

Appendix 2B

## **Adaptive Management Program**

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## 2B.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 California Department of Water Resources (DWR), California Department of Fish and Wildlife (CDFW), U.S. 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 representative<sup>1</sup> and one designated alternate each from DWR, CDFW, Reclamation, USFWS, and NMFS. The AMSC’s role in implementing this Program is described in Section 2B.4.1, “Adaptive Management Steering Committee.”

The Implementing Entities intend to use the AMSC to provide direction and guidance for work under this Program through Adaptive Management Technical Teams (AMTs), coordinate each agency’s participation, and assign existing work groups to the extent possible (for example the Delta Coordination Group) to serve as AMTs, only creating new work groups if needed. Attachment 1 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 (Attachment 2) and track required monitoring, data collection, research, and publications that inform future decisions (see Section 2B.4.2, “Adaptive Management Technical Teams”).

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<sup>1</sup> “Designated sub-director representative” means the official representative designated by the director of an Implementing Entity to act on her or his behalf.

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 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.

Attachment 2 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 G.4.1 and G.4.2 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 (Section 2B.7.3, "Independent Peer Review"). Attachment 2 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 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 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 three to eight years. The evaluation may trigger re-initiation of consultation or an ITP amendment for the actions, 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 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 adaptive management program 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.

## 2B.2 Purpose and Intent

Scientific uncertainty will always exist regarding Central Valley rivers and Sacramento-San Joaquin Delta (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 tradeoffs 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 to: (1) 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) work with floating, independent facilitators to implement scientific investigations and monitoring that will best reduce important uncertainties specific to each AMA (Attachment 2). 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 2B.5, "Link between Adaptive Management Program and Regulatory Processes."

The intents of this Program are to:

1. Describe the steps required to implement the adaptive management process (see Attachment 1) and explain how the process links to the operations of the CVP and SWP.
2. Describe how adaptive management for ongoing engagement on the operations of the CVP and SWP will be utilized for specific actions (see Attachment 2).
3. 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.
4. If necessary and agreed upon by the Implementing Entities, develop and implement new AMAs.
5. 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.
6. Describe the structure for communication among the Implementing Entities and the broader stakeholder community regarding implementation of this Program.
7. Describe the role of the AMSC in tracking, on an annual basis, funding for this Program.

## 2B.3 Scope of Adaptive Management Program

### 2B.3.1 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 (Attachment 2) 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 Old and Middle River (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 Juvenile Production Estimate
- Alternative Salmonid Loss Estimation Pilot Study
- Shasta Coldwater Pool Management
- Georgiana Slough Migratory Barrier Effectiveness for Salmonid Fishes
- Spring Outflow
- Clear Creek

## **2B.3.2 Compliance and Effectiveness Monitoring**

Compliance and effectiveness monitoring programs will include the elements as described in Attachment 2, 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 2B.7). Changes to the compliance and effectiveness monitoring may require ESA consultation and may require amendments to the relevant CESA authorization before being implemented (see Section 2B.5).

## **2B.4 Program Structure, Roles, and Responsibilities**

### **2B.4.1 Adaptive Management Steering Committee**

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 tradeoffs (policy and ecological) associated with adaptively managing actions identified in Attachment 2. AMSC decisions will be informed by AMTs dedicated to each individual AMA identified in Attachment 2. 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 tradeoffs may need to be considered, and how confidently the outcomes of those decisions can be predicted.

#### **2B.4.1.1 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 reinitiate 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 2B.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 ensure 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.
- Ensure 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 Programmatic Agreement 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 Program budget annually to assess potential gaps in funding relevant to overall implementation.

### **2B.4.1.2 Membership**

The AMSC will include one designated sub-director-level representative and one designated alternate 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.

## 2B.4.2 Adaptive Management Technical Teams

AMTs will be dedicated to each AMA identified in Attachment 2. AMTs are charged with identifying uncertainty, building knowledge, and implementing each AMA.

### 2B.4.2.1 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 Attachment 2. 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 Attachment 2 (see Attachment 1 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 Attachment 2 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 tradeoffs 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 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 Attachment 2. The descriptions in Attachment 2 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.

### **2B.4.2.2 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.

### **2B.4.3 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 Attachments 1 and 2, 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.

## **2B.5 Link between Adaptive Management Program and Regulatory Processes**

### **2B.5.1 Federal Endangered Species Act**

The Code of Federal Regulations at 50 Code of Federal Regulations, Section 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 USFWS or NMFS (depending on which species are involved) if one or more of several criteria are met. Although there is no regulatory mechanism to modify ESA Section 7 biological opinions without reinitiating the Section 7 consultation, there are options to improve understanding or modify an action without reinitiating Section 7 consultation if 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
2. The identified action is subsequently modified in a manner that causes an effect on 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 on species that may occur as the Program 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
2. Provide the mechanism for regular inquiries and evaluation to determine if reinitiation is required as the Program 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, USFWS or NMFS 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, USFWS or NMFS would issue a new ITS to the federal action agency.

## 2B.5.2 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 the 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.

## 2B.6 Funding

Funding is anticipated from a variety of sources, including CDFW, DWR, USFWS, 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 implement the 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 AMAs conducted each year.

## **2B.7 Relationship of the Adaptive Management Program to Other Processes**

### **2B.7.1 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 (Section 2B.5).

### **2B.7.2 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 State Water Resources Control Board 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 Voluntary Agreement Science Program pertaining to actions contained in the Program, 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.

### **2B.7.3 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 AMAs.

## 2B.8 Attachments

**Attachment 1:** Adaptive Management Program Framework and Implementation

**Attachment 2:** Adaptive Management Actions and Programs