fall.

- b. Evaluate implementation of alternative methods to support effective water temperature management in the Lower American River, including infrastructure modifications at Folsom and Nimbus dams, including but not limited to measures evaluated during planning or value engineering studies (Reclamation et al. 2007, Thomas Cook Innovation 2014, LLC).

Response: Stakeholders have had extensive coordination and discussions on how to improve habitat conditions (including infrastructure modifications at Folsom and Nimbus dams) for fish in the lower American River. Prior infrastructure modifications proposed were investigated and none were found to be feasible. Through the ARG, Reclamation intends to continue discussions on actions that could be taken to improve habitat conditions in the lower American River.

- 3) Manage operations on the American River to minimize hypoxic conditions for Chinook salmon migrating and spawning downstream of Nimbus Dam.

Response: Please see below.

- a. Dissolved oxygen gauges be installed and made publicly accessible via the CDEC. These should record dissolved oxygen hourly (or more frequently) and be placed at strategic locations near Nimbus Dam, including the north and south banks of the dam outflow, the hatchery ladder, and between Nimbus Basin and Sailor Bar, since these are where adult Chinook salmon enter the hatchery fish ladder and where a large portion of in-river spawning occurs (Cramer Fish Cramer Fish Sciences 2023, Reclamation 2024a).

Response: Dissolved oxygen is continuously monitored (15-minute interval) year-round on the lower American River at the locations listed below. One logger is placed seasonally (summer/fall) below Folsom Dam.

- *Watt Avenue temperature and flow compliance point*
- *Hazel Avenue temperature and flow compliance point (below spawning riffle in Nimbus Basin).*
- *Below Nimbus Dam spillway (Gates 9/10).*
- *Below Nimbus Dam powerhouse outflow.*

- b. Provide results of this dissolved oxygen monitoring to the American River Group on a monthly basis.

Response: River conditions are discussed monthly at ARG. Data captured from the loggers is downloaded approximately every three weeks. The information is presented via multi-plots which show each logger/flows/temperatures. The DO logger data is uploaded yearly on EDI. <https://portal.edirepository.org/nis/mapbrowse?packageid=edi.1587.1>

- c. During the salmon spawning period, Reclamation should consider initiating spilling from Nimbus Dam if dissolved oxygen levels fall below 7 mg/L at any time (the threshold required by the Central Valley Regional Water Quality Control Board (Central Valley Regional Water Quality Control Board [2019]) and open additional gates if levels remain below this threshold after initial spilling.

Response: River conditions are discussed monthly at ARG. When there is potential for concern, extensive coordination and discussions occur regarding habitat conditions, including dissolved oxygen management, and operations of the CVP in the lower American River. If river conditions are a concern, ARG meets more frequently to discuss possible operational changes that could be needed at Nimbus Dam to support improved fish habitat conditions in the river.

- d. Evaluate potential implementation of alternative methods to support effective management of dissolved oxygen levels in the Lower American River below Nimbus Dam, which could include mechanical means of increasing dissolved oxygen levels (Horne 2019), and report their findings to the American River Group.

Response: River conditions are discussed monthly at ARG. When there is potential for concern, extensive coordination and discussions occur regarding habitat conditions, including dissolved oxygen management, and operations of the CVP in the lower American River. Through the ARG, Reclamation intends to continue discussions on actions that could be taken to increase habitat conditions in the lower American River.

Stanislaus River

- 1) Seek to increase opportunities (through easements or other approaches to alleviate concerns related to seepage) to release flows over 1,500 cfs for more than 10 consecutive days, even when not in reservoir or flood management.

Response: Reclamation will continue to operate the CVP for multiple purposes, as described in the purpose and need of the 2025 LTO ROD and consistent with EO 14181.

- 2) Implement gravel augmentation to maintain, or increase, the extent of suitable spawning habitat that is available between Goodwin Dam and Orange Blossom Bridge.
 - a. Renew efforts to place gravel in Goodwin Canyon, either in the float tube pool or at the cable crossing.

Response: Gravel was placed in Goodwin Canyon in 2015, 2020, and 2021 and anticipated again in 2026.

- b. If Reclamation accepts this recommendation, NMFS requests an update on implementation by December 31 of even years, starting in 2026.

Response: As described, Reclamation has been placing gravel in Goodwin Canyon prior to this recommendation.

- 3) On a five-year interval, Reclamation monitor topographic change and evaluate the availability of suitable spawning and rearing habitat based on best available scientific methods and data.

Response: Reclamation works with contractors and agencies to evaluate spawning and rearing habitat utilization and monitor salmon populations through adult and juvenile monitoring.

- a. If Reclamation accepts this recommendation, NMFS requests an update on implementation by December 31 of even years, starting in 2026.

Response: Reclamation evaluation of suitable habitat is ongoing and prior to this EFH consultation

San Joaquin River

- 1) Pursue habitat restoration opportunities along the lower San Joaquin River to address effects of the proposed action on the complex channels and floodplain habitats HAPC and the thermal refugia HAPC.
 - a. Shallower rearing areas with riparian vegetation and large woody debris would provide “rest stops” for juvenile salmonids to use for feeding and as refuges from larger visual predators during outmigration.

Response: The San Joaquin River Restoration Program expects to consider this recommendation when they engage in habitat restoration in the future. However, currently the San Joaquin River Restoration Program is not conducting habitat restoration, and is not expected to conduct habitat restoration in the near future.

- b. If Reclamation accepts this recommendation, NMFS requests an update on implementation by December 31 of even years, starting in 2026.

Response: Please see previous response

- 2) Support habitat restoration efforts that increase food production.

Response: Please see previous response.

- a. NMFS requests an update on implementation by December 31 of even years, starting in 2026.

Response: Please see previous response.

Delta

- 1) Implement measures to reduce the predation intensity at the San Joaquin River Scour Hole through modifications to the channel geometry and associated habitats.

Response: Reclamation is analyzing alternatives through a NEPA analysis to reduce predation at the San Joaquin River Scour Hole.

- 2) Include monitoring data of fall-run and late fall-run Chinook salmon in the decision process for operations of the DCC gates to reduce potential predation associated with routes through the Delta interior.

Response: Reclamation operates the DCC with consideration to Knights Landing Catch Index, Sacramento Catch Index, and the Salmon Monitoring Team when water quality criteria per D-1641 are met. The catch index includes all runs of salmon.

- a. Protective actions regarding the DCC gate operations include closing the gates during periods when juvenile Chinook salmon are emigrating, regardless of run designation.

Response: From October 1 through November 30, Reclamation proposes to close the DCC gates in addition to the requirements in D-1641 to further reduce juvenile salmonid entrainment risk based on the Knights Landing Catch Index and Sacramento Catch Index monitoring.

- 3) Include monitoring data of fall-run and late fall-run Chinook salmon in the decision process for operations of the south Delta temporary barriers to reduce potential predation.

Response: Reclamation will provide a copy of the EFH report to DWR, the agency in charge of installation of the barriers.

- a. Installation of the south Delta temporary barriers should be delayed until the spring emigration of fall-run Chinook salmon from the San Joaquin River basin is nearing completion.

Response: Please see above.

- b. After installation of the barriers, the culverts are recommended to remain tied open to allow downstream passage of juvenile Chinook salmon until the monitoring at Mossdale indicates that there are few fish migrating downstream through the San Joaquin River system.

Response: Please see above.

- c. If Reclamation accepts this recommendation, NMFS requests an update on implementation by December 31 of even years, starting in 2026.

Response: Please see above.

- 4) Reclamation and DWR develop a plan that identifies and prioritizes projects that support riparian and floodplain habitat restoration efforts, and submit that plan to NMFS.

Response: Reclamation in coordination with the Science Integration Team {SIT}, identifies prioritizes riparian and floodplain habitat restoration. NMFS Southwest Science Center participates and provides valuable input to SIT.

- 5) If large pulses of Chinook salmon are detected migrating through the Delta or are observed in salvage, regardless of run type, protective actions should be employed to reduce the entrainment and loss of these fish at the CVP and SWP export facilities.
 - a. These actions include export reductions to reduce the extent of hydraulic impacts within waterways leading to the south Delta export facilities.

Response: Reclamation will operate in accordance with the actions evaluated in the governing Biological Opinions and adopted in the most current ROD at the time.

- b. Closure of the DCC gates to prevent routing of juvenile Chinook salmon into the interior Delta, and preferential exports from the CVP facilities to reduce loss during salvage operations.

Response: Reclamation will continue to operate in accordance with the actions evaluated in the governing Biological Opinions and adopted in the most current ROD at the time.

- c. Closing the DCC gates in the fall during pulse flows on the Mokelumne River designed to attract adult Chinook salmon will reduce straying of these fish into the open DCC route.

Response: This recommendation is being implemented as part of the 2025 ROD.



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
501 West Ocean Boulevard, Suite 4200
LONG BEACH, CA 90802

Refer to NMFS No: WCRO-2024-02917

April 14, 2025

Mr. Adam Nickels
Acting Regional Director
Bureau of Reclamation
Mid-Pacific Region
2800 Cottage Way
Sacramento, California 95825

Re: Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat
Consultation for the Reinitiation of Consultation on the Long-Term Operations of the
Central Valley Project and State Water Project

Electronic transmittal only

Dear Mr. Nickels:

Thank you for your request for consultation with NOAA's National Marine Fisheries Service (NMFS) on essential fish habitat (EFH) for the Long-Term Operations of the Central Valley Project and State Water Project. NMFS reviewed the proposed action for potential effects on EFH pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), implementing regulations at 50 CFR 600.920, and agency guidance for use of the ESA consultation process to complete EFH consultation.

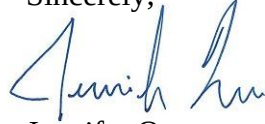
Based on the best available information, NMFS has concluded that the proposed action would adversely affect EFH designated under the Pacific Coast Salmon, Pacific Coast Groundfish, and Coastal Pelagic Species Fishery Management Plans (FMPs). Therefore, in the enclosed, NMFS provides Conservation Recommendations.

As required by Section 305(b)(4)(B) of the MSA, Reclamation 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 timeframes 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)].



Reclamation 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(1)]. We appreciate your consideration of our Conservation Recommendations. If you wish to discuss this consultation further or have questions concerning our recommendations, please contact Cathy Marcinkevage, of my staff, at (916) 930-3600.

Sincerely,

A handwritten signature in blue ink, appearing to read "Jennifer Quan", is positioned above the printed name.

Jennifer Quan
Regional Administrator

Enclosure

cc: File: ARN: 151422-WCR2021-SA00122

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NATIONAL MARINE FISHERIES SERVICE
MAGNUSEN-STEVENSON FISHERY CONSERVATION AND MANAGEMENT ACT
ESSENTIAL FISH HABITAT CONSULTATION

Section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) directs federal agencies to consult with NOAA's National Marine Fisheries Service (NMFS) on all actions or proposed actions that may adversely affect essential fish habitat (EFH). Under the MSA, this consultation is intended to promote the conservation of EFH as necessary to support sustainable fisheries and the managed species' contribution to a healthy ecosystem. For the purposes of the MSA, EFH means "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity," and includes the associated physical, chemical, and biological properties that are used by fish (50 CFR 600.10). Adverse effect means any impact that reduces quality or quantity of EFH, and may include direct or indirect physical, chemical, or biological alteration of the waters or substrate and loss of (or injury to) benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects may result from actions occurring within EFH or outside of it and may include direct, indirect, site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) of the MSA also requires NMFS to recommend measures that can be taken by the action agency to conserve EFH. Such recommendations may include measures to avoid, minimize, mitigate, or otherwise offset the adverse effects of the action on EFH (50 CFR 600.905(b)).

Background

This EFH consultation on the proposed reinitiation of consultation on the long-term operation (LTO) of the Central Valley Project (CVP) and State Water Project (SWP) was written in accordance with section 305(b)(2) of the MSA (16 U.S.C. 1801 et seq.) and implementing regulations at 50 CFR 600.

NMFS has completed pre-dissemination review of this document using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (DQA) (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). The document will be available within 2 weeks at the NOAA Library Institutional Repository (<https://repository.library.noaa.gov/welcome>). A complete record of this consultation is on file at the Sacramento NMFS Office.

Consultation History

- On September 30, 2021, the Bureau of Reclamation (Reclamation) provided a letter to NMFS requesting reinitiation of consultation on the LTO of the CVP and SWP pursuant to the Endangered Species Act (ESA) section 7 and EFH.
- On October 31, 2024, Reclamation provided NMFS with an EFH Assessment (Reclamation 2024c). On this date, NMFS initiated the EFH consultation.

Proposed Action

The purpose of the proposed action is to continue the operation of the CVP in coordination with the SWP, for their authorized purposes. Reclamation operates the CVP for the congressionally authorized purposes of (1) river regulation, improvement of navigation, and flood control; (2) irrigation and domestic uses, and fish and wildlife mitigation, protection, and restoration; and (3) power, and fish and wildlife enhancement. The California Department of Water Resources (DWR) operates the SWP for the primary purpose of water supply deliveries and flood control, and the SWP provides additional benefits including power generation and environmental stewardship. Conservation measures were included to avoid and minimize or compensate for CVP and SWP effects, and included actions that benefit listed species (Appendix H, Reclamation 2023-2024). Effects to EFH from the proposed action are described in Reclamation's EFH Assessment (Reclamation 2024c). For a full description of the proposed action, we incorporate by reference here, Reclamation's final Biological Assessment (BA, Reclamation 2024d) for the reinitiation of consultation on the LTO of the CVP and SWP, provided to NMFS on October 23, 2024 (Appendix A to the NMFS Biological Opinion, NMFS 2024).

Action Area

The action area for this EFH consultation includes habitat within areas expected to be affected directly or indirectly by the Federal action and not merely the immediate habitat area involved in the action. Specifically, the EFH action area includes (1) the Sacramento River from Keswick Dam downstream to the Sacramento-San Joaquin Delta; (2) Clear Creek from Whiskeytown Dam to its confluence with the Sacramento River; (3) the American River from Lake Natoma Dam downstream to its confluence with the Sacramento River; (4) the Stanislaus River from New Melones Dam to its confluence with the San Joaquin River; (5) the San Joaquin River from the confluence of the Stanislaus River downstream to the Sacramento-San Joaquin Delta; and (6) the Sacramento-San Joaquin Delta, which includes the region of waterways bounded by the Sacramento River downstream from the I Street Bridge in Sacramento, the San Joaquin River downstream from the Airport Way Bridge near Vernalis, waters bounded on the east approximately by the alignment of Interstate 5, and westwards to nearly the western tip of Chipps Island. The action area also includes Spring Creek from Spring Creek Debris Dam to Keswick Reservoir. The action area for this EFH consultation does not extend past Chipps Island since effects of the proposed action are not expected to adversely affect EFH for managed species beyond this point. This EFH consultation also does not include effects to Trinity River, since future Trinity River operations are expected to be addressed in a separate consultation.

Essential Fish Habitat Affected by the Proposed Action

This EFH analysis is based on the EFH assessment provided by Reclamation, the analysis in the NMFS Biological Opinion (NMFS 2024), and descriptions of EFH for various species and life stages of Pacific Coast salmon (Pacific Fishery Management Council [PFMC] 2024c), Pacific Coast groundfish (PFMC 2024b), and coastal pelagic species (PFMC 2024a) contained in the fishery management plans (FMPs) and that occur in the action area. These FMPs were developed by the PFMC and approved by the Secretary of Commerce. Table 1 provides details associated

with this EFH analysis. This consultation also describes conservation measures Reclamation proposes in their BA (Appendix H, Reclamation 2023-2024) to avoid, minimize, mitigate, or otherwise offset potential adverse effects resulting from the proposed action on EFH.

Table 1. Fishery Management Plans and effects by the Proposed Action in the action area.

Fishery Management Plan That Identifies EFH in the Action Area	Does Action Have an Adverse Effect on EFH?	Does Action Have an Adverse Effect on HAPC?	Are EFH Conservation Recommendations Provided?	Portion of the Action Area where EFH is present
Pacific Coast Salmon (PFMC 2024c)	Yes	Yes	Yes	Sacramento River, Clear Creek, American River, Stanislaus River, San Joaquin River, Sacramento-San Joaquin Delta
Pacific Coast Groundfish (PFMC 2024b)	Yes	Yes	Yes	Sacramento-San Joaquin Delta, and portions of the lower Sacramento River and American River
Coastal Pelagic Species (PFMC 2024a)	Yes	No	Yes	Sacramento-San Joaquin Delta

All evolutionarily significant units of Chinook salmon in the Central Valley (Sacramento River winter-run Chinook salmon, Central Valley [CV] spring-run Chinook salmon, CV fall-run Chinook salmon, and CV late fall-run Chinook salmon) are managed under the Pacific Coast Salmon FMP (PFMC 2024c), and all occur within the action area.

EFH for Pacific Coast salmon includes those waters and substrate necessary for salmon production needed to support a long-term sustainable salmon fishery and salmon contributions to a healthy ecosystem. Freshwater EFH for Chinook salmon includes streams, lakes, ponds, wetlands, and other water bodies currently, or historically accessible to salmon in Washington, Oregon, Idaho, and California, except areas upstream of certain impassable man-made barriers (as identified by the PFMC [2024]) and longstanding, naturally-impassable barriers (i.e., natural waterfalls in existence for several hundred years).

EFH for Pacific Coast groundfish is defined as the aquatic habitat necessary to allow groundfish production to support long-term sustainable fisheries for groundfish and for groundfish contributions to a healthy ecosystem ((PFMC 2024b). Descriptions of Pacific Coast groundfish EFH for each species and their life stages result in more than 400 EFH identifications. Species most likely to occur in the action area include starry flounder (*Platichthys stellatus*) and English sole (*Pleuronectes vetulus*). The Pacific Coast groundfish EFH in the action area includes all waters from the mean higher high water line, and the upriver extent of saltwater intrusion in river mouths.

EFH for coastal pelagic species is described in the Coastal Pelagic Species FMP (PFMC 2024a) and explains the habitat requirements of five pelagic species: Northern anchovy, Pacific sardine, Pacific (chub) mackerel, jack mackerel, and market squid. These four finfish and market squid are treated as a single species complex because of similarities in their life histories and habitat requirements. Species most likely to occur in the action area include Northern anchovy (*Engraulis mordax*) and Pacific sardine (*Sardinops sagax*).

Along the West Coast, the PFMC identifies habitats that fall within “Habitat Areas of Particular Concern” (HAPC) and recommends these to NMFS consistent with the MSA. HAPCs are considered high priority areas for conservation, management, or research because they are important to ecosystem function, sensitive to human activities, stressed by development, or are rare. These areas provide important ecological functions and/or are especially vulnerable to degradation and can be designated based on either specific habitat types or discrete areas. HAPCs are a discrete subset of EFH. This EFH consultation focuses on addressing any adverse effects the proposed action may incur on EFH and in the following designated HAPCs:

- HAPCs for Pacific Coast salmon are: complex channels and floodplain habitats, spawning habitat, thermal refugia, estuaries, and marine and estuarine submerged aquatic vegetation, as described in Appendix A to the Pacific Coast Salmon FMP (PFMC and NMFS 2014b). The marine and estuarine submerged aquatic vegetation HAPC is not present within the action area.
- HAPCs for Pacific Coast groundfish are: estuaries, canopy kelp, seagrass, rocky reefs, and areas of interest, as described in the Pacific Coast Groundfish FMP (PFMC 2024b). Only the HAPC for estuaries is present within the action area.

EFFECTS ON EFH AND EFH CONSERVATION RECOMMENDATIONS

This section provides information by watershed and includes a brief description of the proposed action, adverse effects to EFH, and conservation recommendations. The proposed action includes conservation measures to avoid, minimize, mitigate, or otherwise offset potential CVP and SWP effects and include actions that benefit MSA-managed species. For a full description of the proposed action, we incorporate by reference Reclamation’s October 23, 2024, final BA (Reclamation 2024d).

Sacramento River/Shasta Division Proposed Action

For the Sacramento River, the proposed action includes Sacramento River Pulse Flows, Adult Migration and Holding Temperature Objectives, Water Temperature and Storage, Egg Incubation and Emergence Temperature Objectives, Ramping Rates, Base Flows for Shasta Refill and Redd Maintenance including Minimum Instream Flows and Rice Decomposition Smoothing (Table 2). The proposed action also includes conservation measures to minimize potential negative effects (Table 3). We incorporate by reference here the proposed action and its project components found in Reclamation’s final BA (Reclamation 2024d).

Within the Sacramento River Division, Reclamation operates Shasta and Keswick dams year-round in coordination with the other facilities of the CVP and SWP. These operations are seasonal in their nature, as Reclamation operates in the winter for flood control, including both the channel capacity within the Sacramento River and Shasta Reservoir flood conservation space. Releases for flood control will vary, depending on the current storage, the forecasted inflow, and the flow in the mainstem Sacramento River at Bend Bridge where flows are held below 100,000 cfs. When not operating for fall and winter flood control, Shasta Dam is operated primarily to conserve storage while meeting minimum flows both down the Sacramento River and in the Delta. During the winter to spring period, there are natural accretions (flows from unregulated creeks) into the Sacramento River below Shasta Dam. In wetter water year types, Reclamation may be able to operate mostly for flood control and minimum instream requirements because of the large volumes of accretions to the Sacramento River. In drier years, these accretions may be lower and, therefore, require Reclamation to release a higher level of releases from the upstream reservoirs to meet state permit requirements as well as project exports in the Delta.

In the spring, reservoir releases are relatively stable until flows are needed to support instream demands on the mainstem Sacramento River and Delta Outflow requirements. When Delta regulatory constraints are reduced, exports can increase during periods of excess flow and Reclamation can build additional storage south of the Delta, in San Luis Reservoir, without increasing releases from upstream reservoirs. An overarching goal for Reclamation when operating the CVP is to fill the reservoirs as much as possible by the end of the flood control season (end of May), while still meeting all other authorized project purposes. An action component in the proposed action is the inclusion of spring pulse releases, where under certain hydrological conditions, Reclamation will make reservoir releases to simulate natural springtime freshets events that stimulate and facilitate juvenile salmonid emigration.

During the summer, operational considerations are mainly flows sufficient to meet Delta outflow requirements, instream demands, temperature control, and exports. A particularly challenging aspect of summer operations is the Cold-Water Pool Management in Shasta Reservoir, where during summer months, Reclamation releases large volumes of water to meet downstream agricultural demands while also providing suitable temperatures for winter-run Chinook salmon spawning and incubation. To meet these competing demands, Reclamation proposed to use a bin strategy that allows for strategically selected temperature compliance locations, based on projected total storage and cold-water pool. Temperature management continues into the fall, and by late fall, the remaining cold-water pool in Shasta Reservoir is usually very limited.

In the fall and with decreasing agricultural demands, Reclamation reduces its reservoir releases, to begin again the process of building storage for the following summer. However, early in the fall, upper Sacramento River flows cannot be too low, as there are still significant instream diversion demands on the mainstem between Keswick Dam and Wilkins Slough, and depending on conditions, SWRCB Delta requirements may require upstream reservoir releases which may include from Shasta Reservoir. This necessitates maintaining higher releases to support the instream demands until they decrease later in the season. To manage that change between higher early-fall releases with the lower releases in the late fall and winter, Reclamation will consider the potential for dewatering redds with a risk analysis of the remaining winter-run Chinook

salmon redds, the anticipated fall-run Chinook salmon redds, and the probability of sufficient cold water in a subsequent year.

The proposed action also includes a number of conservation measures intended to avoid, minimize, mitigate, or otherwise offset CVP and SWP project effects as well as contribute to the recovery and enhancement of species and their habitats (Table 3). These conservation measures include non-flow actions that benefit listed species.

Table 2. Action Components of the Proposed Action for the Sacramento River.

Action Component	Proposed Action
Sacramento River Pulse Flows	To increase the out-migration survival of Chinook salmon, Reclamation would release up to 150 TAF in pulse flow(s) each water year, typically in the spring to benefit Chinook salmon in the Sacramento River watershed, when the pulse “does not interfere with the ability to meet temperature objectives or other anticipated operations of the reservoir” (Reclamation 2023-2024).
Adult Migration and Holding Temperature Objectives	Under circumstances where these conditions may cause water temperatures to rise to concerning levels prior to the completion of the final temperature management plan, Reclamation will begin temperature management as early as March 1 to target water temperatures of 58.0°F daily average at the Sacramento River at the CCR (Sacramento River above Clear Creek) gauge. Reclamation, through coordination, may propose a different temperature based on the potential impacts to winter-run Chinook salmon spawning and egg incubation.
Water Temperature and Storage	The Shasta Reservoir Management Plan (Shasta Management Plan) that will use a system of management “Bins” to administer water temperature and storage levels. There are three Bins (1, 2, and 3) based on the expected End of April storage. Each Bin has two categories: A (standard) and B (drought protection). The letter of the Bin (A or B) is primarily driven by the expected demands on the reservoir which are a function of hydrology, meteorology, system-wide conditions, contractual requirements and other conditions. Bin A years are when the expected demand on the reservoir is lower, meaning it is likely to result in better drought protection should the following year be dry. Bin B years are intended to increase the priority of storage conservation to address the possibility that the ensuing year could be a drought. Bin B years may be when there is limited water supply in the Shasta system, or the system as a whole is more stressed and additional actions are necessary to reach the objectives of that Bin.
Egg Incubation and Emergence Temperature Objectives	An average daily water temperature of 53.5°F is targeted in Bin 1 (Enhance) downstream of the CCR gauge, in Bin 2 (Recover/Maintain) at the CCR gauge, and in Bin 3 (Protect) upstream of the CCR gauge. Bins 1 and 2 target temperature dependent mortality of $\leq 3\%$ while Bin 3 targets $\leq 30\%$.

Action Component	Proposed Action
Ramping Rates	Rapid changes in river elevation from ramping reservoir releases up or down can impact aquatic biota. Sudden flow decreases can strand fishes and macroinvertebrates. Ramping rates to limit how quickly releases are reduced can lessen or minimize these impacts. Under Water Rights Order 90-5, the change in the release rate (ramping) from Keswick Dam from September through February shall not decrease more than the rates noted in the PA, in order to minimize stranding of salmon. In addition to the requirements under Order 90-5, the ramping rates for Keswick Dam between July 1 and March 31 would be reduced between sunset and sunrise, as described in the PA.
Base Flows for Shasta Refill and Redd Maintenance including Minimum Instream Flows	Reclamation proposes to set target base flows from Keswick Dam for the winter (December 1 through the end of February) based on Shasta Reservoir End of September storage. These base flows consider historical performance in building Shasta Reservoir's cold-water pool. Fall and winter base flows support fall-run and Central Valley spring-run Chinook salmon, address winter-run Chinook salmon redd dewatering stressors, and support cold water pool management.
Rice Decomposition Smoothing	Rice decomposition smoothing could minimize impacts to both winter-run Chinook salmon and fall-run Chinook salmon by minimizing fry stranding and redd dewatering as flows drop in the winter. The Sacramento River Settlement Contractors (SRSC) and CVP Water Service Contractors will synchronize their diversions to lower peak rice decomposition demand. Starting in August, Reclamation and the SRSC, through the Sacramento River Group (SRG), will develop a delivery schedule based on dewatering risk for winter-run Chinook salmon redd locations and update as conditions warrant.

Table 3. Proposed Conservation Measures for the Sacramento River. Actions are summarized from Appendix H of Reclamation (2023-2024), unless duplicative with items listed above in Table 2.

Conservation Measure	Description/Objective
Sacramento River Settlement Contractors (SRSC) Delaying or Shifting Spring Diversions to Maximize Storage	Reclamation may request that the SRSC delay diversions in the spring to increase the likelihood that Shasta Reservoir elevations reach the upper gates on the Temperature Control Device.
SRSC Shifting Timing of Delivery of Transfer Water	Reclamation may request that the SRSC shift timing of delivery of transfer water to increase the amount of water in Shasta Reservoir through the water temperature management season.
Wilkins Slough Minimum Flow Criteria Relief	Under this conservation measure, summer flows would be lower than 5,000 cfs in the driest of years. As a default, Reclamation will target a minimum flow of 3,400 cfs under these conditions. October flows may vary due to demands, water transfer operations and protection of winter-run Chinook salmon redds and are likely to be in the 3,250 - 5,000 cfs range, although higher flows may be necessary at times. After the irrigation season, Reclamation expects to begin ramping down to the minimum flow of 3,250 cfs as soon as possible given deliveries, Delta conditions and winter-run Chinook salmon redd dewatering concerns. Reclamation, through coordination with the Shasta Operations Team (SHOT), will determine the appropriate ramp down date after evaluating tradeoffs between Shasta Reservoir storage, next year's water temperature management, winter-run Chinook salmon redd dewatering and fall-run Chinook salmon stranding and redd dewatering.
Rebalancing between other CVP Reservoirs	Under this conservation measure, Sacramento River flows may decrease in dry years as one approach to conserving storage in Shasta Reservoir and operate the temperature control device (TCD) to target 53.5° F upstream of CCR for the most critical period during the winter-run Chinook salmon spawning and egg incubation period to avoid critical loss of winter-run Chinook salmon population. Reclamation will reduce Shasta Reservoir releases for water supply (CVP allocations) to only that needed for meeting public health and safety demands, including minimum salinity levels in the Delta.
Limitation on CVP Allocations for End of September Storage	Under this conservation measure, Reclamation may consider water supply reductions in dry water years. Reclamation will reduce Shasta Reservoir releases for water supply (CVP allocations) to only that needed for meeting public health and safety demands, including minimum salinity levels in the Delta. Reclamation, through coordination with the SHOT, will identify moderate and heavy system-wide tradeoffs with the goal of conserving storage and meeting minimal water temperature objectives. This action attempts to increase end of water year storage for Shasta Reservoir by reducing spring and summer flows. In extremely dry years or in multi-year droughts, it is possible that these actions will not achieve an End-of-September storage above 2.0 million-acre feet (MAF).

Conservation Measure	Description/Objective
Modifications to Water Transfers	Under this conservation measure, Reclamation may request that the SRSC shift timing of delivery of transfer water during the typical irrigation season (April through September) to help improve water temperature management and/or protect against winter-run Chinook salmon redd dewatering and fall-run Chinook salmon stranding. Sacramento River flows would increase, and storage in Shasta Reservoir would be reduced. If the SHOT denies water transfers, the water would be delivered, and Shasta Reservoir would have less cold-water pool.
Limitations in SRSC Water Available Under Contract	Under this conservation measure, Sacramento River flows may decrease in the spring, summer, and fall of dry years as one approach to conserving storage in Shasta Reservoir. Listed species potentially impacted by this action include winter-run Chinook salmon, spring-run Chinook salmon, steelhead, and green sturgeon.
Refuge Coordination for Instream Flow, Lake Levels, and Refuge Needs	Under this conservation measure, Shasta Reservoir releases to refuges in the summer and fall may decrease during the driest of years as a way to increase Shasta Reservoir storage. Listed species potentially impacted by this action include winter-run Chinook salmon, spring-run Chinook salmon, steelhead, and green sturgeon.
Annual Winter-Run Chinook Salmon Broodyear Assessment	Based on the outcome of the broodyear assessment prepared by the Winter-run JPE sub-team, Reclamation, NMFS, United States Fish and Wildlife Service (USFWS) and California Department of Fish and Wildlife will convene appropriate technical staff to make recommendations if it is necessary to increase the production of winter-run Chinook salmon associated with the Integrated-Recovery Supplementation Program or take other actions to protect production of winter-run Chinook salmon at the Livingston Stone National Fish Hatchery. USFWS, through coordination with the SHOT, will implement measures as appropriate. The outcome of the broodyear assessment may also be considered in implementing actions within the drought toolkit as described in Section 3.12 Drought of the Proposed Action.
Drought Operations Priority Framework	Under this conservation measure, Reclamation will develop a Drought Emergency Plan that establishes system priorities and a water temperature management plan that seeks to provide winter-run Chinook salmon spawning water temperatures to avoid catastrophic losses related to summer water temperature management with the goal of achieving a projected End-of-September storage as close to 2.0 MAF as possible. Some of the actions that will be included in the Drought Emergency Plan could occur in any month of the year. Sacramento River flows into the Delta would be reduced to conserve storage in Shasta Reservoir. Listed species potentially impacted by this action include winter-run Chinook salmon, spring-run Chinook salmon, steelhead, green sturgeon, Delta smelt and longfin smelt.

Effects on Essential Fish Habitat in the Sacramento River

Pacific Coast Groundfish and Coastal Pelagic Species EFH is limited in the mainstem Sacramento River upstream of the Delta. Specifically, the upstream extent of Coastal Pelagic Species EFH is delineated around river mile 4, near Sherman Island, well within the legal Delta. Pacific Coast Groundfish EFH extends further upstream to river mile 144, near Colusa, California. The downstream portions are more tidally influenced (e.g., river mile 46, near Freeport, California). HAPCs for Pacific Coast groundfish are estuaries, rocky reefs, canopy-forming kelp, seagrasses, and areas of interest (PFMC 2024b), with only the former of those, the estuaries HAPC, existing in the lower Sacramento River. Of the species managed under the FMP, Elasmobranchs are generally limited to San Francisco Bay, and groundfish and rockfish are nearly exclusively marine. Even euryhaline species, such as Starry flounder, which can be found in the spring as young-of-year in salinities less than 2 parts per thousand (ppt), have not been found more than 75 miles from the ocean. Therefore, estuarine habitat, a crucial environment for groundfish in inland areas, is generally absent in the Sacramento River upstream of the San Francisco Bay Delta, except under very specific flow conditions. Consequently, groundfish species, which rely on these habitats, are unlikely to inhabit the marginal EFH that might exist in these upstream locations. Given the lack of suitable habitat and the low probability of groundfish presence there, NMFS has determined that the proposed action will not result in adverse effects to Pacific Coast groundfish EFH.

The Chinook salmon HAPCs that occur within the Sacramento River include complex channels and floodplain habitats, thermal refugia, and spawning habitat. Various HAPCs are present from Keswick Dam, river mile 302, downstream through the San Francisco Bay Delta, and additionally found in some tributaries and watersheds adjacent to the mainstem Sacramento River. Complex channels are rare on such a heavily managed river, but present in flood bypasses. Thermal refugia is most prevalent upstream, influenced by cold water releases in the spring and summer from Shasta Reservoir. Based on the best available information, NMFS concludes that the following adverse effects on EFH designated for Chinook salmon are reasonably certain to occur:

Effects to Redd Quality

Seasonal operation of Shasta and Keswick dams, as described in the final PA (Reclamation 2024d), include controlling flow and water temperatures in the upper Sacramento River where all runs of Chinook salmon spawn. These operations affect the complex channels and floodplain habitats, and spawning HAPCs. The seasonal flows modeled under the proposed action in the Sacramento River at Keswick Dam are very similar to the observed managed flows in most months under current operations, which both show high summer and early fall flows with lower flows in the winter and spring. Depending on the time of year, higher flows may negatively impact spawning and egg/alevin incubation. If flows are too high, they may result in depths and flow velocities in excess of suitable flows for constructing redds, and for redds that were already constructed, which may be at risk of being scoured from the bed (NMFS 2017). In addition, adults may construct redds under high flow conditions and in areas that are later dewatered or isolated from the main river channel when the flows decline.

Likewise, low flow conditions during the late fall and winter in the spawning reaches of the upper Sacramento River could have a number of negative effects on spawning, egg incubation, and alevins. As described by Windell et al. (2017), potential adverse effects of low flows on eggs and alevins include: an insufficient area of riverbed with suitable attributes to accommodate redds for all spawning-ready fall-run and late fall-run Chinook salmon adults; inadequate flow velocities to flush sediments from the redds; insufficient flow to maintain adequate levels of dissolved oxygen in contact with eggs and alevins in the redds and to flush metabolic wastes from the redd; and insufficient water depths for redds, such that minor reductions in flow result in redd stranding and dewatering.

Overall, NMFS considers the effects of seasonal operations on EFH as being both positive and negative. Seasonal operations where Reclamation builds storage enables Reclamation to make summer releases at a suitable temperature for winter-run Chinook salmon spawning and egg incubation. Conversely, reducing releases in the fall, winter, and spring can limit the available spawning and rearing habitat for fall-run and late fall-run Chinook salmon, negatively impacting EFH. Central Valley spring-run Chinook salmon adults are less frequently detected spawning in the Sacramento River, but juveniles emerging from tributaries can benefit from proposed action flows in the complex channels and floodplain habitats in the mainstem for rearing and outmigration.

Effects to Outmigration Cues

Reclamation proposes to implement spring pulse flows under certain hydrologic conditions to improve the survival of out-migrating juvenile salmon, especially CV spring-run, fall-run, and late fall-run Chinook salmon. These actions affect the complex channels and floodplain habitats, and spawning HAPCs. A spring pulse flow is expected to result in increased survival of juvenile salmon by mimicking the natural hydrologic cues that trigger salmon outmigration (Kjelson *et al.* 1981). NMFS considers this action component to provide a benefit to Chinook salmon EFH, as it would increase survival of out-migrating juveniles by improving the migration corridor function of the mainstem Sacramento River. However, in years with low End of September storage, the prescribed low flows during the late fall and winter can have a negative effect on downstream migration of juvenile salmon. An assessment of mark-recapture survival model runs in the mainstem Sacramento River revealed that of the numerous mortality factors considered, spanning multiple spatial scales, increasing flow correlated most strongly with increasing out-migration success (Iglesias *et al.* 2017). This assessment focused on hatchery-origin Chinook salmon, but it provides additional evidence that flow is one of the most important factors affecting overall survival of Chinook salmon in the Central Valley (Kjelson and Brandes 1989, Zeug *et al.* 2014, Michel *et al.* 2015).

Water Temperature

Temperature management actions affect the thermal refugia, and spawning HAPCs. The temperature targets, associated with implementation of the Shasta Management Framework bin strategy, are described in Table 4.

Table 4. Shasta Management Framework Goals, Objectives and Indicators. Source: summarized from Reclamation (2023-2024). See also Section 3.2 Framework Approach of the BA for descriptions of Bins (Reclamation 2024d)

	Bin 1a	Bin 1b	Bin 2a	Bin 2b	Bin 3a	Bin 3b
Estimated Frequency	80% of Years		~11.5% of Years		~8.5% of Years	
Biological Objective	Enhance		Recover	Maintain	Protect	
Biological Goals	• Maximize species recruitment opportunities • Increase spatial diversity • Maximize floodplain linkages • Enhance ecological flows • Increase available habitat for fall-run Chinook salmon in the fall and winter months		• Maintain or maximize species recruitment opportunities with some reduction in spawning habitat compared to Bin 1 • Maintain or restore river function and key floodplain linkages • Restore key ecological flows		• Avoid critical loss of population • Maintain key refuges of spawning and early rearing habitat • Avoid catastrophic changes to habitat and impacts to the broodyear	
Temperature Management for Sacramento River winter-run Chinook salmon	Manage spawning habitat		Manage the majority of spawning habitat		Manage spawning habitat during the critical periods of the spawning and egg incubation period	
Temperature Target	average daily water temperature of 53.5°F					
Compliance Point	Downstream of the CCR (Sacramento River above Clear Creek) gauge		At the CCR gauge		Upstream of the CCR gauge	
Temperature Dependent Mortality Target	≤3%				≤30%	

NMFS acknowledges that the limited cold-water pool is maximized each year to ensure that suitable spawning and incubation conditions are available to endangered winter-run Chinook salmon in the upper Sacramento River from May 15 through October 31. Relative to current operations, the proposed action and the Cold-Water Pool Management action component would provide a benefit to winter-run Chinook salmon and Chinook salmon EFH generally during the time that Reclamation is able to provide suitable temperatures. However, the use of cold-water reserves for winter-run Chinook salmon through the summer would impact those spring-run and fall-run Chinook salmon spawning later in the season in October and beyond, since the cold water is typically used up by the end of the temperature management season. The effect of the Cold-Water Pool Management on Chinook salmon EFH is both positive and negative, where Reclamation is able to selectively improve access to spawning habitat and thermal refugia during the specific periods of winter-run Chinook salmon spawning in the spring, but where late-summer and fall periods would be subject to reduced access and degraded thermal refugia for spring-run and fall-run Chinook salmon spawning.

Stranding and Dewatering

Under the proposed action, Reclamation proposes to adjust fall flows based on Shasta Reservoir storage to avoid dewatering winter-run Chinook salmon redds and cold-water pool impacts. Higher flows during the October to November period could increase the available spawning habitat that would benefit fall-run Chinook salmon redds. These actions affect the thermal refugia, and spawning HAPCs. Currently, Reclamation lowers flows in the early fall period in order to conserve water for spring cold-water pool. This can result in dewatering fall-run Chinook salmon redds that were constructed at higher flows when Reclamation was keeping flows higher to minimize dewatering winter-run Chinook salmon redds. Therefore, this action component could potentially benefit fall-run Chinook salmon in years where Reclamation ends the water year with high storage in Shasta Reservoir.

Additionally, as part of the Fall and Winter Refill and Redd Maintenance proposed action component, Reclamation would assess the water demands of the upstream CVP contractors and the Sacramento River Settlement Contractors to better coordinate water deliveries and minimize significant flow fluctuations. Typically, Sacramento Valley rice growers will flood their fields in the fall after the year's harvest to help decompose crop residue (e.g. rice hulls and straw) which can otherwise impede seedbed preparation and contribute to disease and weed problems. The water required for rice decomposition can pose a sudden demand on the system, which in turn can cause significant fluctuation in river flow. Coordinated (i.e. smoothed) diversions in late October and early November could provide increased reliability that target flows would be met according to the Fall and Winter Refill and Redd Maintenance operations. Because NMFS assumes that the minimum flows identified in the proposed action for this season would be achieved, this action component would, therefore, provide greater certainty that Reclamation would be able to reduce releases gradually to meet the base flows according to the Fall and Winter Refill and Redd Maintenance action component. Considering that this action component would contribute to stabilizing flows and increase the reliability of the Fall and Winter Refill and Redd Maintenance action component, the effects of the Rice Decomposition Smoothing are positive for Chinook salmon EFH.

Essential Fish Habitat Conservation Recommendations for the Sacramento River

As described in the above effects analysis, NMFS has determined that the proposed action would adversely affect EFH for Chinook salmon in Sacramento River. NMFS provides the following conservation recommendations to avoid, minimize, mitigate, or otherwise offset the effects of the proposed action on the spawning, complex channels and floodplain habitats, and thermal refugia HAPCs.

Sacramento River Conservation Recommendation 1

To address the potential adverse effects to Chinook salmon spawning habitat related to seasonal operations, NMFS recommends Reclamation operate facilities to maintain flow conditions adequate enough to provide for a properly functioning channel, geomorphology, and spawning conditions. This could include future spawning bed quality surveys, identifying geomorphic flows to achieve gravel transport and full-scale bed mobilization, and leveraging the latest bathymetric data in order to identify Keswick releases that could improve spawning habitat.

Sacramento River Conservation Recommendation 2

NMFS recommends that Reclamation works with the Fish Agencies and Sacramento River Group (SRG) to consider fall-run Chinook salmon needs, specifically the spawning habitat HAPC, in Shasta operations. For example, Reclamation could request that the SRG water operations consider needs of fall-run Chinook salmon spawning and incubation when setting temperature compliance points, flows to avoid redd dewatering, and system-wide tradeoffs. Decision support tools, such as incorporating characterization of fall-run Chinook salmon egg-to-fry survival and redd dewatering can help inform temperature management plans. In addition, to address impacts to the thermal refugia HAPC, Reclamation could coordinate with the SRG to explore late summer and early fall pulse flows from Keswick and Shasta dams to reduce water temperatures. These pulse flows are intended to temporarily break downstream thermal barriers in the adult migratory corridor to allow fish passage upstream to existing cooler areas of the river and increase natural origin fall-run Chinook salmon juvenile survival (Michel *et al.* 2023). A related pulse flow has been implemented to support juvenile spring-run Chinook salmon survival in late spring; this action could potentially be modified to also increase survival of fall-run Chinook salmon.

Sacramento River Conservation Recommendation 3

NMFS recommends Reclamation establish a process through the SRG to reduce the potential for redd dewatering for winter-run Chinook salmon and fall-run Chinook salmon. For example, preventing higher mid-summer flows than necessary during the peak of winter-run Chinook salmon spawning both reduces winter-run Chinook salmon redd dewatering later in the season and thereby makes it easier to stabilize flows for fall-run Chinook salmon spawning and prevent their subsequent redd dewatering. This planning and smoothing out of peak summer flows, when possible given other operational constraints, would benefit the spawning HAPC for winter-run and fall-run Chinook salmon.

Clear Creek Proposed Action

Clear Creek, originating in the Trinity Mountains, is a tributary to the Sacramento River downstream of Keswick Dam. Whiskeytown Reservoir and Dam demarks the Upper and Lower Clear Creek. Lower Clear Creek provides spawning habitat for Chinook salmon that no longer have access to Upper Clear Creek, including spring-run, fall-run, late fall-run, and occasionally winter-run Chinook salmon.

The proposed action components for Clear Creek include a new seasonal flow schedule and revised temperature management (Table 5), as well as ongoing channel maintenance and spring attraction pulse flows (Table 6).

Reclamation proposes to provide seasonally variable instream Clear Creek flows from Whiskeytown Dam to emulate natural processes. Reclamation, with input from the Clear Creek Technical Team (CCTT), will schedule the hydrograph to maximize multi-species benefits, with low flows of approximately 100 cfs in the summer to 300 cfs in the winter. During Critical water year types, flows may be reduced based on available water from Trinity Reservoir.

Reclamation proposes to manage Whiskeytown Dam releases to meet a daily average water temperature of 61°F from June 1 through August 15, 60°F from August 16 through September 15, and 56°F or less from September 16 through November 15 at the Igo stream gauging station on Clear Creek. During Critical water years, Reclamation will operate to as close to these temperatures as possible, but acknowledges temperature criteria may not be met.

Reclamation proposes to release up to 10 thousand acre-feet (TAF) from Whiskeytown Dam for both spring attraction and channel maintenance (during dry or wetter years) pulse flows, except in years with significant uncontrolled spill. We incorporate by reference here the more detailed explanation of the proposed action in Reclamation's final PA (Reclamation 2024d).

Table 5. Action Components of the Proposed Action for Clear Creek.

Action Component	Proposed Action
Water temperature management	Reclamation proposes to manage Whiskeytown Dam releases to meet the following daily average water temperatures at the U.S. Geological Survey (USGS) Igo stream gauge station: • 61°F from June 1 through August 15 • 60°F from August 16 through September 15 • 56°F from September 16 through November 15
Minimum instream (seasonally oscillating) flows	Seasonally oscillating flows, generally between 100 and 300 cfs. Refer to section 3.5 of the final proposed action for more details (Reclamation 2024d).
Channel maintenance and spring attraction pulse flows	Reclamation will release up to 10 thousand acre-feet from Whiskeytown Dam for a channel maintenance pulse flow, spring attraction pulse flows, and other physical and biological objectives (except in years with significant uncontrolled spill). The pulse flows (scheduled on or after February 1) will not exceed the current safe outlet works capacity of 840 cfs.
Temporary weir	A temporary weir is placed in late-August to early-November to physically separate fall-run from spring-run Chinook salmon during spawning to minimize hybridization and redd superimposition.

Table 6. Proposed Conservation Measures for Clear Creek (Appendix H, Reclamation 2023-24)

Conservation Measures	Description/Objective
Down ramping rate of no more than 25 cfs per hour	Down ramping rates would minimize the rate of flow decreases during controlled flow reduction, minimizing the risk of juvenile and yearling salmonids being stranded.
Minimum instream flows	Providing minimum instream flows would help provide refuge habitat, food availability and quality, and reduce predation and competition for juvenile and yearling salmonids.
Pulse flows	Reclamation and Department of Water Resources propose to continue channel maintenance and spring attraction pulse flows. However, the total volume available for channel maintenance pulse flows will be reduced and will not occur in Dry and Critical water year types.
Water temperature management	Provide suitable water temperatures for spawning, holding, and rearing Chinook salmon.

Effects on Essential Fish Habitat for Clear Creek

Chinook salmon EFH impacted by the proposed action includes Lower Clear Creek to the confluence with the Sacramento River. The Pacific Coast salmon HAPCs that occur within Lower Clear Creek include: (1) complex channels and floodplain habitats, (2) thermal refugia, and (3) spawning habitat. Based on the best available information, NMFS concludes that the proposed action would adversely affect EFH for Pacific Coast salmon in Clear Creek. We conclude that the following adverse effects on EFH designated for Chinook salmon are reasonably certain to occur.

Impacts to Substrate Quality and Quantity from Managed Flows

The operation of Whiskeytown Dam contributes to the decrease in magnitude and frequency of flood flows and decreases the downstream movement of sediment and large woody debris. Those effects are expected to continue under the proposed action, with the decreases in the magnitude and frequency of flood flows largely being attributed to proposed operations. The reductions in sediment and large woody debris recruitment limits the natural creation of complex channels and floodplain habitats important for spawning and rearing by trapping sediment, nutrients, and organic matter, creating pools, sorting gravels, and providing cover for salmon (Appendix A to the Pacific Coast salmon FMP, PFMC and NMFS 2014a). Physical responses to altered flow regimes include the deposition of fine sediments in gravel; channel stabilization and narrowing; reduced channel complexity such as the formation of point bars, secondary channels, oxbows, and changes in channel planform; downstream channel erosion; and reduced floodplain connection (Poff *et al.* 1997). These hydrologic effects are expected to continue as a result of proposed action operations. Although these effects are somewhat offset during temporary pulse flows, these responses continue to adversely affect the complex channels and floodplain habitats HAPC.

Due to proposed channel maintenance pulse flows, the adverse effects on the complex channels and floodplain habitats HAPC will be reduced over time as a result of enhancements of riparian floodplain habitat. Channel maintenance pulse flows are likely to improve the salmon spawning HAPC by mobilizing and dispersing gravel, and reducing fine sediment, depending on the frequency of occurrence and magnitude of flow. Spring attraction pulse flows are expected to improve conditions for adult spring-run Chinook salmon migrating upstream towards spawning grounds.

Water Temperature Effects from Water Operations

The thermal refugia HAPC provides areas to escape warm water temperatures, and is critical to Chinook salmon survival. These areas include cool water tributaries, lateral seeps, side channels, tributary junctions, deep pools, areas of groundwater upwelling and other areas that are cooler than surrounding waters. They can occur at spatial scales ranging from entire tributaries to highly localized pockets of water embedded within larger rivers (Appendix A to the Pacific Coast salmon FMP, PFMC and NMFS 2014a).

Reservoir operations are expected to affect water temperatures in Clear Creek, including the thermal refugia HAPC. Controlled reservoir releases minimize large flood events and other

natural flows that would inundate floodplain habitat, recharge groundwater, and would aid in maintaining cooler water temperatures. The proposed action includes summer water temperature management ($\leq 61^{\circ}\text{F}$ from June 1 to August 15 and $\leq 60^{\circ}\text{F}$ from August 16 to September 15) and fall water temperature management ($\leq 56^{\circ}\text{F}$ from September 16 to November 15). Daily average water temperatures have historically remained below 60°F at Igo during the summer temperature management period. With the new proposed flow schedule, flows will be lower during the summer, and it may be more difficult to keep water temperatures below 60°F . Increased water temperatures are likely to result in reduced dissolved oxygen. Typically, during the fall spawning period, water temperatures have exceeded 56°F in most years. The 56°F daily average water temperature has been determined to be suboptimal, and would likely lead to mortality of incubating eggs and reduced survival (Myrick and Cech 2004, Martin *et al.* 2017). During the beginning of the 56°F water temperature objective period, the proposed action is expected to adversely affect the spawning HAPC for Chinook salmon.

NMFS expects the proposed change in minimum instream flows, which includes decreasing flows in summer and increasing flows in winter and spring, to improve the availability of cooler water in Clear Creek during the 56°F water temperature objective period, which starts in mid-September. This threshold will be most difficult to meet during Critical years. Typically, in October and November, the 56°F water temperature objective is more readily met due to decreasing air temperatures. Although the proposed action will continue water temperature management releases, available thermal refugia and spawning HAPCs for Chinook salmon in Clear Creek will likely continue to be limited by controlled reservoir releases.

Benthic Disturbance and Passage Blockage

A temporary weir is installed between the Gorge Cascade and Clear Creek Road Bridge (approximately river mile 8) each year to physically separate fall-run Chinook salmon from spring-run Chinook salmon, to minimize the risk of hybridization and redd superimposition. Installation of the weir is expected to disturb the benthic community in a small portion of the creek where the weir will be placed and where crew will be entering the creek while placing the structure. Habitat restoration activities are also likely to result in disturbance to the creek channel bottom. These disturbances could physically impact the benthic community and reduce foraging organisms in the immediate area. After the weir is removed, benthic organisms are expected to recover rapidly in the disturbed area due to the small footprint. NMFS expects that the effects of disturbance to the benthic community from the Project's weir installation will be minor.

Although the weir minimizes the risk of hybridization between fall-run and spring-run Chinook salmon, the weir physically blocks fall-run Chinook salmon adults from accessing upstream spawning habitat. This results in fall-run Chinook salmon spawning below the weir, in waters which may be less suitable than in reaches further upstream. This benefits the spawning HAPC for spring-run Chinook salmon, but negatively impacts the spawning HAPC for fall-run Chinook salmon. Fall-run Chinook salmon adults are likely to be exposed to warmer water temperatures and may not have access to suitable spawning substrate. Substrate in Lower Clear Creek is still recovering from debris from the 2018 Carr Fire, and spawning habitat throughout Lower Clear Creek is still limited for both fall-run and spring-run Chinook salmon (Reclamation 2024b).

We incorporate by reference here, Section 3.13.3.3 of the final PA (Reclamation 2024d), which mentions habitat restoration on Clear Creek. Any construction related to restoration projects have the potential to temporarily disturb the creek channel and benthic community, as well as potentially limit passage, depending on the timing and duration of construction activities.

Spawning Habitat Availability

Spawning habitat typically consists of low gradient stream reaches, containing clean gravel with low levels of fine sediment and high intergravel flow. The natural recruitment of spawning habitat substrate has been impacted by Whiskeytown Dam. Maximum available spawning habitat for fall-run Chinook salmon is achieved at approximately 300 cfs (USFWS 2015). Under the proposed action, flows will be low during August to mid-November (100 to 200 cfs released from Whiskeytown Dam) (section 2.5.3, Reclamation 2023-2024). Since flows would be increasing in the fall, spring-run Chinook salmon eggs and emerging fry would experience increased habitat and cooler temperatures, as described in section 7.2.1.3. of the Biological Opinion (NMFS 2024).

Proposed channel maintenance and spring attraction pulse flows under the proposed action represent less than 30% of the flow needed to transport sediment in the absence of flows from downstream tributaries (Whiskeytown releases up to approximately 840 cfs). As a result, effects of these flows are expected to be of low magnitude and occur with low frequency. Based on redd timing, fall-run and late fall-run Chinook salmon eggs and emerging fry would be exposed to the effects of these pulse flows, which could affect the spawning HAPC for fall-run and late fall-run Chinook salmon. Pulse flows may displace incubating eggs from redds, resulting in exposure to predation, abrasion, and increased water temperature if transported out of suitable habitat. For more details on the effects analysis of salmonid critical habitat in Clear Creek, refer to section 7.2.2 of the Biological Opinion (NMFS 2024).

Essential Fish Habitat Conservation Recommendations

As described in the above effects analysis, NMFS has determined that the proposed action would adversely affect EFH for Chinook salmon in Clear Creek. NMFS provides the following conservation recommendations to avoid, minimize, mitigate, or otherwise offset the effects of the proposed action on the spawning, complex channels and floodplain habitats, and thermal refugia HAPCs.

Clear Creek Conservation Recommendation 1

NMFS recommends that Reclamation work with Fish Agencies and the CCTT to determine how to manage releases from Whiskeytown Dam to provide suitable water flows for all life stages of Chinook salmon, including fall-run Chinook salmon, to reduce stranding and isolation, protect incubating eggs from being dewatered, promote habitat quality and availability, and assess whether Clear Creek flows or pulse flows should be further modified to reduce adverse impacts on Chinook salmon. For example, Reclamation, with input from the CCTT, could explore releasing pulse flows in the late summer-early fall to improve conditions for fall-run Chinook salmon. Providing adequate flows for migration, mobilization of spawning gravels, and

providing suitable water temperatures would improve spawning and thermal refugia HAPCs, and would increase the likelihood that Chinook salmon populations persist.

Clear Creek Conservation Recommendation 2

NMFS recommends Reclamation develops water temperature models to improve Clear Creek water temperature management, as described in section 6.1.4.1.2 of the BA (Reclamation 2023-2024), to improve fall water temperature management closer to optimum water temperatures for all life stages of all Chinook salmon in Clear Creek.

Clear Creek Conservation Recommendation 3

NMFS recommends Reclamation develop a new spawning gravel budget and implement a long-term gravel augmentation plan in Clear Creek, including acquisition of a long-term gravel supply, which would benefit Chinook salmon EFH, including spawning HAPC. Gravel augmentation increases the quality and quantity of salmon spawning habitat, and would help address fine sediment deposition in gravel caused by the proposed action. This would also benefit fall-run and late fall-run Chinook salmon spawning habitat.

Clear Creek Conservation Recommendation 4

For construction effects associated with habitat restoration, NMFS recommends implementing appropriate BMPs for Clear Creek using the BMPs described in NMFS's Biological Opinion for the NOAA Restoration Center's Program to Facilitate Implementation of Restoration Projects in the Central Valley of California (NMFS 2018). Reclamation should implement the BMPs that are most protective of aquatic habitats, such as minimizing disturbance to existing riparian vegetation, minimizing the application of herbicide, and providing fish passage during construction.

Clear Creek Conservation Recommendation 5

NMFS recommends that Reclamation develop a plan that identifies and prioritizes projects that restore the creek channel closer to natural conditions, and submit that plan to NMFS. Restoration projects would ideally include incorporating large woody debris that would naturally occur in Clear Creek without the proposed action. Implementing projects that have restoration components would improve the spawning and the complex channels and floodplain habitats HAPCs for all Chinook salmon that spawn and rear in Clear Creek.

American River Proposed Action

Reclamation operates and maintains the American River Division of the CVP for flood control, municipal, industrial and agricultural water supplies, hydroelectric power generation, fish and wildlife protection, recreation, and Delta water quality. Facilities include Folsom Dam, its reservoir (977 TAF capacity), power plant, temperature control shutters on the power plant, and the Joint Federal Project auxiliary spillway, as well as the Nimbus Dam, Lake Natoma, Nimbus Power Plant, and Folsom South Canal. Folsom Reservoir is the largest storage and flood control reservoir on the American River.

Reclamation proposes to meet water rights, contracts, and agreements that are both specific to the American River Division as well as those that apply to the entire CVP, including the Delta Division. For Lower American River flows (below Nimbus Dam), Reclamation proposes to adopt the American River Minimum Flow Schedule (ARMFS). Flows range from 500 to 2,000 cfs based on time of year and annual hydrology. Notably, the Minimum Release Requirement (MRR) for January will be determined using the Sacramento River Index, while the American River Index will be used for the remaining months, both with a 90% exceedance forecast. These indices will be based on the first Bulletin 120 of each year, in February, then updated with each subsequent month's Bulletin 120, until a final MRR is calculated in May for the remainder of the year. When developing the operational forecast, Reclamation will evaluate an end-of-December Folsom storage of at least 300 TAF, though Reclamation acknowledges that in some years, operational constraints may result in an end-of-December storage of less than 300 TAF.

Key differences between the ARMFS and the Modified Flow Management Standard include using a 90% exceedance forecast for MRR calculations instead of 50% or 75%, establishing a defined timeframe for implementing monthly MRRs, evaluating and potentially adjusting MRR calculations in November and December, and removing the offramp and volume offset in the spring pulse flow to provide more flexibility for flow shaping.

The proposed action for the American River in the EFH Assessment (Reclamation 2024c) includes the ARMFS, as well as conservation measures, to mitigate and offset potential negative effects, to listed species and their critical habitats (Table 7 and Table 8). We also incorporate by reference here the more detailed description of the proposed action provided by Reclamation for the ESA consultation on October 23, 2024 (Reclamation 2024d).

Table 7. Action Components from the Proposed Action for the American River.

Action Component	Proposed Action
Minimum Release Requirements and Redd Dewatering Protective Adjustments	Reclamation's American River operations include the American River Minimum Flow Schedule (ARMFS) which is intended to provide water supply reliability and water temperature management for fisheries. The ARMFS uses two hydrological indices to determine Reclamation's Minimum Release Requirement (MRR) from Nimbus Dam. The Sacramento River Index, a monthly forecast of the total unimpaired water year flow volume for key rivers in the region, is used to determine the January MRR. From February to December, the American River Index (ARI) is used to determine the MRRs. The ARI measures the unimpaired inflow to Folsom Reservoir minus certain spilled water. The MRR curves are based on inflection points, and corresponding index values are determined through an iterative process, while target flows are established based on biological considerations. The ARMFS also incorporates Redd Dewatering Protective Adjustments (RDPA) to safeguard the spawning habitats of fall-run Chinook salmon and California Central Valley (CCV) steelhead from redd dewatering due to reductions in MRR.
Spring Pulse Flows	Reclamation will implement a spring pulse flow when the March MMR falls between 1,000 and 1,500 cfs. This pulse flow will peak at three times the March MRR, not exceeding 4,000 cfs, and last for 2 days. The American River Group will provide technical input on flow volumes, while the final timing will be determined collaboratively by California Department of Fish and Wildlife (CDFW), USFWS, and NMFS. Reclamation, through the American River Group, may facilitate additional pulse flows if water is available from non-CVP sources or if release schedules allow for greater flexibility.
Ramping Rates	Reclamation proposes to ramp down releases in the American River below Nimbus Dam at night, if possible. The maximum allowable decrease within a 24-hour period (ranging from 500 to 4,000 cfs) and the maximum change per step (from 100 to 1,350 cfs) vary depending on the starting flow rate (specified in 10 bins from <5,000 to 20,000). As the flow rate decreases, so do the allowable changes, reflecting a more cautious approach at lower flows to minimize impacts on aquatic life. Specifically, daily decreases of 10% or less are allowed under the lowest flow conditions (e.g., 500 out of 5,000 cfs), but that percentage can be as high as 25% (4,000 out of 16,000 cfs) at the upper end.
Water Temperature Management	The Temperature Management Plan aims to maintain optimal water temperatures for both CCV steelhead and fall-run Chinook salmon in the Lower American River. Ideally, daily average temperatures between Nimbus Dam and Watt Avenue would not exceed 65°F for CCV steelhead rearing, especially during the active temperature management season from May 15 to October 31. While temperatures below 56°F are ideal for Chinook salmon spawning, which typically occurs from mid-October to January, the Automated Temperature Selection Procedure prioritizes CCV steelhead rearing during summer months. This system sets monthly water temperature targets at Watt Avenue, ranging from 63°F to 72°F depending on the schedule. Schedule 78 has a water temperature limit of 72°F from May through November. Schedules 2 through 77 each represent a change in a single month's upper-temperature limit by 1°F.

Table 8. Proposed Conservation Measures for the American River (page 24, Appendix H, Reclamation 2023-2024)

Conservation Measure	Description/Objective
Temperature Management Study	Reclamation would manage the Folsom/Nimbus Dam complex and the water temperature control shutters at Folsom Dam to select the lowest schedule given the available quantity and quality of water in Folsom Reservoir, ideally to maintain a daily average water temperature of 65°F (or other water temperature as determined by the temperature modeling) or lower at Watt Avenue Bridge from May 15 through October 31, to provide suitable conditions for juvenile steelhead rearing in the Lower American River, if cold water is available.

Effects on Essential Fish Habitat for American River:

The American River lacks estuarine habitat, a critical component for groundfish survival in inland areas, rendering the river unsuitable for these species. Consequently, groundfish are unlikely to occupy the marginal EFH designated in the American River roughly downstream of Howe Avenue. This absence of suitable habitat and the low probability of groundfish presence leads to the conclusion that the proposed action will not measurably impact Pacific Coast Groundfish EFH. Furthermore, no HAPCs for Pacific Coast groundfish exist in the American River. Additionally, coastal pelagic species EFH does not extend as far upstream as the American River. Therefore, NMFS anticipates no adverse effects on Pacific Coast groundfish EFH or coastal pelagic species EFH from the proposed action.

The Pacific Coast salmon EFH impacted by the proposed action includes the American River from below the Nimbus Dam complex to the confluence with the Sacramento River. The Chinook salmon HAPCs that occur within the American River include complex channels and floodplain habitats, thermal refugia, and spawning habitat. Fall-run Chinook salmon are the most abundant run of Chinook salmon in the American River and all life stages can be found at different times of the year. The American River also supports non-natal rearing of juvenile winter-run and spring-run Chinook salmon (Phillis *et al.* 2018, Day and Morris 2023). Based on the best available information, NMFS concludes that the proposed action would adversely affect EFH for Chinook salmon in the American River. We conclude that the following adverse effects on EFH designated for Chinook salmon are reasonably certain to occur.

Managed Flows

The complex channels and floodplain habitats and spawning HAPCs are affected by reductions in sediment and large woody debris recruitment is also largely a result from the existence of Folsom and Nimbus dams, which are part of the environmental baseline. Those effects are expected to continue under the proposed action, with proposed operations. The current operations of the Folsom and Nimbus dam complex contribute to a decrease in the magnitude and frequency of flood flows and decrease the downstream movement of sediment and large

woody debris. Specifically, the proposed reservoir system operations reduce the movement of sediment and large woody debris downstream. The hydrologic effects of proposed action operations are expected to result in geomorphic responses including the deposition of fine sediments in gravel; channel stabilization and narrowing; reduced channel complexity such as the formation of point bars, secondary channels, oxbows, and changes in channel planform; downstream channel erosion; bed armoring; and reduced floodplain connection (Poff *et al.* 1997, Graf 2006). All of these operations adversely affect the complex channels and floodplain habitats and spawning HAPCs.

Analysis indicates that, due to natural fluvial geomorphic processes, even well-constructed habitat enhancement sites erode quickly because there is no possibility of any recruitment of suitable spawning material from upstream sources (Fairman 2007, Reclamation 2024a). The Lower American River gravel budget must be regularly augmented to sustain the amount of suitable spawning gravel that is available, and more action is needed to increase habitat extent.

Water Temperature

The presence of and role that thermal refugia may play in the quantity and quality of Chinook salmon habitat in the Lower American River is not well understood. Thermal refugia typically include cool water tributaries, lateral seeps, side channels, tributary junctions, deep pools, areas of groundwater upwelling, and other mainstem river habitats that are cooler than surrounding waters ($\geq 3.6^\circ$ F cooler). Among those habitats, the Lower American River includes side channels and deep pools, but it is unclear if they act as thermal refugia. Given the evidence that Chinook salmon in the Lower American River show signs of thermal stress, it is likely that thermal refugia are lacking. The specific effect that the proposed action will have on thermal refugia is not clear, but stressful water temperatures for adult Chinook salmon in the American River are expected to continue under the proposed action.

Adult fall-run Chinook salmon females experience egg retention or pre-spawning mortality in the American River in most years when water temperatures in the fall migration and staging period are sub-optimal. From 1993 to 2017, the proportion of unspawned females ranged from 3% to 67% and averaged 20%, and the proportion that retained greater than 30% of their eggs ranged from 6% to 80% with an average of 33% (Reclamation 2019). More recent observations have continued this trend, for example, 26% of female carcasses recovered in October 2021 through January 2022 were partially spawned or unspawned (Grimes and Galinat 2022). To help address this impact to fall-run Chinook salmon adults and EFH, the Automated Temperature Selection Procedure (ATSP) aims to provide suitable conditions, to the extent possible, for fall-run Chinook salmon staging and early spawning. However, due to temperature management throughout the summer for juvenile steelhead rearing and limitations of the Folsom-Nimbus selective withdrawal system, providing cool water temperatures below Nimbus Dam for adult Chinook salmon holding and spawning is challenging. For example, historical data show that water temperatures just below Nimbus Dam at the gage near Hazel Avenue seldom fall below 53.5°F before December (for fall-run Chinook salmon in this location it's understood to be a conservative measure below which no temperature dependent mortality is accrued), when seasonal conditions (cooler air temperatures and shorter days) help to bring water temperatures down (Figure 1). Daily average temperatures at the same location and time period also frequently exceed 56.0°F (the lowest October and November target temperature in the ATSP) (Figure 2).

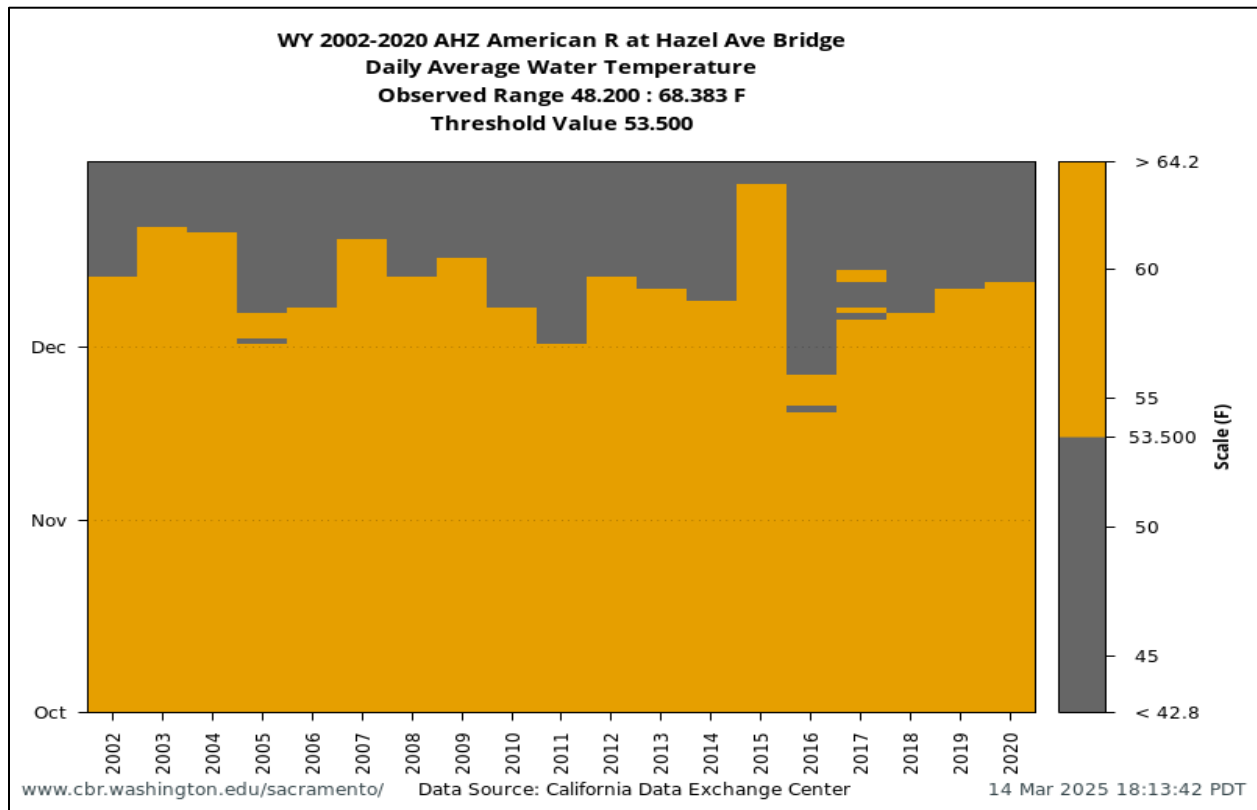


Figure 1. October through December daily average water temperatures in the Lower American River for 2002 through 2020. The color scale indicates water temperature values above (orange) or below (gray) 53.5°F.

Source: SacPAS (University of Washington Columbia Basin Research 2025)

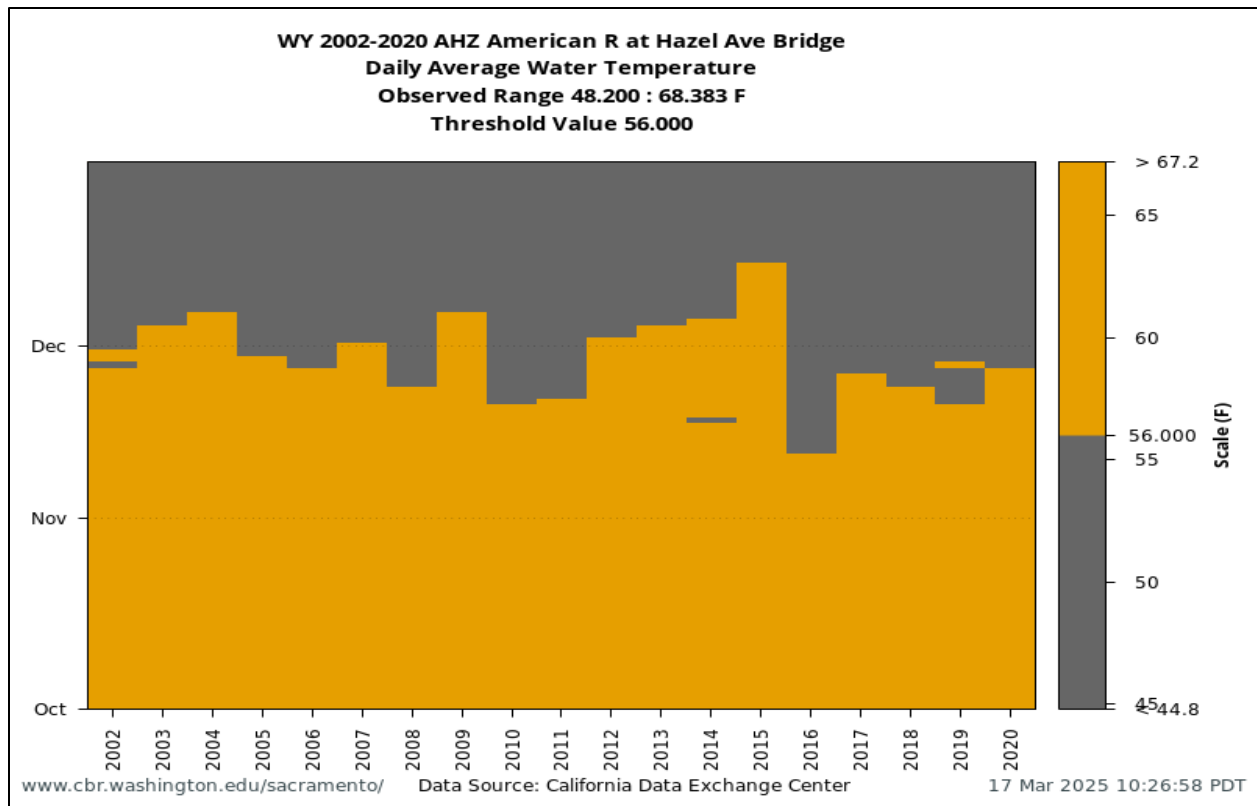


Figure 2. October through December daily average water temperatures in the Lower American River for 2002 through 2020. The color scale indicates water temperature values above (orange) or below (gray) 56° F.

Source: SacPAS (University of Washington Columbia Basin Research 2025)

Spawning Habitat Effects

Spawning habitat consists of the combination of several components including, but not limited to, gravel, depth, flow, temperature, and dissolved oxygen. Among those components, water temperature is the one that the proposed action will have the greatest impact on EFH for Chinook salmon. The proposed action is expected to result in stressful, lethal water temperatures for a relatively large proportion of Chinook salmon spawning and embryo incubation during October and November in the Lower American River. Chinook salmon egg mortality increases as water temperatures warm above 53.5°F (Martin *et al.* 2017, Martin *et al.* 2020). The Lower American River is rarely, if ever, cooler than 53.5°F at Watt Avenue during October and November (Figure 1). In most years, water temperatures at Watt Avenue are above 60°F well into October. The combination of egg retention, pre-spawning mortality, and embryo mortality from warm water temperatures in the Lower American River likely greatly impacts Chinook salmon production. Poor quality spawning habitat is expected to occur under the proposed action because, despite best efforts to protect Chinook salmon spawning, water temperatures in October and November are stressful and lethal every year; and the modeling results presented in the BA (Appendix M Attachment M, Reclamation 2023-2024) suggest that will continue.

The ARMFS is intended to provide suitable habitat conditions for steelhead and fall-run Chinook salmon in the Lower American River. While this element of the proposed action may at times

provide less detrimental spawning and embryo incubation habitat, the many demands affecting operations of the American River Division mean that the overall proposed action is expected to impact spawning habitat for fall-run Chinook salmon. In addition to the water temperature effects described above, salmon spawning habitat will be adversely affected due to flow fluctuations resulting in redd dewatering. Fall-run Chinook salmon eggs and alevins in the American River are vulnerable to dewatering from the time when spawning begins in October through February when fry emergence from the streambed ends (Vogel and Marine 1991, Bratovich *et al.* 2005). The redd dewatering protective adjustments included in the ARMFS help to reduce potential redd dewatering (Appendix M Attachment M, Reclamation 2023-2024).

Low dissolved oxygen levels are another component that has become an emerging stressor on the Lower American River. Dissolved oxygen plays an important role in the survival and healthy development of juvenile CCV steelhead and Chinook salmon eggs in the American River. Low dissolved oxygen levels can cause significant stress and even mortality, particularly in the vulnerable early life stages. The Central Valley Regional Water Quality Control Plan requires dissolved oxygen of at least 7.0 milligrams per liter (mg/L) from Folsom Lake to the Sacramento River. Monitoring in Lake Natoma in 2023 were below this standard, in the 5-6 mg/L range, depending on water depth. Some of the following conservation recommendations are listed to mitigate the effects of the proposed action on dissolved oxygen levels on the spawning HAPC in the Lower American River, which are similar to Term and Condition 3(a) in the Biological Opinion (NMFS 2024).

Essential Fish Habitat Conservation Recommendations for American River:

As described in the above effects analysis, NMFS has determined that the proposed action would adversely affect EFH for Chinook salmon in the American River.

NMFS provides the following conservation recommendations to avoid, minimize, mitigate, or otherwise offset the effects of the proposed action.

American River Conservation Recommendation 1

NMFS recommends that Reclamation develop a gravel budget or utilize an existing and still applicable gravel budget, and augment gravel in accordance with that budget. Gravel and large wood augmentation will help address reductions in channel complexity caused by the proposed action. By setting a consistent sediment budget, using BMPs during construction, and regularly monitoring the suitable gravel between Nimbus Dam and the Sacramento River confluence, these actions can ensure the effectiveness of habitat restoration to restore the complex channels and floodplain habitats HAPC. On a five-year interval, Reclamation should regularly monitor topographic change and evaluate the availability of suitable spawning habitat based on best available scientific methods and data.

American River Conservation Recommendation 2

NMFS recommends that Reclamation implement a power bypass at Folsom Dam in all years as necessary to provide more suitable fall spawning and egg incubation temperatures for Chinook salmon, unless annual September temperature modeling indicate 56°F average daily water

temperature, or lower, could be achieved at Watt Avenue on or before November 1st, without the bypass. NMFS recommends that Reclamation coordinate with the American River Group to develop the water temperature objectives for fall conditions. Additionally, NMFS recommends that Reclamation evaluate implementation of alternative methods to support effective water temperature management in the Lower American River, including infrastructure modifications at Folsom and Nimbus dams, including but not limited to measures evaluated during planning or value engineering studies (Reclamation et al. 2007, Thomas Cook Innovation 2014, LLC).

American River Conservation Recommendation 3

NMFS recommends that Reclamation manage operations on the American River to minimize hypoxic conditions for Chinook salmon migrating and spawning downstream of Nimbus Dam. First, NMFS recommends that dissolved oxygen gauges be installed and made publicly accessible via the California Department Exchange Center (CDEC). These should record dissolved oxygen hourly (or more frequently) and be placed at strategic locations near Nimbus Dam, including the north and south banks of the dam outflow, the hatchery ladder, and between Nimbus Basin and Sailor Bar, since these are where adult Chinook salmon enter the hatchery fish ladder and where a large portion of in-river spawning occurs (Cramer Fish Cramer Fish Sciences 2023, Reclamation 2024a). Reclamation should provide results of this dissolved oxygen monitoring to the American River Group on a monthly basis. Secondly, during the salmon spawning period, Reclamation should consider initiating spilling from Nimbus Dam if dissolved oxygen levels fall below 7 mg/L at any time (the threshold required by the Central Valley Regional Water Quality Control Board (Central Valley Regional Water Quality Control Board [2019]) and open additional gates if levels remain below this threshold after initial spilling. Third, NMFS recommends that Reclamation evaluate potential implementation of alternative methods to support effective management of dissolved oxygen levels in the Lower American River below Nimbus Dam, which could include mechanical means of increasing dissolved oxygen levels (Horne 2019), and report their findings to the American River Group.

Stanislaus River Proposed Action

The proposed action for the Stanislaus River is summarized in Table 9 and Table 10. Reclamation operates to meet water rights, contracts, and agreements that are specific to the East Side Division, including the Stanislaus River. Senior water right holders (Oakdale Irrigation District and South San Joaquin Irrigation District) will receive annual water deliveries consistent with the 1988 Agreement and Stipulation, and water will be made available to CVP contractors in accordance with their contracts and applicable shortage provisions. In high storage, high inflow conditions, Reclamation will operate for flood control in accordance with the U.S. Army Corps of Engineers flood control manual. Because New Melones is a large reservoir relative to its annual inflow, flood control is relatively infrequent; however, Tulloch Lake, located downstream of New Melones Reservoir, is subject to high local inflows, and may be in flood control operations for brief periods when New Melones Reservoir is not. During these periods, releases from Tulloch Lake may be used to meet flow objectives, schedules, or requirements on the lower Stanislaus River below Goodwin Dam.

Table 9. Action Components of the Proposed Action for the Stanislaus River.

Action Component	Proposed Action
Seasonal Operations	Releases for water rights, contracts, reservoir and flood management, other agreements.
Minimum instream flows	2023 Stepped Release Plan, with water year type determined by San Joaquin Valley “60-20-20” Water Year Hydrologic Classification based on the 90% exceedance forecast.
Ramping rates	Flow changes follow specified ramping rates, with some exceptions allowed for on case-by-case basis.

Table 10. Proposed Conservation Measures for the Stanislaus River.

Conservation Measure	Description/Objective
Minimum instream flows and Ramping rates	Implement the 2023 Stepped Release Plan and specified ramping rates.
Spring pulse flows, fall pulse flows, and winter instability flows	Implement pulse flows consistent with the 2023 Stepped Release Plan.
Stanislaus River Water Temperature Management	Reclamation will continue to study approaches to improving temperature for listed species on the lower Stanislaus River, to include evaluating the utility of conducting temperature measurements/profiles in New Melones Reservoir.

Effects on Essential Fish Habitat for Stanislaus River:

As described in Table 1, EFH for Pacific Coast groundfish and coastal pelagic species is not present in the Stanislaus River. Pacific Coast salmon EFH impacted by the proposed action includes the Stanislaus River from below Goodwin Dam to the confluence with the San Joaquin River. HAPCs that occur within the Stanislaus River include complex channels and floodplain habitats, thermal refugia, and spawning habitat. Based on the best available information, NMFS concludes that the proposed action would adversely affect EFH for Pacific Coast salmon in the Stanislaus River. We conclude that the following adverse effects on EFH designated for Chinook salmon are reasonably certain to occur:

Rearing & Migratory Habitat

Water management for flood reduction and water supply will continue to disrupt natural processes that form complex channels and inundate floodplain habitats that support juvenile Chinook salmon rearing and migration (Poff *et al.* 1997, Yarnell *et al.* 2015). Simplified channel form and managed flows also reduce the recruitment of riparian vegetation and large trees such as cottonwoods, which in turn reduces the amount of large woody debris in the river and

associated complex habitats. Potential thermal refugia such as deeper pools or shaded banks are more limited in a simpler, incised, channel. Collectively, these impacts to rearing and migratory habitat adversely affect the complex channels and floodplain habitats HAPC and the thermal refugia HAPC.

Water Temperature

Reservoir operations are expected to affect thermal conditions in the Stanislaus River downstream of Goodwin Dam, and temperatures will sometimes be unsuitable for Chinook salmon life stages. We incorporate by reference the analysis of proposed action effects on water temperatures that is provided in Section 7.4.1.3.1.1 (Tables 76, 77, and 78) of the Biological Opinion (NMFS 2024). These water temperature effects will adversely affect the thermal refugia HAPC and the spawning HAPC. As a conservation measure in the EFH Assessment (Reclamation 2024c), Reclamation proposes to study approaches to improving temperature for listed species on the lower Stanislaus River, which include evaluating the utility of conducting temperature measurements/profiles in New Melones Reservoir. This could provide some benefit to EFH for Chinook salmon if options to improve water temperature are implemented. Reclamation also includes a fall pulse flow in the 2023 Stepped Release Plan, which, by increasing thermal mass in the river, tends to cool mean daily and maximum daily water temperatures in river reaches downstream of Goodwin Canyon.

Spawning Habitat

Recruitment of spawning habitat substrate has been impacted by the operation of New Melones Dam, and the spawning HAPC will continue to be impacted by the proposed action. Under the managed hydrograph, recruitment and mobilization of sediments below Goodwin Dam, including appropriately-sized spawning gravels is disrupted (Kondolf *et al.* 2001, Yarnell *et al.* 2015).

Essential Fish Habitat Conservation Recommendations for the Stanislaus River:

As described in the above effects analysis, NMFS has determined that the proposed action would adversely affect EFH for Chinook salmon in the Stanislaus River. NMFS provides the following conservation recommendations to avoid, minimize, mitigate, or otherwise offset the effects of the proposed action.

Stanislaus River Conservation Recommendation 1

NMFS recommends that Reclamation seek to increase opportunities (through easements or other approaches to alleviate concerns related to seepage) to release flows over 1,500 cfs for more than 10 consecutive days, even when not in reservoir or flood management. This would allow extended inundation of higher-level areas at current and future restoration sites; and improve food production, and rearing and migratory habitat in the river and provide the Stanislaus Watershed Team more flexibility to shape water volumes in a manner most beneficial to Chinook salmon EFH. Improvements to rearing and migratory habitat would help to address effects of the proposed action on the complex channels and floodplain habitats HAPC and the

thermal refugia HAPC. If Reclamation accepts this recommendation, NMFS requests an update on implementation by December 31 of even years, starting in 2026.

Stanislaus River Conservation Recommendation 2

NMFS recommends that Reclamation implement gravel augmentation to maintain, or increase, the extent of suitable spawning habitat that is available between Goodwin Dam and Orange Blossom Bridge. One specific suggestion is to renew efforts to place gravel in Goodwin Canyon, either in the float tube pool or at the cable crossing. This would help to address effects of the proposed action on the spawning HAPC. If Reclamation accepts this recommendation, NMFS requests an update on implementation by December 31 of even years, starting in 2026.

Stanislaus River Conservation Recommendation 3

NMFS recommends that, on approximately a five-year interval, Reclamation monitor topographic change and evaluate the availability of suitable spawning and rearing habitat based on best available scientific methods and data. Improvements to rearing and spawning habitat would help to address effects of the proposed action on the complex channels and floodplain habitats HAPC, the spawning HAPC, and possibly (depending on project design) the thermal refugia HAPC. If Reclamation accepts this recommendation, NMFS requests an update on implementation by December 31 of even years, starting in 2026.

San Joaquin River Proposed Action

The San Joaquin River portion of the action area includes the San Joaquin River from the confluence with the Stanislaus River downstream past Vernalis to approximately Mossdale. While no action components such as releases or diversion are initiated within this area, proposed action components that affect flow in the Stanislaus River will affect flow in this area.

Effects on Essential Fish Habitat for the San Joaquin River

As described in Table 1, EFH for Pacific Coast groundfish and coastal pelagic species is not present in the San Joaquin River upstream of the statutory Delta. Chinook salmon EFH impacted by the proposed action includes the San Joaquin River from the confluence with the Stanislaus River downstream past Vernalis to approximately Mossdale. HAPCs that occur within this area include complex channels and floodplain habitats, and thermal refugia. Based on the best available information, NMFS concludes that operations under the proposed action would adversely affect EFH for Chinook salmon in this reach of the San Joaquin River. We conclude that the following adverse effects on EFH designated for Chinook salmon are reasonably certain to occur:

Rearing and Migratory Habitat

Water management for flood reduction and water supply will continue to disrupt natural processes that form complex channels and inundate floodplain habitats that support juvenile Chinook salmon rearing and migration (Poff *et al.* 1997). Simplified channel form and managed flows also reduce the recruitment of riparian vegetation and large trees such as cottonwoods,

which in turn reduces the amount of large woody debris in the river and associated complex habitats. Potential thermal refugia such as deeper pools or shaded banks are more limited in a simpler channel. Collectively, these impacts to rearing and migratory habitat adversely affect the complex channels and floodplain habitats HAPC and the thermal refugia HAPC.

Water Temperature

Thermal conditions in the San Joaquin River are often unsuitable for migrating Chinook salmon. See analysis of proposed action effects on water temperatures in Section 7.4.3.1.1. (particularly Tables 98 and 99) of the Biological Opinion (NMFS 2024). The effects of the proposed action on water temperatures will adversely affect salmon EFH, including the thermal refugia HAPC.

Essential Fish Habitat Conservation Recommendations for the San Joaquin River

As described in the above effects analysis, NMFS has determined that the proposed action would adversely affect EFH for Chinook salmon in the San Joaquin River. NMFS provides the following conservation recommendations to avoid, minimize, mitigate, or otherwise offset the effects of the proposed action.

San Joaquin River Conservation Recommendation 1

NMFS recommends that Reclamation pursue habitat restoration opportunities along the lower San Joaquin River to address effects of the proposed action on the complex channels and floodplain habitats HAPC and the thermal refugia HAPC. For example, shallower rearing areas with riparian vegetation and large woody debris would provide “rest stops” for juvenile salmonids to use for feeding and as refuges from larger visual predators during outmigration. If Reclamation accepts this recommendation, NMFS requests an update on implementation by December 31 of even years, starting in 2026.

San Joaquin River Conservation Recommendation 2

NMFS recommends that Reclamation support, specifically, habitat restoration efforts that increase food production. Since higher food supply can help to offset thermal stress, this would further address effects of the proposed action on the thermal refugia HAPC. If Reclamation accepts this recommendation, NMFS requests an update on implementation by December 31 of even years, starting in 2026.

Sacramento-San Joaquin Delta Proposed Action

The Sacramento-San Joaquin Delta (Delta) includes portions of the Lower Sacramento River and San Joaquin River as well as portions of Suisun, Honker, and Grizzly bays. It is characterized by freshwater inflows from the two main river systems (Sacramento and San Joaquin rivers) as well as numerous other tributaries, including the Mokelumne, Cosumnes, and Calaveras rivers. Salinity in the Delta region forms a continuum from full freshwater in the upper Delta locations to full marine salinity in the San Francisco Bay Estuary to the west. The estuarine portion of the Delta occurs where salinity is greater than approximately 0.5 ppt and under most hydrologic conditions occurs downstream from approximately Rio Vista on the Sacramento River, and

Jersey Point on the San Joaquin River. This spectrum of salinity gradients allows for multiple fish species to be present in the Sacramento-San Joaquin Delta and San Francisco Bay Estuary, ranging from marine species, to fully freshwater species, and includes multiple species tolerant of varying salinity habitats.

The majority of the Delta region is tidally influenced, as shown by tidally driven river stage changes, which can extend upriver for considerable distances. These changes in water surface elevations in the Delta region occur under most riverine inflow conditions, except for the very highest flood flows. The influence of tidal forcing on the direction and magnitude of flows in channels of the Delta depends on the phase of the tide (i.e., flood or ebb), lunar phase (i.e., spring versus neap tides), elevation above sea level, and riverine inflows into the Delta. In most areas of the Delta, reversal of flows within the Delta channels occurs with the changing phases of the tides. Under natural conditions in tidal regions with bidirectional flows, flood tides will cause the water within most Delta channels to move upstream, and subsequently to flow downstream upon an ebb tide. In those regions where flows are dominated by riverine conditions, flows are unidirectional but may change in magnitude during the tidal cycle.

The Delta has approximately 700 miles of waterways consisting of both natural channels and manmade-constructed channels. These waterways surround more than 60 leveed tracts and islands. Over 1,100 miles of constructed levees protect farmland, cities, and rural communities from flooding in the Delta region. However, the construction of these protective levees has disconnected the adjacent historical floodplains from their associated Delta waterways. Almost all of the shoreline habitat in the Delta consists of armored levees to prevent erosion, which has substantially reduced the presence of any riparian habitat along the waterside of the levees. The current Delta consists of highly modified aquatic habitat, most of which has severely reduced ecological function for native species, including Chinook salmon.

Reclamation proposes to continue to operate the CVP and SWP facilities in the Delta to provide for delivery of water supply to areas adjacent to, and south of the Delta (see Table 3-12 in Reclamation 2024d). We incorporate by reference here the more detailed description of the proposed action in Reclamation's final PA (Reclamation 2024d). Water rights, contracts, and agreements specific to the Delta include Decision (D)-1641, Coordinated Operations Agreement (COA) and other related agreements pertaining to CVP and SWP operations and Delta watershed users. In order to meet these agreements, Reclamation proposed to continue minimum health and safety exports at Jones Pumping Plant and Banks Pumping Plant of 1,500 cfs. Reclamation and DWR propose to continue to use the Sacramento River, San Joaquin River, and Delta channels to transport water to export pumping plants located in the south Delta (Jones, Banks, and Contra Costa Water District pumping plants) and the north Delta (Barker Slough Pumping Plant). Reclamation proposes revised operations to the Delta Cross Channel (DCC); the continuation of the seasonal installation and operation of three agricultural barriers in the South Delta; water transfers within the Sacramento and San Joaquin River basins from July through November; continued Clifton Court Forebay aquatic weed removal; and Old and Middle River flow management.

The proposed action for the Stanislaus River is summarized in Table 11 and Table 12. Conservation measures have been included in the proposed action (Appendix H, Reclamation

2023-2024). These conservation measures include non-flow actions that benefit listed species without impacting water supply. Reclamation proposes the following measures to minimize adverse effects of operations: Suisun Marsh Salinity Control Gates (SMSCG) Operation; Summer and Fall Delta Outflow and Habitat; continuing to implement existing restoration efforts, including completing 8,396.3 acres of tidal habitat restoration in the Delta by 2026; Yolo Bypass Salmonid Habitat Restoration and Fish Passage Project; and the predator hot spot removal effort in the Delta. Reclamation and DWR would continue the implementation of the following actions to reduce mortality of ESA-listed fish species: DCC Gate operations; Tracy Fish Collection Facility improvements to operating procedures; ongoing Skinner Fish Facility operations; incorporating flexibility in salvage release sites; and the Small Screen Program.

Table 11. Action Components of the Proposed Action in the Sacramento-San Joaquin Delta.

Action Component	Proposed Action
Exports	Ongoing exports at the south Delta export facilities and associated fish salvage facilities; and risk-based Old and Middle River (OMR) management incorporating real-time monitoring and models where possible.
Delta Cross Channel (DCC) Gate Operations	DCC operations based on D-1641, closures for fish protections, and operations that avoid exceeding water quality standards.
Delta Outflow	Delta Outflow: Central Valley Project (CVP): Spring Delta Outflow for approximately 2 years, in above normal/below normal/dry years. After approximately 2 years, OMR management Delta outflow to meet D-1641 requirements; Suisun Marsh Salinity Control Gate operation for up to 60 additional days between June 1 and October 31, depending on year type; increased Delta outflow in wet and above normal year types in certain conditions State Water Project (SWP): Pre-adoption of the Voluntary Agreements, implementation of the Incidental Take Permit (ITP) action for duration of permit
Old and Middle River (OMR) Management	OMR Managed Reverse flows based on species distribution, modeling, and risk analysis with provisions for capturing storm flows Early season winter-run Chinook salmon triggers Weekly distributed loss thresholds for winter-run Chinook salmon, Central Valley (CV) spring-run Chinook salmon and California Central Valley (CCV) steelhead CV spring-run Chinook salmon surrogate threshold Spring Outflow; Use of genetic identification Date and temperature offramps with additional temperature site Governance with the Salmon Monitoring Team (SaMT) and Water Operations Management Team (WOMT) coordination and 6-agency director group
Agricultural Barriers	Temporary agricultural barriers installed each year (~May to November) to maintain water levels for south of Delta agricultural water diverters.
Water Transfers	Reclamation and DWR propose to operate the CVP and SWP to facilitate transfers through providing water in streams for delivery to alternative diversion points, conveying water across the Delta for export, or storing water for delivery at a future time.
Suisun Marsh Salinity Control Gates (SMSCG)	SMSCG consists of three radial gates, a boat lock structure, and a maintenance channel operated to decrease the salinity of the water in Montezuma Slough to meet salinity standards set by the State Water Resources Control Board (SWRCB) and Suisun Marsh Preservation Agreement.

Table 12. Proposed Conservation Measures for the Delta (Appendix H, Reclamation 2023-24).

Conservation Measures	Description/Objective
DCC Gate Closure	Reduce potential scouring and flooding that might occur in the channels on the downstream side of the gates Reduce straying of Mokelumne River fall-run Chinook salmon adults and protect out-migrating juvenile salmonids from entering the interior Delta Reduce juvenile salmonid entrainment risk at the salvage facilities
Tracy Fish Collection Facility (TFCF) and Skinner Delta Fish Protective Facility	Screen fish from Jones Pumping Plant with the TFCF using behavioral barriers consisting of primary louvers and four traveling screens in the secondary channel, to guide entrained fish into holding tanks before transport by truck to release sites within the western Delta Screen fish from Banks Pumping Plant with the Skinner Delta Fish Protective Facility using behavioral barriers consisting of primary louvers and secondary screens (louvers and flat plate screens) to guide fish away from the pumps that lift water into the California Aqueduct and into holding tanks before transport by truck to release sites within the western Delta
Tidal Habitat Restoration	Tidal habitat restoration is expected to improve habitat quality and food availability long term
Old and Middle River Management	Manage diversion rates from the South of Delta modified based on abiotic and biotic factors for several listed species Decrease the entrainment risk stressor by potentially preventing adults from being entrained at the export facility
Summer and Fall Delta Outflow and Habitat	Operate the Suisun Marsh Salinity Control Gates (SMSCG) for 60 days using a 7-day tidal 7-day open operation (7-7) schedule to maximize the number of days that Belden's Landing three-day average salinity is equal to, or less than, 4 psu In dry years following below normal years, DWR will operate SMSCG for 30 days using 7-7 operation to maximize the number of days Belden's Landing three-day salinity is equal to, or less than 6 psu Decrease the entrainment risk stressor by increasing flows in the Delta and, thus, benefitting the migratory transport of juveniles to the estuary and potentially preventing entrainment at the export facility Decrease the outmigration cue and food availability stressors by increasing flow through the Delta

Conservation Measures	Description/Objective
Spring Delta Outflow	Actions that will support the additional Delta outflow include the following: (1) Reclamation and DWR south of Delta export modifications; (2) Reclamation reoperating upstream reservoirs to advance and allow for scheduling of water made available by contractors in CVP watersheds; and (3) passing Delta inflow from water made available by Voluntary Agreement (VA) Parties. Decrease the water temperature stressor by increasing flow in the migratory corridor from the Delta to the Sacramento River Water temperature stressor may also increase the following year due to higher release requirements that could deplete the cold-water pool Decrease the entrainment risk stressor by increasing migratory transport of juveniles to the estuary, potentially preventing entrainment at the export facility May decrease the outmigration cue and food availability stressors by increased flow through the Delta

Effects on Essential Fish Habitat for Sacramento-San Joaquin Delta

Pacific Coast salmon EFH impacted by the proposed action within the Delta region includes all waters of the Sacramento River and San Joaquin River within the Delta, including the multiple channels within the Delta, and tidally influenced portions of tributaries entering the Delta. The Pacific Coast salmon HAPCs that occur within the Delta include complex channels and floodplain habitats, and estuaries. The Pacific Coast groundfish HAPC that occurs within the Delta includes estuaries. No HAPCs were identified in the Coastal Pelagic Species FMP. Based on the best available information, NMFS concludes that the proposed action would adversely affect EFH for Pacific Coast salmon, Pacific Coast groundfish, and coastal pelagic species. We conclude that the following adverse effects on EFH designated for Pacific Coast salmon, Pacific Coast groundfish, and coastal pelagic species are reasonably certain to occur.

Passage Impacts

The proposed action includes operations of the temporary agricultural barriers in the south Delta and the SMSCGs on Montezuma Slough. These operations are expected to result in restricted upstream and downstream passage for adult and juvenile Chinook salmon in these areas.

Temporary agricultural barriers are in place from May to November. Flap gates are tidally operated, and are closed during ebb tides. During this time, passage is blocked for adults migrating upstream and juveniles migrating downstream, temporarily preventing access to the complex channels and floodplain habitats HAPC for Pacific Coast salmon. Juvenile Chinook salmon habitat would be subjected to warm water temperatures, resulting in poor water quality and likely increased predation near the structures. Delaying migration for both adult and juvenile spring-run and fall-run Chinook salmon is expected to reduce survival overall. See Section 7.5.1.14. of the NMFS Biological Opinion (NMFS 2024) for more details on anticipated effects.

SMSCGs are operated for 10 to 80 days per year. When operated, a boat lock is open and allows for passage of adult and juvenile Chinook salmon. However, as described in section 7.5.1.8.2. of the NMFS Biological Opinion (NMFS 2024), migrating adult Chinook salmon are typically delayed or blocked when the gates are closed. This has the potential to adversely impact adults migrating to their spawning grounds, as delays can result in reduced spawning success and reduced survival.

Contaminants

The proposed action could affect water quality within EFH habitat for Pacific Coast salmon, Pacific Coast groundfish, and coastal pelagic species, from storing and diverting water resulting in decreased inflow into the Delta in the winter and spring and increased inflow in the summer. Reduced flows may concentrate contaminants when present, while increased flows may dilute contaminants. Increased flows could also mobilize existing contaminants. Water quality degradation due to contaminant mobilization would impact the quality of the estuaries HAPC for Pacific Coast salmon by direct adverse physiological or behavioral effects on fish upon exposure to the contaminants as well as reducing the abundance and quality of lower trophic level prey resources through biological uptake of contaminants (Phipps *et al.* 1995, Fleeger *et al.* 2003). Release of contaminants in areas containing submerged aquatic vegetation could inhibit or prevent the growth of vegetation, thereby reducing habitat for invertebrates associated with this habitat. The invertebrates serve as food resources for juvenile Chinook salmon. The magnitude of these adverse effects on Chinook salmon EFH are generally expected to remain relatively low compared to contaminant mobilization that might occur without the proposed action.

These same effects would also be expected to impact Pacific Coast groundfish EFH, including effects to the estuaries HAPC (intertidal estuarine habitat in the western Delta).

Since EFH for coastal pelagic species is primarily based on water temperatures, the effects of contaminants is more tenuous on the functioning of this EFH. However, the mobilization of environmental contaminants would be expected to have a negative impact on the health of coastal pelagic species in the estuarine waters of the Delta.

Predator Control

Modification of EFH associated with engineered structures offers cover or advantageous habitat for predators of special-status species. The low spatial complexity and reduced habitat diversity (e.g., lack of cover) of channelized waterways in the Delta could reduce refuge for juvenile Chinook salmon from predators (Raleigh *et al.* 1984, 70 FR 52488 2005). The proposed action includes localized reduction of predatory fish abundance at locations such as Clifton Court Forebay and at Tracy Fish Collection Facility, and thereby reduce predation risks to juvenile salmonids; however, the efficacy of such actions is uncertain. These actions are primarily focused on reducing Chinook salmon predation, and may improve conditions in the estuaries and complex channels and floodplain habitats HAPCs for Pacific Coast salmon. They are not expected to significantly reduce predation on Pacific Coast groundfish or coastal pelagic species within the Delta.

Changes in Flows and Local Hydrodynamics

Modifications of Delta flows are expected to disrupt the migration of adult spawning Chinook salmon and rearing and migrating juvenile Chinook salmon within the complex channels and floodplain habitats HAPC for Pacific Coast salmon, as well as the estuaries HAPC for migrating juvenile Pacific Coast groundfish within the waters of the western Delta. These modifications may arise through the export of water via the CVP and SWP pumping facilities, operations of the DCC gates, water transfers, and operation of the south Delta temporary agricultural barriers. Delta inflows and outflows are anticipated to affect the rearing and distribution of Pacific Coast groundfish within the Delta and San Francisco Bay Estuary through changes in the location of the low salinity mixing zones of the Delta and estuary and the resulting changes in the areas of primary and secondary productivity that support these species. Likewise, changes in Delta outflow may affect the extent of upstream movement of coastal pelagic species within the Delta. Changes in the seasonal distribution of marine and estuarine vegetation are expected based on the amount of Delta outflow related to proposed action operations. The areas of vegetation are likely to increase or decrease, depending on the ambient salinity and the preferred habitat characteristics of the different species of aquatic plants.

Essential Fish Habitat Conservation Recommendations for the Sacramento-San Joaquin Delta

As described in the above effects analysis, NMFS has determined that the proposed action would adversely affect EFH for Pacific Coast salmon, Pacific Coast groundfish, and coastal pelagic species in the Sacramento-San Joaquin Delta. NMFS recommends the following conservation measures to avoid, minimize, mitigate, or otherwise offset the effects of the proposed action.

Delta Conservation Recommendation 1

NMFS recommends Reclamation reduces predator “hot spots” in the Delta to improve survival of juvenile Chinook salmon and juvenile groundfish with the following measures:

- Implement measures to reduce the predation intensity at the San Joaquin River Scour Hole through modifications to the channel geometry and associated habitats. Reducing predator habitat is expected to benefit Pacific Coast salmon EFH.
- Include monitoring data of fall-run and late fall-run Chinook salmon in the decision process for operations of the DCC gates to reduce potential predation associated with routes through the Delta interior. Protective actions regarding the DCC gate operations include closing the gates during periods when juvenile Chinook salmon are emigrating, regardless of run designation.
- Include monitoring data of fall-run and late fall-run Chinook salmon in the decision process for operations of the south Delta temporary barriers to reduce potential predation. Installation of the south Delta temporary barriers should be delayed until the spring emigration of fall-run Chinook salmon from the San Joaquin River basin is nearing completion. After installation of the barriers, the culverts are recommended to remain tied open to allow downstream passage of juvenile Chinook salmon until the monitoring at Mossdale indicates that there are few fish migrating downstream through the San Joaquin River system.

- If Reclamation accepts this recommendation, NMFS requests an update on implementation by December 31 of even years, starting in 2026.

Minimizing or reducing predators at these locations would improve conditions of the complex channels and floodplain habitats and estuaries HAPCs within the Delta for Pacific Coast salmon and Pacific Coast groundfish EFH.

Delta Conservation Recommendation 2

NMFS recommends Reclamation and DWR develop a plan that identifies and prioritizes projects that support riparian and floodplain habitat restoration efforts, and submit that plan to NMFS. These restoration efforts would benefit all migrating and rearing juvenile fish. Riparian and floodplain restoration would improve the quality and quantity of rearing habitat for juvenile fish by providing natural cover, enhancing stream shade, as well as helping to offset water temperature increases (Fogel *et al.* 2022). These restoration efforts are expected to improve the existing conditions of Pacific Coast salmon EFH, Pacific Coast groundfish EFH, and coastal pelagic species EFH, particularly the complex channels and floodplain habitats HAPC for Chinook salmon.

Delta Conservation Recommendation 3

NMFS recommends that if large pulses of Chinook salmon are detected migrating through the Delta or are observed in salvage, regardless of run type, protective actions should be employed to reduce the entrainment and loss of these fish at the CVP and SWP export facilities. These actions include export reductions to reduce the extent of hydraulic impacts within waterways leading to the south Delta export facilities, closure of the DCC gates to prevent routing of juvenile Chinook salmon into the interior Delta, and preferential exports from the CVP facilities to reduce loss during salvage operations. In addition, closing the DCC gates in the fall during pulse flows on the Mokelumne River designed to attract adult Chinook salmon will reduce straying of these fish into the open DCC route. These actions would benefit conditions for the complex channels and floodplain habitats HAPC for Pacific Coast salmon EFH.

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Bureau of Reclamation Responses to Essential Fish Habitat Conservation Recommendations

2024 Long Term Operation of the CVP and SWP

Sacramento River

To address the potential adverse effects to Chinook salmon spawning habitat related to seasonal operations, NMFS recommends:

- 1) Operate facilities to maintain flow conditions adequate enough to provide for a properly functioning channel, geomorphology, and spawning conditions.

Response: Reclamation continues to operate the multipurpose Central Valley Project as described in the Preferred Alternative. (Alternative 2- Multiagency Consensus Alternative) adopted in the 2025 Record of Decision (ROD). Reclamation will continue to operate consistent with the operation selected in the most current ROD and biological opinions or court-mandated actions.

- a. This could include future spawning bed quality surveys

Response: Reclamation completed the Sacramento River Gravel Augmentation Study (2020). SacramentoRiverGravelBudgetReport_Final.docx. An analysis of shields stress modeled geomorphic flows related to gravel transport and full-scale bed mobilization. This information is used to inform spawning bed projects. Annual monitoring on spawning habitat restoration projects is part of the Upper Sacramento River Anadromous Fish Habitat Restoration Project Monitoring Plan and Protocols (Monitoring Plan (final) 170831.pdf) and is reported out in the 2022-2023 and more recent annual reports (Available at Upper Sacramento River Anadromous Fish Habitat Restoration Program).

- b. Identify geomorphic flows to achieve gravel transport and full-scale bed mobilization

Response: Reclamation completed the Sacramento River Gravel Augmentation Study (2020). Microsoft Word - SacramentoRiverGravelBudgetReport_Final.docx. An analysis of shields stress modeled geomorphic Flows Related to Gravel Transport and Full-scale Bed Mobilization.

- c. Leveraging the latest bathymetric data in order to identify Keswick releases that could improve spawning habitat

Response: Reclamation operators have a good understanding of Keswick Reservoir bathymetry and operational capabilities and limitations, and do not believe that leveraging bathymetric profiles would help in real-time operations nor adds value at this time. However, Reclamation is currently developing a new temperature platform that incorporates bathymetry into the modeling. Therefore, once the Water Temperature Modeling Platform (WTMP) is complete, bathymetry will be inherently included in operational decisions for Keswick Reservoir.

- 2) Reclamation works with the Fish Agencies and Sacramento River Group (SRG) to consider fall-run Chinook salmon needs, specifically the spawning habitat HAPC, in Shasta operations.

Response: Please see below.

- a. Request that the SRG water operations consider needs of fall-run Chinook salmon spawning and incubation when setting temperature compliance points

Response : Reclamation currently discusses Shasta Dam operations temperature impacts on fall-run Chinook salmon. There are limitations to the currently used temperature model during the fall period when fall-run Chinook salmon spawn. Reclamation is planning to do a hindcast of fall-run TDM for the 2024 Shasta Cold Water Pool Report. The new temperature models are expected to perform better in the fall period.

- b. Flows to avoid redd dewatering, and system-wide tradeoffs.
- c. Decision support tools, such as incorporating characterization of fall-run Chinook salmon egg-to-fry survival and redd dewatering can help inform temperature management plans.

Response : The Proposed Action include consulted upon include considerations for fall-run Chinook salmon redd maintenance and alevin survival. Release reductions and risk analysis include fall-run Chinook salmon returns. Moreover, a goal of the Shasta Framework is to increase available habitat for fall-run Chinook salmon in the fall and winter months. Reclamation uses decision tools that consider fall-run Chinook salmon.

- d. Reclamation could coordinate with the SRG to explore late summer and early fall pulse flows from Keswick and Shasta dams to reduce water temperatures.
- e. A related pulse flow has been implemented to support juvenile spring-run Chinook salmon survival in late spring; this action could potentially be modified to also increase survival of fall-run Chinook salmon

Response: Reclamation has coordinated with agencies to help provide flows to benefit fall-run Chinook salmon.

- 3) Establish a process through the SRG to reduce the potential for redd dewatering for winter-run Chinook salmon and fall-run Chinook salmon.

Response: The Proposed Action consulted upon includes various conservation measures that address stranding and isolation and redd dewatering and promote habitat quality and availability for Chinook salmon, including fall-run Chinook salmon. These conservation measures include the Wilkins Slough Conservation Measure, the fall and winter baseflows for Shasta Reservoir Refill and Redd Maintenance Conservation Measure and the Modifications to Water Transfer Conservation Measure. In addition, the SRG implemented Sacramento River pulse flow actions to provide wild and hatchery fall-run Chinook salmon benefits. The SRG has coordinated intensively with agencies to help provide flows to increase survival of fall-run Chinook salmon hatchery fish.

- a. Preventing higher mid-summer flows than necessary during the peak of winter-run Chinook salmon spawning both reduces winter-run Chinook salmon redd dewatering later in the season and thereby makes it easier to stabilize flows for fall-run Chinook salmon spawning and prevent their subsequent redd dewatering. This planning and smoothing out of peak summer flows, when possible given other operational constraints, would benefit the spawning HAPC for winter-run and fall-run Chinook salmon.

Response: Reclamation is aware of the systemwide operational concerns that can cause the need for rebalancing of storage between reservoirs during summer and fall. Keswick Reservoir summer flow releases for this multipurpose project are dictated by various considerations. Summer operational considerations include releases for water temperature control, instream diversion demands, Delta outflows, Delta salinity, and exports. In-river temperatures downstream of Keswick Dam can be controlled via two methods. The first is thermal mass, by changing release volume or shifting releases between Trinity Basin imports and Shasta Reservoir, and the second is selective withdrawal of colder water through the Temperature Control Device. Determination of which method to use is made daily as operators balance releases from multiple reservoirs to meet downstream needs. Releases in the summer meet water temperature objectives, support essential features of critical habitat and support water supply deliveries. Releases from Shasta Reservoir typically begin increasing in April as storm frequency decreases, air temperatures increase and system-wide demands increase. Peak releases from Shasta Reservoir typically occur June through August and begin to decrease from the peak sometime in August or September. Occasionally, in very wet years, high storage levels through the summer may result in a need to release higher than normal flows in early fall to meet flood control requirements for the next year.

Consideration of fall conditions may also warrant measures for drought protection and rebalancing of storage between reservoirs.

Clear Creek

- 1) Reclamation work with Fish Agencies and the CCTT to determine how to manage releases from Whiskeytown Dam to provide suitable water flows for all life stages of Chinook salmon, including fall-run Chinook salmon, to reduce stranding and isolation, protect incubating eggs from being dewatered, promote habitat quality and availability, and assess whether Clear Creek flows or pulse flows should be further modified to reduce adverse impacts on Chinook salmon.

Response: The CCTT and Fish Agencies will continue to meet quarterly to discuss Clear Creek and Whiskeytown Dam management and to make recommendations that will provide high quality habitat for Chinook salmon. The CCTT develops an annual proposal for Central Valley Operations' considerations, which details Whiskeytown Dam operations that the team believes will promote Chinook salmon utilization of Clear Creek. This proposal incorporates the CCTT's plans to protect Chinook Salmon, such as, reducing redd dewatering, promoting quality habitat and availability, reducing stranding potential, and sustaining appropriate water temperatures.

- b. Reclamation, with input from the CCTT, could explore releasing pulse flows in the late summer-early fall to provide adequate flows for migration, mobilization of spawning gravels, and providing suitable water temperatures.

Response: The CCTT's annual proposal incorporate the CCTT's plan to best utilize 10,000 acre-feet allocated for pulse flow and other flow manipulations. Typically, the CCTT has concluded that multiple spring pulse flows are the best use of this water, but the CCTT has explored other flow manipulation plans, such as fall pulses. The CCTT will continue to evaluate and recommend actions that best meet the needs of Chinook salmon and lower Clear Creek habitat.

- 2) Reclamation develops water temperature models to improve Clear Creek water temperature management, as described in section 6.1.4.1.2 of the Biological Assessment (Reclamation 2023- 2024), to improve fall water temperature management closer to optimum water temperatures for all life stages of all Chinook salmon in Clear Creek.

Response: Reclamation developed water temperature models using HEC5Q. These models are being updated to HEC-ResSim within the Water Temperature Management Platform.

- 3) Develop a new spawning gravel budget and implement a longterm gravel augmentation plan in Clear Creek, including acquisition of a long-term gravel supply, which would benefit Chinook salmon EFH, including spawning HAPC.

Response: Reclamation has a long and successful history of gravel augmentation on Clear Creek.

- 4) For construction effects associated with habitat restoration, implement appropriate BMPs for Clear Creek using the BMPs described in NMFS's Biological Opinion for the NOAA Restoration Center's Program to Facilitate Implementation of Restoration Projects in the Central Valley of California (NMFS 2018).

Response: Reclamation, in cooperation with the Yurok Tribe, plans to implement several habitat restoration projects on Clear Creek in the coming years. Reclamation will consider the BMPs, many of which are already implemented on-going projects and projects recently completed.

- a. Reclamation should implement the BMPs that are most protective of aquatic habitats, such as minimizing disturbance to existing riparian vegetation, minimizing the application of herbicide, and providing fish passage during construction.

Response: Reclamation constructs projects using BMPs that best meet all project objectives.

- 5) Develop a plan that identifies and prioritizes projects that restore the creek channel closer to natural conditions, and submit that plan to NMFS.

Response: Reclamation, in coordination with the Yurok Tribe, is implementing projects to improve habitat conditions in Clear Creek. These projects include supplementation of beneficial materials (gravel, wood, and boulders) and a large-scale channel rehabilitation project ("Horsetown Project"). Additionally, Reclamation is implementing a new base flow regime for Clear Creek, which will more naturally follow seasonal rhythms of the local ecosystem and climate. Together these projects look to restore the form and function of Clear Creek and boost overall anadromous fish populations. Plans for each project will be submitted to NMFS through individual biological assessments. Projects are also discussed at the Clear Creek Technical Team with all participants, including NMFS.

- a. Ideally include incorporating large woody debris that would naturally occur in Clear Creek without the proposed action.

Response: Reclamation, in coordination with the Yurok Tribe, intends to continue supplementing large wood into Clear Creek efforts on an annual basis. Reclamation hopes to further expand the use of large woody debris through the incorporation of wood structure supplementation into the gravel augmentation project.

American River

- 1) Develop a gravel budget or utilize an existing and still applicable gravel budget, and augment gravel in accordance with that budget.

Response A spawning habitat assessment for the lower American River was recently completed by the Water Forum using the topobathymetric survey referenced below, a 2D model update and a recently completed substrate survey of the river. The acreage of suitable spawning habitat is variable over a range of flows (to a max of about 5K, and is dependent on depth, velocity, and substrate size habitat suitability indices (HIS) within the suitability constraints. Representing this as a range of acres is most appropriate to see acreages tied to hydraulic suitability only (HIS) and substrate + hydraulic suitability (gHSI). CVPIA Sit analysis is also currently utilized for determining areas for gravel placement where the river is deficient.

- a. On a five-year interval, Reclamation should regularly monitor topographic change and evaluate the availability of suitable spawning habitat based on best available scientific methods and data.

Response: The most recent topobathymetric surveys that cover Nimbus Dam to the Sacramento River confluence consist of airborne LiDAR and boat-based single- and multi-beam SONAR (to fill any gaps). The most recent data acquisition took place winter 2023/spring 2024. Previous data acquisition occurred in 2006/2008 and 2017. The 2006/2008 data was collected by USACE (2006 single-beam sonar) and DWR (2008 LiDAR).

The raw data referenced above are post-processed and resampled to develop a 3-foot resolution Digital Elevation Model (DEM) of the channel bed/banks, generally to the edge of the Designated Floodway boundary that loosely coincides with the American River Parkway boundary. The data is used to develop a reach-scale topographic change atlas for the river and includes 2006/2008 vs. 2017, and 2017 vs. 2023/2024. The 2017 vs. 2024 atlas is currently in QA/QC review and will be available when finalized. Ongoing, current, and future data collected, once finalized, is available for use in discussions with ARG and other stakeholders in determining areas where gravel is deficient and appropriate measures to fill in that river hole.

- 2) Implement a power bypass at Folsom Dam in all years as necessary to provide more suitable fall spawning and egg incubation temperatures for Chinook salmon, unless annual September temperature modeling indicate 56°F average daily water temperature, or lower, could be achieved at Watt Avenue on or before November 1st, without the bypass.

Response: Reclamation continues to operate the multipurpose project as described in the Preferred Alternative. (Alternative 2- Multiagency Consensus Alternative) as adopted in the 2025 Record of Decision and consistent with the 2019 Central Valley Power Initiative. In years when the lower American River will have temperatures unsuitable for rearing or spawning, Reclamation, will meet with fisheries agencies (likely to occur in August and September) to evaluate actions that can be taken to minimize temperature impacts to fisheries. This evaluation could include evaluations of a power bypass in the fall if temperatures are greater than 56 degrees at Hazel Avenue in November.

- a. Coordinate with the American River Group to develop the water temperature objectives for fall conditions.

Response: Reclamation continues to operate the multipurpose Central Valley Project as described in the Preferred Alternative. (Alternative 2- Multiagency Consensus Alternative) as adopted in the 2025 Record of Decision which includes that Reclamation, through ARG, to annually prepare a Temperature Management Plan for the summer through fall.

- b. Evaluate implementation of alternative methods to support effective water temperature management in the Lower American River, including infrastructure modifications at Folsom and Nimbus dams, including but not limited to measures evaluated during planning or value engineering studies (Reclamation et al. 2007, Thomas Cook Innovation 2014, LLC).

Response: Stakeholders have had extensive coordination and discussions on how to improve habitat conditions (including infrastructure modifications at Folsom and Nimbus dams) for fish in the lower American River. Prior infrastructure modifications proposed were investigated and none were found to be feasible. Through the ARG, Reclamation intends to continue discussions on actions that could be taken to improve habitat conditions in the lower American River.

- 3) Manage operations on the American River to minimize hypoxic conditions for Chinook salmon migrating and spawning downstream of Nimbus Dam.

Response: Please see below.

- a. Dissolved oxygen gauges be installed and made publicly accessible via the CDEC. These should record dissolved oxygen hourly (or more frequently) and be placed at strategic locations near Nimbus Dam, including the north and south banks of the dam outflow, the hatchery ladder, and between Nimbus Basin and Sailor Bar, since these are where adult Chinook salmon enter the hatchery fish ladder and where a large portion of in-river spawning occurs (Cramer Fish Cramer Fish Sciences 2023, Reclamation 2024a).

Response: Dissolved oxygen is continuously monitored (15-minute interval) year-round on the lower American River at the locations listed below. One logger is placed seasonally (summer/fall) below Folsom Dam.

- *Watt Avenue temperature and flow compliance point*
- *Hazel Avenue temperature and flow compliance point (below spawning riffle in Nimbus Basin).*
- *Below Nimbus Dam spillway (Gates 9/10).*
- *Below Nimbus Dam powerhouse outflow.*

- b. Provide results of this dissolved oxygen monitoring to the American River Group on a monthly basis.

Response: River conditions are discussed monthly at ARG. Data captured from the loggers is downloaded approximately every three weeks. The information is presented via multi-plots which show each logger/flows/temperatures. The DO logger data is uploaded yearly on EDI. <https://portal.edirepository.org/nis/mapbrowse?packageid=edi.1587.1>

- c. During the salmon spawning period, Reclamation should consider initiating spilling from Nimbus Dam if dissolved oxygen levels fall below 7 mg/L at any time (the threshold required by the Central Valley Regional Water Quality Control Board (Central Valley Regional Water Quality Control Board [2019]) and open additional gates if levels remain below this threshold after initial spilling.

Response: River conditions are discussed monthly at ARG. When there is potential for concern, extensive coordination and discussions occur regarding habitat conditions, including dissolved oxygen management, and operations of the CVP in the lower American River. If river conditions are a concern, ARG meets more frequently to discuss possible operational changes that could be needed at Nimbus Dam to support improved fish habitat conditions in the river.

- d. Evaluate potential implementation of alternative methods to support effective management of dissolved oxygen levels in the Lower American River below Nimbus Dam, which could include mechanical means of increasing dissolved oxygen levels (Horne 2019), and report their findings to the American River Group.

Response: River conditions are discussed monthly at ARG. When there is potential for concern, extensive coordination and discussions occur regarding habitat conditions, including dissolved oxygen management, and operations of the CVP in the lower American River. Through the ARG, Reclamation intends to continue discussions on actions that could be taken to increase habitat conditions in the lower American River.

Stanislaus River

- 1) Seek to increase opportunities (through easements or other approaches to alleviate concerns related to seepage) to release flows over 1,500 cfs for more than 10 consecutive days, even when not in reservoir or flood management.

Response: Reclamation will continue to operate the CVP for multiple purposes, as described in the purpose and need of the 2025 LTO ROD and consistent with EO 14181.

- 2) Implement gravel augmentation to maintain, or increase, the extent of suitable spawning habitat that is available between Goodwin Dam and Orange Blossom Bridge.
 - a. Renew efforts to place gravel in Goodwin Canyon, either in the float tube pool or at the cable crossing.

Response: Gravel was placed in Goodwin Canyon in 2015, 2020, and 2021 and anticipated again in 2026.

- b. If Reclamation accepts this recommendation, NMFS requests an update on implementation by December 31 of even years, starting in 2026.

Response: As described, Reclamation has been placing gravel in Goodwin Canyon prior to this recommendation.

- 3) On a five-year interval, Reclamation monitor topographic change and evaluate the availability of suitable spawning and rearing habitat based on best available scientific methods and data.

Response: Reclamation works with contractors and agencies to evaluate spawning and rearing habitat utilization and monitor salmon populations through adult and juvenile monitoring.

- a. If Reclamation accepts this recommendation, NMFS requests an update on implementation by December 31 of even years, starting in 2026.

Response: Reclamation evaluation of suitable habitat is ongoing and prior to this EFH consultation

San Joaquin River

- 1) Pursue habitat restoration opportunities along the lower San Joaquin River to address effects of the proposed action on the complex channels and floodplain habitats HAPC and the thermal refugia HAPC.
 - a. Shallower rearing areas with riparian vegetation and large woody debris would provide “rest stops” for juvenile salmonids to use for feeding and as refuges from larger visual predators during outmigration.

Response: The San Joaquin River Restoration Program expects to consider this recommendation when they engage in habitat restoration in the future. However, currently the San Joaquin River Restoration Program is not conducting habitat restoration, and is not expected to conduct habitat restoration in the near future.

- b. If Reclamation accepts this recommendation, NMFS requests an update on implementation by December 31 of even years, starting in 2026.

Response: Please see previous response

- 2) Support habitat restoration efforts that increase food production.

Response: Please see previous response.

- a. NMFS requests an update on implementation by December 31 of even years, starting in 2026.

Response: Please see previous response.

Delta

- 1) Implement measures to reduce the predation intensity at the San Joaquin River Scour Hole through modifications to the channel geometry and associated habitats.

Response: Reclamation is analyzing alternatives through a NEPA analysis to reduce predation at the San Joaquin River Scour Hole.

- 2) Include monitoring data of fall-run and late fall-run Chinook salmon in the decision process for operations of the DCC gates to reduce potential predation associated with routes through the Delta interior.

Response: Reclamation operates the DCC with consideration to Knights Landing Catch Index, Sacramento Catch Index, and the Salmon Monitoring Team when water quality criteria per D-1641 are met. The catch index includes all runs of salmon.

- a. Protective actions regarding the DCC gate operations include closing the gates during periods when juvenile Chinook salmon are emigrating, regardless of run designation.

Response: From October 1 through November 30, Reclamation proposes to close the DCC gates in addition to the requirements in D-1641 to further reduce juvenile salmonid entrainment risk based on the Knights Landing Catch Index and Sacramento Catch Index monitoring.

- 3) Include monitoring data of fall-run and late fall-run Chinook salmon in the decision process for operations of the south Delta temporary barriers to reduce potential predation.

Response: Reclamation will provide a copy of the EFH report to DWR, the agency in charge of installation of the barriers.

- a. Installation of the south Delta temporary barriers should be delayed until the spring emigration of fall-run Chinook salmon from the San Joaquin River basin is nearing completion.

Response: Please see above.

- b. After installation of the barriers, the culverts are recommended to remain tied open to allow downstream passage of juvenile Chinook salmon until the monitoring at Mossdale indicates that there are few fish migrating downstream through the San Joaquin River system.

Response: Please see above.

- c. If Reclamation accepts this recommendation, NMFS requests an update on implementation by December 31 of even years, starting in 2026.

Response: Please see above.

- 4) Reclamation and DWR develop a plan that identifies and prioritizes projects that support riparian and floodplain habitat restoration efforts, and submit that plan to NMFS.

Response: Reclamation in coordination with the Science Integration Team {SIT}, identifies prioritizes riparian and floodplain habitat restoration. NMFS Southwest Science Center participates and provides valuable input to SIT.

- 5) If large pulses of Chinook salmon are detected migrating through the Delta or are observed in salvage, regardless of run type, protective actions should be employed to reduce the entrainment and loss of these fish at the CVP and SWP export facilities.
 - a. These actions include export reductions to reduce the extent of hydraulic impacts within waterways leading to the south Delta export facilities.

Response: Reclamation will operate in accordance with the actions evaluated in the governing Biological Opinions and adopted in the most current ROD at the time.

- b. Closure of the DCC gates to prevent routing of juvenile Chinook salmon into the interior Delta, and preferential exports from the CVP facilities to reduce loss during salvage operations.

Response: Reclamation will continue to operate in accordance with the actions evaluated in the governing Biological Opinions and adopted in the most current ROD at the time.

- c. Closing the DCC gates in the fall during pulse flows on the Mokelumne River designed to attract adult Chinook salmon will reduce straying of these fish into the open DCC route.

Response: This recommendation is being implemented as part of the 2025 ROD.