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RECLAMATION

Record of Decision



Reinitiation of Consultation on the Coordinated Long-Term Modified Operations of the Central Valley Project and State Water Project

Mission Statements

The Department of the Interior (DOI) conserves and manages the Nation's natural resources and cultural heritage for the benefit and enjoyment of the American people, provides scientific and other information about natural resources and natural hazards to address societal challenges and create opportunities for the American people, and honors the Nation's trust responsibilities or special commitments to American Indians, Alaska Natives, and affiliated island communities to help them prosper.

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

Cover Photo: Shasta Dam

FEB 19 2020

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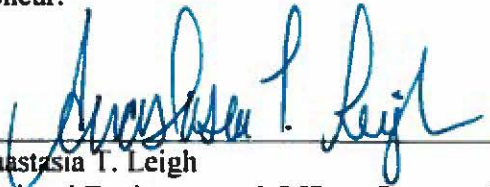
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Summary

The Central Valley Project (CVP) is one of the Bureau of Reclamation's (Reclamation) largest and most important water projects, storing and delivering nearly 12 million acre-feet of water in support of California's farms, cities, wildlife refuges, and fish and wildlife. Reclamation serves these water supply needs through the balancing of competing statutory responsibilities. Reclamation's goal is to provide and enhance water and hydropower reliability for California communities, agriculture, fisheries, and wildlife refuges, in accordance with its statutory responsibilities, including compliance with Endangered Species Act (ESA) requirements for listed species within the project area.



Friant-Kern Canal (Shafter-Wasco Irrigation District)

In August 2016, after a decade of significant operational restrictions resulting from ESA biological opinions issued in 2008 and 2009, Reclamation and the California Department of Water Resources (DWR) reinitiated consultation under the ESA with the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) (collectively, the Services) on the Coordinated Long-Term Modified Operations of the CVP and the State Water Project (SWP). Reclamation reinitiated consultation in part due to multiple years of drought, but also because of continued low populations of listed species, and ineffectiveness of some of the measures required in the 2008 and 2009 biological opinions. Reclamation relied on the new scientific information and its operational expertise to develop improved approaches for managing the CVP and SWP (Projects). In particular, Reclamation worked with the Services to identify aspects of the Reasonable and Prudent Alternatives from the 2008 and 2009 Biological Opinions that have not produced the expected results and replaced them with actions that are expected to better meet biological objectives for threatened and endangered species pursuant to the requirements of the ESA.

In conjunction with the reinitiated consultation, and pursuant to the National Environmental Policy Act (NEPA), the Bureau of Reclamation announced in December 2017 its Notice of Intent to prepare an environmental impact statement (EIS) to propose an improved plan of operations for the CVP and SWP. Reclamation then undertook a year-long process with DWR, the Services, water users, and the public to develop a reasonable range of alternatives including four alternatives that emphasize different aspects of operations. Each alternative responded to the overall purpose and need of providing operational flexibility by addressing the status of listed species, with the goal of enabling Reclamation to maximize water deliveries and optimize power generation. Reclamation released its draft EIS on July 12, 2019, and Final EIS on December 19, 2019.

Reclamation’s formulation of alternatives took into account the fact that the status of listed species has been driven by many factors beyond Reclamation’s control to address through operations, including dam and levee construction, urbanization, invasive species, and other land and water use changes. In the 1930s, Congress authorized the initial features of the Central Valley Project, and the United States began construction of Shasta Dam and Folsom Dam. The United States completed construction of Shasta Dam in 1945 and Folsom Dam in 1956. Congress continued to authorize major additions to the CVP over the next several decades, including Keswick Dam on the Sacramento River, Friant Dam on the San Joaquin River, Trinity and Lewiston Dams on the Trinity River, and New Melones Dam on the Stanislaus River. Congress also authorized the Delta Division, which Reclamation uses to divert and deliver water from the Sacramento River to the Tracy Pumping Plant, the Contra Costa Pumping Plants, and the intakes for the Contra Costa and Delta-Mendota Canals.



Suisun Marsh (USFWS/Steve Martarano)

There is no doubt that these and other decisions of prior federal and state leaders have reshaped California over the last two centuries. During this time, Congress and the state authorized development of the CVP and SWP, irreversibly altering the Central Valley's landscape by building massive water projects that forever changed free-flowing rivers and blocked access to spawning grounds for many of the species considered in the Biological Opinions. The consequences of these decisions to permanently alter the natural environment also led directly to the decline of multiple species. Notwithstanding these declines, neither Congress nor the State of California have directed Reclamation or DWR to remove or decommission any of the features of either the CVP or SWP, given that the Projects provide significant benefits to society. Similarly, thousands of miles of public and private levees have been constructed since the mid-19th century, dramatically transforming the landscape and impacting terrestrial and aquatic species. Likewise, Congress and the state recognize the value of the levees to reclaim land for agricultural use and to help manage floodwaters and have similarly refused to authorize removal of those structures.

This backdrop forms the affected environment under NEPA and establishes the baseline condition for determining the effect of the proposed action on the environment. As explained in the Final EIS, without the decades of water operations and habitat restoration actions by Reclamation and DWR to support listed species, especially during California's recent devastating drought, the historic environmental impacts of dams, levees, and other human changes to the ecosystem would have already led to the extinction of many of the Central Valley's aquatic species. For example, Reclamation's management of the CVP (even under current operations as summarized in the Final EIS No Action Alternative) provides the cold water that salmon need to survive in various life stages, including through operation of Shasta Dam's temperature control device to improve management of Shasta Reservoir's limited cold water pool, and population supplementation by the Livingston-Stone National Fish Hatchery. The range of reasonable alternatives considered in the FEIS seeks to improve on current operations, but is bounded by what Reclamation's proposed action is: to operate the CVP to store, divert, and convey water consistent with its legal obligations.



Aleutian and snow geese at San Joaquin National Wildlife Refuge (USFWS)

Reclamation’s proposed modernization of its operations through real-time monitoring and management is expected to result in a more efficient system. The continued existence of dams and other facilities, however, limit Reclamation’s ability to address legacy impacts simply through delivery of operational flows. Proposed changes to operations to comply with the ESA relied on the best available science, and on the combined expertise of agency professionals with decades of experience at USFWS, NMFS, Reclamation and DWR. Reclamation used the new scientific data and advancements in real-time monitoring capacity to propose a strategy that it anticipates will allow it to better operate in real time, imposing operational restrictions only when necessary to address the needs of listed species.

This Record of Decision (ROD or Decision) approves Reclamation’s preferred alternative, Alternative 1, to better integrate ESA compliance actions and water supply operations through an operational plan that improves Reclamation’s flexibility to manage the CVP, and best meets the authorized Project purposes. Reclamation’s Decision includes a significant commitment to improved coordinated operations with DWR to meet ESA requirements for Delta Smelt, North American green sturgeon, California Central Valley steelhead, Central Valley spring-run Chinook salmon and Sacramento winter-run Chinook salmon and their habitat (collectively, “listed species”), as well as other fish and wildlife species in the project area.

Reclamation and DWR recognize the importance of the CVP and SWP in providing water to millions of Californians, agriculture, and wildlife refuges while supporting rare and unique species,

and developed a plan of operations to better meet these needs. In the preferred alternative, Reclamation commits to an extensive suite of actions over the next decade, in coordination with DWR and water users, to address ESA requirements for threatened and endangered fish as well as other measures that address legacy landscape-level impacts that are not attributable to current operations.



Winter-run Chinook salmon (USFWS)

Highlighted improvements to current operations developed in consultation with DWR and with the USFWS and NMFS, include:

- Real-time monitoring and analyses to support increased flexibility to more efficiently use available water supplies;
- Increased Shasta Reservoir storage and cold water pool to benefit winter-run Chinook salmon;
- Improved temperature management strategies for aquatic species' needs on the Sacramento, American, and Stanislaus Rivers;
- Spring pulse flows to support Sacramento basin Spring-run Chinook salmon juvenile migration;
- An expanded toolkit for summer/fall Delta Smelt Habitat actions;

- Extensive habitat restoration for the benefit of aquatic species;
- Intervention measures (i.e., direct human involvement such as hatcheries for Delta Smelt and salmon, adult rescue, and juvenile trap and haul);
- Ongoing and transparent scientific review to help accelerate the state of the art for science and provide independent evaluation by outside experts.

This Decision is expected to modernize Reclamation’s operations by integrating real-time monitoring and real-time operations to enhance operations. It better reflects the complexity of the Projects where Reclamation operators must address multi-purpose uses, multi-species’ needs, and multi-year actions, while complying with federal and state obligations, including coordination with DWR. Reclamation’s sound, scientifically-based approach should benefit both ecosystem needs and water supply, including commitments to ESA compliance actions to meet the needs of threatened and endangered species. Based on prior spending by Reclamation, DWR and water users, these measures entail an estimated \$1.5 billion expenditure, with an anticipated \$15 million annually for real-time monitoring.



Enhanced Delta Smelt monitoring (USFWS)

Statutory Background

Between the 1800s and early 1900s, settlers drastically modified the Central Valley environment to reduce flooding and irrigate farms by draining wetlands, building levee systems and diversion ditches, and constructing storage facilities. In the 1930s, California sought to create a unified water system to move surplus water from the Sacramento Valley to the arid San Joaquin Valley. When the Great Depression hit, Congress agreed to support the project, envisioning that the CVP would drive growth and prosperity in California. The CVP was created by the Central Valley Project Authorizations Act of Aug. 26, 1937, ch. 832, 50 Stat. 844, 850, § 2. In 1960, California voters approved construction of the SWP through the Burns-Porter Act (Water Code Sec. 12930-12944). The principal facilities of the SWP are Oroville Reservoir and related facilities, and San Luis Dam and related facilities, Delta facilities, the California Aqueduct, and the North and South Bay Aqueducts. Together, Reclamation and DWR's coordinated operation of the CVP and SWP makes the Central Valley one of the most productive agricultural regions in the world.

PL 102-575, Section 3402. The Purposes of the CVPIA

Congress established the CVP to improve navigation, regulate river flows, prevent flooding, and to store and deliver water for the purposes of reclaiming arid and semi-arid land and Indian reservations. The CVP also supplies water for municipal and industrial purposes; however, the largest demand for CVP water is for agriculture.

In 1992, Congress passed the Central Valley Project Improvement Act (CVPIA), modifying the purposes of the Project. PL 102-575. The CVPIA established comprehensive purposes necessary to support California's economy, agriculture, and environment: protecting, restoring, and enhancing fish and wildlife habitats; addressing the CVP's impacts on fish and wildlife habitat; improving the operational flexibility of the CVP; increasing the CVP's water-related benefits to California; and contributing to California's efforts to protect the San Francisco Bay/Sacramento-San Joaquin Delta Estuary. CVPIA § 3402(a)-(e). Congress directed the Secretary of the Interior (Secretary) to "achieve a reasonable balance among competing demands for the use of Central Valley Project water, including the requirements of fish and wildlife, agricultural, municipal and industrial and power contractors." CVPIA § 3402(f).



Battle Creek (USFWS)

Section 3406

Under the original authorization for the CVP, Project dams and reservoirs were “used, first, for river regulation, improvement of navigation, and flood control; second, for irrigation and domestic uses; and, third, for power.” Act of Aug. 26, 1937, ch. 832, 50 Stat. 844, 850. The CVPIA expressly modified the hierarchy of purposes for the CVP to achieve a reasonable balance among competing demands for CVP water by making protection of fish and wildlife a co-equal purpose with irrigation and municipal and industrial uses. Congress directed Reclamation to operate the CVP first for the primary purposes of river regulation, navigation, and flood control; then for the secondary purposes of water supply for irrigation and domestic uses and fish and wildlife mitigation, protection, and restoration; and finally, for the tertiary purposes of power and fish and wildlife enhancement. The CVPIA also directs Reclamation to meet federal and state law obligations, including the ESA. CVPIA § 3406(b).

Water Infrastructure Improvements for the Nation Act

In December 2016, Congress passed the Water Infrastructure Improvements for the Nation Act (WIIN Act; P.L. 114-322), which also informed this Decision. Enacted in response to severe drought in California, the WIIN Act included several directives aimed at increasing water supplies

for users by increasing flexibility and without adversely affecting listed species beyond what is anticipated over the duration of the Biological Opinions. Measures included in the WIIN Act include Section 4001, which directed that the Secretary of the Interior and the Secretary of Commerce “shall provide the maximum quantity of water supplies practicable” to CVP water users by authorizing approval of operations or temporary projects, including developing real-time monitoring capabilities for the Delta cross-channel gates. Section 4002(a) directs the Secretaries of Commerce and the Interior to manage water supplies at the most negative flow rate (rate of pumping) allowed under the applicable Biological Opinions to maximize water to users. Section 4003 of the WIIN Act authorizes Reclamation and DWR to provide for operations of the CVP and SWP at levels that allow, under certain circumstances, OMR flows to be higher than the most negative reverse flow allowed under the Biological Opinions. Section 4004 of the WIIN Act provided direction that federal agencies should consult and cooperate with state and local agencies, and public water agencies that have water contracts with the CVP and SWP, including opportunities to submit information and to review and comment on any biological opinions.



Almond orchard in bloom in California’s Central Valley

In addition to Reclamation law, the CVPIA and the WIIN Act, Reclamation’s operations are largely driven by requirements contained in the ESA, water rights and contracts, and orders of the State Water Resources Control Board to protect state designated beneficial uses, including fish and wildlife, and to maintain water quality for domestic uses.

Implementing these competing directives is enormously complex given the extent of the CVP and its hydrological scope, and diverse and sometimes conflicting needs of listed species. Moreover, Reclamation does not operate the CVP in isolation, but must coordinate operations with the SWP, sharing water and in some cases, facilities. Reclamation considers actions on multiple time scales, making decisions on an annual, monthly, weekly and daily basis, as well as considering operational

needs and hydrological conditions over multiple years, generally without perfect foresight. Given these factors, Congress declined to specify a particular operation for the CVP, instead giving the Secretary considerable discretion to accomplish the very difficult task of deciding how to operate a complicated water management project given constantly changing conditions that drive decision-making.

Factual Background

The CVP and SWP are operated in coordination to convey water to meet agricultural, municipal and industrial (M&I), and fish and wildlife demands in California. The Projects support the state's powerful economy, providing water to the Los Angeles Metropolitan Area, Silicon Valley, and the farmers that make California the country's leading agricultural state. Together, the CVP and SWP play a vital role in the Nation's economy providing water to farms, homes and industry in California while also generating electric power, conserving fish and wildlife, and creating opportunities for recreation and enhancing water quality. The CVP and SWP protect against water shortages and floods and, through their hydropower facilities, provide a reliable and low-cost source of renewable hydropower to Californians.



Shasta Dam

Today, the CVP is one of the world's largest water projects, consisting of 20 dams and reservoirs, 11 hydropower plants, and 500 miles of canals and aqueducts. Reclamation delivers enough water through the CVP to meet the needs of 1 million households and over a million-acre feet of water for fish and wildlife and their habitat, including state and federal wildlife refuges and wetlands. Similarly, the SWP serves the water needs for two-thirds of all Californians, through 21 dams and reservoirs, five power plants, 16 pumping plants and 662 miles of aqueducts.

Project operations have changed substantially since the CVP and SWP were constructed in the mid-20th century. Operations were initially limited by physical capacity and available water, but Reclamation and DWR's flexibility was increasingly constrained over the years to respond to requirements of multiple state and federal laws, rules and regulations, especially beginning in the 1990s, which saw major changes in operations due to the listing of multiple species under the ESA, including the Delta Smelt, Sacramento River winter-run Chinook salmon, California Central Valley steelhead, and Central Valley spring-run Chinook salmon.

In 1995, the SWRCB issued D-1641, which imposed new obligations on both the CVP and SWP, including a new export to total Delta inflow export/inflow (E/I) ratio and spring X2 salinity requirements. Pumping limitations based on San Joaquin River flow reduced the ability to use water available as a result of local accretions and precipitation that is not regulated by releases from storage ("unstored flows"). The Projects shifted operations in order to meet water supply demands in a manner that led to both Projects entering the fall with lower reservoir levels.

The Services issued their first biological opinions for the Projects in the 1990s, leading to considerable changes in operations. Since then, NMFS and USFWS have issued multiple biological opinions for operation of the Projects, with each one including additional restrictions on Project operations intended to protect the listed species. These restrictions have curtailed Reclamation and DWR's operational flexibility and ability to effectively manage the Project for all project purposes.

Notwithstanding these additional constraints, fish populations have continued to decline, predominantly due to extensive human alteration of California's lands and water resources. In addition to expansive historical mining and timber operations that degraded habitat, the past and ongoing effects from construction and the presence of dams and levees radically altered the environment by changing riverine processes, such as sedimentation, gravel and woody debris recruitment; blocking access to spawning and rearing grounds; and altering stream temperatures and flows. Contaminants from rural runoff and urban sources, as well as the introduction of invasive non-native species, further altered physical and biological conditions. These ecosystem changes have transformed and continue to impact California's lands and waters.

Reclamation and DWR requested reinitiation of consultation based on new information following multiple years of drought, low levels of listed fish populations, and new information available as a result of ongoing scientific collaboration. Reclamation and DWR used the new science to propose operations that are expected to make more effective use of the available water supply. Reclamation and DWR incorporated lessons learned from a decade of implementing the USFWS and NMFS Biological Opinions and significant investments in collaborative science, to propose a range of alternatives that better meet the needs of humans and protected species. The three Federal agencies (Reclamation, NMFS, and USFWS) and two state agencies (DWR and CDFW) collaborated during development of the Biological Assessment to draft modified operations for the CVP and SWP, with a focus on giving Reclamation and DWR the flexibility they need to maximize water deliveries while addressing ESA requirements for listed species.

Reclamation submitted its initial Biological Assessment in January 2019. Throughout the ESA consultation process, Reclamation and DWR coordinated closely with USFWS and NMFS to make numerous modifications to the proposed action that improve ESA compliance measures for threatened and endangered species and critical habitat. The final proposed action for operations

includes actions to support threatened and endangered species over the next ten years at an estimated cost of \$1.5 billion.

This Decision was made after extensive public involvement. Reclamation started the process in 2016 when it reinitiated ESA consultation, and since then has held over 100 meetings with stakeholders, interested members of the public and/or tribes. Reclamation coordinated with the USFWS, NMFS and California's Department of Water Resources and Department of Fish and Wildlife, meeting with these agencies at least monthly for the first two years of the process. Reclamation began the process in February 2017 with a workshop that included interested parties. Through the "ROC Band" workshops in 2017 and 2018, Reclamation solicited a broad range of potential ideas from interested stakeholders, including water users, state and federal agencies, non-governmental organizations and members of the general public. The Notice of Availability of the Draft EIS was published in the *Federal Register* on Friday, July 12, 2019. In compliance with 40 C.F.R. §1506.6, notifications regarding the availability of the Draft EIS for review were distributed to the project email list of individuals who expressed interest in the project. Reclamation also issued a press release announcing the availability of the Draft EIS for review and comment. Reclamation circulated the Draft EIS for public review in compliance with NEPA for an initial comment period of 45 days. Additionally, following an informal request for an extension, Reclamation considered all comments received by September 3, 2019. (Section 6.4, *Consultation and Coordination*).

Reclamation's robust process under the ESA and NEPA capitalized on the expertise of Reclamation, NMFS and the USFWS, as well as that of DWR and CDFW, and resulted in a final preferred alternative that uses the best available science and agency expertise to maximize the capabilities of our facilities to meet the challenges that lie ahead.

Purpose and Need

Reclamation and DWR operate the CVP and SWP as multi-purpose projects for flood control, water supply, fish and wildlife, and power generation. The purpose of the action considered in the EIS is to continue the operation of the CVP in coordination with the SWP, for their authorized purposes, in a manner that enables Reclamation and DWR to maximize water deliveries and optimize marketable power generation and to augment operational flexibility by addressing the status of listed species. The need for the action is to use updated scientific information so that Reclamation and DWR can better meet statutory responsibilities for operating the CVP and SWP.

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Reclamation's Decision

Reclamation's Decision is to implement Alternative 1 (Preferred Alternative) as described in the Final EIS and analyzed in the 2019 USFWS and NMFS Biological Opinions. Alternative 1 is identified in the Final EIS as the Preferred Alternative and includes both project-specific and programmatic elements.

Alternative 1 is described in detail in Section 1.4.2. In making this Decision, Reclamation reviewed a range of reasonable alternatives in the EIS, the results of the physical, environmental, economic, and human resources impact analyses, and comments submitted by federal, state, and local agencies, interested parties, and the public. Alternative 1 best meets the purpose and need of the action while balancing the ability to achieve the project objectives and comply with the requirements of the ESA and other applicable laws.

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Alternatives Considered

Under NEPA, an agency is required to take a “hard look” at the environmental effects of an agency action and its reasonable alternatives, including foreseeable direct, indirect, and cumulative impacts. NEPA does not require an infinite range of alternatives, but rather requires a range of alternatives that fosters informed decision-making and permits a reasoned choice.

The Final EIS presents four alternatives that were analyzed in detail, covering a reasonable range of alternatives with a wide spectrum of options. The alternatives considered represent a range of actions that seek to increase water deliveries and to protect fish and wildlife. Reclamation started with 86 components suggested by commenters, and narrowed those down by eliminating options that would not meet the purpose and need, were outside the project area or were not within project scope (e.g., dam removal). The 43 components left after screening generally fell into three categories: (1) flow-related components (changing flows or modifying facilities to accommodate changes in flows), (2) habitat restoration, and (3) intervention (such as hatcheries and juvenile trap and haul). The alternatives evaluated in the Final EIS are composed of different assemblages of the 43 different components. A component is a project or plan that could contribute to meeting the purpose and need but may not be able to fully accomplish it independently. While these options could be arranged to create an almost infinite list of project alternatives, Reclamation considered a range of reasonable alternatives, consistent with NEPA.

The Final EIS explains the process by which it assembled the components into alternatives to present the information in an understandable form and to inform the public and decisionmakers with a range of reasonable alternatives: Alternative 1: Use combinations from each of the three component categories; Alternative 2: Provide the flows required by existing legal decisions (e.g., D-1641 and other water rights decisions); Alternative 3: Use restoration and intervention measures to address the status of listed species where not met by the flows in Alternative 2; Alternative 4: Use flow-related components to address the needs of listed species. These alternatives were developed and modified throughout the EIS process in coordination with DWR, USFWS, NMFS, and water users and reflect a variety of ideas and viewpoints.

Alternative 1 provided an opportunity to draw from a range of strategies under the hypothesis that a mixture of approaches might most efficiently and effectively address the purpose and need better than any single strategy. Alternative 2 comes closest to maximizing contractual deliveries and optimizing marketable power generation by relying upon D-1641 to address the status of listed species. Alternative 3 adds habitat restoration and infrastructure improvements to the flows considered in Alternative 2 to address the status of listed species without additional water supply impacts. Alternative 3 adds costs and reduces the marketability of power generation. Alternative 4 was added in response to comments received during the scoping process, primarily from environmental and fishing non-governmental environmental organizations. Alternative 4 focuses on using water operations to address the status of listed species. Alternative 4 prioritized reservoir storage for cold water to support most critical spawning and incubation life stages of salmonids. Alternative 4 then maximized instream flows on an unimpaired flows schedule to support migration and rearing, except where those releases would undercut cold water pool objectives. Releases and diversions for water supply were provided after meeting storage and migration flows, resulting in reduced contractual deliveries from current deliveries.

The alternatives analyzed in the EIS are fully described in Appendix D, *Alternative Descriptions*, and summarized in Chapter 3, *Alternatives*.

Appendix 1 of the ROD summarizes key components of Alternative 1, the preferred alternative.

No Action Alternative

Under the No Action Alternative, Reclamation would continue with current CVP operation in coordination with DWR's SWP operation (Section 3.3, *No Action Alternative*, and Appendix D, Section 4.2, *No Action Alternative*). The No Action Alternative includes implementation of the 2008 USFWS biological opinion and 2009 NMFS biological opinion and would continue current management direction related to implementation of these biological opinions. Appendix C, *Facility Descriptions and Operations* includes descriptions of CVP and SWP facilities and current operations in more detail.

The No Action alternative would not meet the purpose and need for the action because it does not comply with the objectives of increasing operational flexibility while supporting the needs of listed species in compliance with applicable law. The No Action Alternative was included pursuant to NEPA to provide a baseline for comparing impacts under the action alternatives, as required by 40 C.F.R. § 1502.14(d).

Action Alternatives

Reclamation's experience over the last several decades indicates that the status of the listed species is heavily influenced by drought, by ocean conditions, and myriad external factors beyond Reclamation's or DWR's operational control. Reclamation's ability to improve conditions for listed species is further limited by water right seniority. Flexibility to adjust to then current conditions improves the ability to meet multiple and often competing demands for water. Reclamation's toolkit of operational measures includes making the best use of the Shasta cold water pool and other flows to support the various needs of potentially affected species, and undertaking non-flow actions to directly improve the habitat of listed species. In dry years, when water supplies are limited, Reclamation's discretion is also limited because there is insufficient water to meet all authorized purposes, and Reclamation must work with its partners to craft voluntary solutions to shortages while using hatcheries as refugial populations and as supplementation.

In crafting the action alternatives, Reclamation followed a careful and deliberative process informed by its joint efforts with Tribes, water users, agencies, and environmental organizations. That process resulted in a range of alternatives that leverages decades of experience and expertise within Reclamation and from sister agencies, stakeholders and the public, to pinpoint areas where Reclamation can better use its operational flexibility, informed by the best available science, to meet the Project's multiple objectives, particularly ensuring that operations are protective of listed species and their habitat.

Components Common to All

Components common to all action alternatives include the following agreements, contracts, forecasts, and permits:

- Coordinated Operation Agreement (COA)—Reclamation and DWR would operate their respective facilities in accordance with the COA, as amended in 2018. The 2018 amended COA defines the project facilities and their water supplies, sets forth procedures for coordinating operations, and identifies formulas for sharing joint responsibilities for meeting Delta standards and other legal uses of water. The amended COA further identifies how unstored flow is shared, sets up a framework for exchange of water and services between the projects, and provides for periodic review of the agreement.
- CVP Water Contracts—Reclamation is not proposing to execute new contracts or amend existing contracts under the action alternatives. The action alternatives assess operation of the CVP and SWP to deliver water under the terms of all existing contracts up to full contract amounts, including full Level 4 refuge contract amounts. Pursuant to section 4011 of the WIIN Act, upon the request of a contractor, the Secretary of the Interior shall convert any water service contract to allow for prepayment. Conversion of such contracts will not affect operations under either the no action or the action alternatives.
- SWP Water Contracts—The SWP has signed long-term contracts with 29 water agencies statewide to deliver water supplies developed from the SWP system.
- Allocation and Forecasts—Reclamation allocates CVP water on an annual basis in accordance with contracts. Reclamation bases north-of-Delta allocations primarily on available water supply within the north-of-Delta system along with expected controlling regulations throughout the year. For south-of-Delta allocations, Reclamation relies on upstream water supply, previously stored water south-of-Delta (in San Luis Reservoir), and conveyance capability through the Delta. To determine allocations, Reclamation makes preliminary assessments of the next year’s water supply possibilities, incorporating fall storage conditions combined with a range of forecasted hydrologic conditions. Reclamation refines these preliminary assessments as the water year progresses.
- Agricultural Barriers—DWR initiated the South Delta Temporary Barrier Project in 1991. Currently, DWR has permits extending the project through 2022. This project seasonally installs three barriers to maintain water levels for agricultural diversions in parts of the South Delta.
- Suisun Marsh Preservation Agreement—The Suisun Marsh Preservation Agreement (SMPA) between DWR, Reclamation, California Department of Fish and Wildlife (CDFW), and Suisun Resource Conservation District 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, sets a timeline for implementing the plan of protection, and delineates monitoring and mitigation requirements.

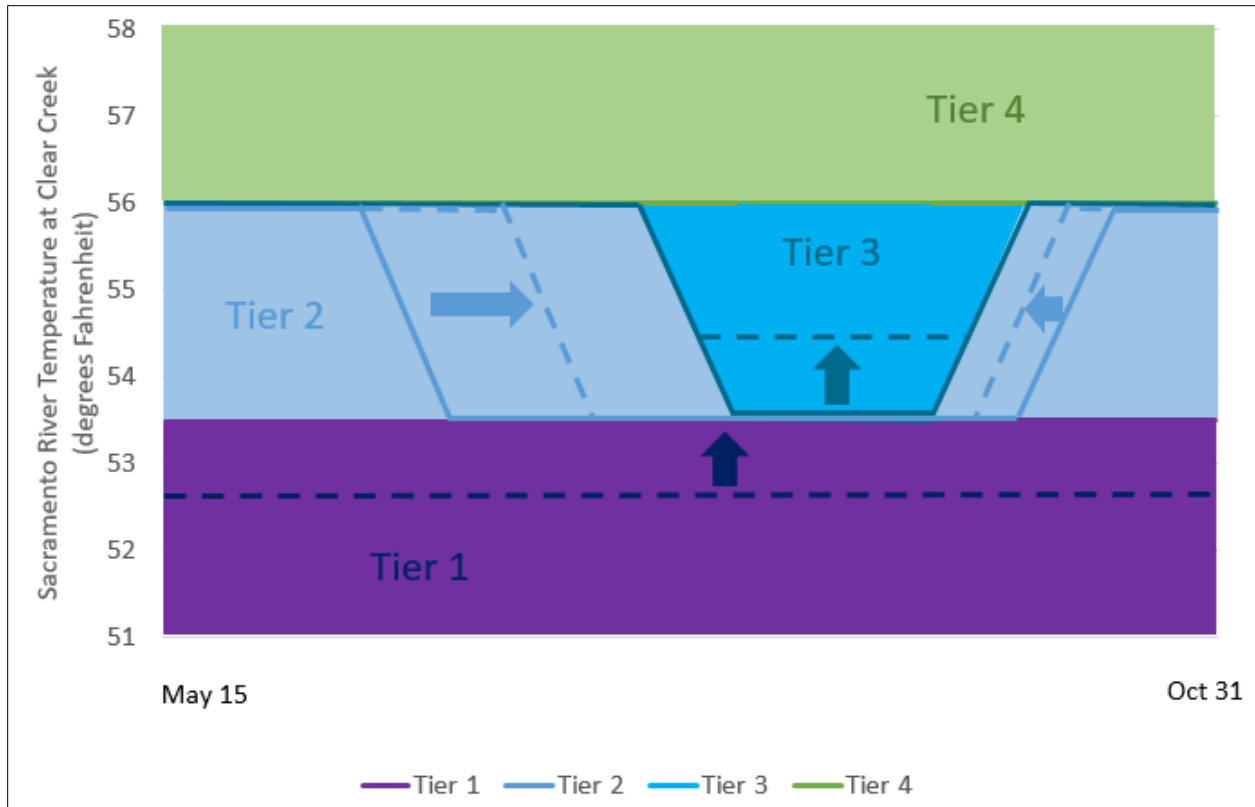
- CVPIA—Reclamation would operate in accordance with its obligations under the CVPIA. This includes exercising discretion to take actions under CVPIA § 3406(b)(2). The Secretary of Interior may make water available for other purposes if the Secretary determines that the 800,000 AF identified in § 3406(b)(2) is not needed to fulfill the purposes of Section 3406.

Alternative 1

Alternative 1 incorporates the biological objectives to protect fish and wildlife under the 2008 and 2009 RPAs. Alternative 1 includes a combination of flow-related actions and non-flow related actions, including habitat restoration and intervention measures (such as hatchery production, adult rescue or juvenile trap and haul) to increase water deliveries and protect fish and wildlife.

After submitting a Biological Assessment, Reclamation and DWR refined the proposed action in consultation with NMFS and USFWS to address the Services' concerns about potential adverse effects to ESA-listed fish species. The revised proposed action analyzed in the Final EIS is a logical outgrowth of the alternative analyzed in the draft EIS, consistent with the flexibility inherent in NEPA to modify alternatives in response to comments. Revisions include clarifying language, adding performance metrics, modifying thresholds for compliance, and adding specificity to habitat programs by naming several habitat restoration and fish passage projects. The habitat restoration projects would increase the area of potential impact to terrestrial species. These projects would be operated in accordance with the mitigation measures outlined in Appendix 3 of the ROD and comply with requirements to minimize impacts to listed species. Additional environmental compliance review would be completed if necessary. Changes to Alternative 1 are summarized in Master Response 4. Preferred Alternative 1 is summarized below by system and described more fully in Section 3.4, *Alternative 1*, and Appendix D, Section 4.3, *Alternative 1*.

Upper Sacramento River (Shasta and Sacramento Divisions)—Reclamation would operate Shasta Reservoir to meet water rights, contracts, and agreements that are specific to the Shasta and Sacramento Divisions and to those that apply to the entire CVP, including the Delta Division. Reclamation would manage the available Shasta Reservoir cold water pool to support winter-run spawning, incubation, and emergence according to a tiered system with performance metrics for temperature dependent mortality and total egg to fry survival. Reclamation would also implement several operational components that are intended to contribute to increased spring Shasta storage levels as compared to recent years: (1) Fall and Winter Refill and Redd Maintenance, which sets minimum late fall and winter flows, including modification of rice decomposition operations compared to the Current Operations Scenario (COS); (2) modified fall outflow requirements compared to the COS; (3) flexibility in export operations (especially in April and May) compared to the COS; and (4) December 2018 changes to COA (which are also included in COS). These operations, as well as real-time operations, are expected to result in increased end of September carryover storage, which Reclamation expects to benefit the following May 1 storage in years without flood control releases.



Tiered Temperature Management Strategy to provide cold water during the critical life stages for salmonids. See detailed description in the Final EIS (Section 3.4.1) and Biological Assessment (Figure 4-3 in Final EIS Appendix AB).

Reclamation would also release spring pulse flows of up to 150 TAF, under certain circumstances, in coordination with the Upper Sacramento Scheduling Team to help spring-run Chinook salmon juvenile out-migration. Additional actions to support improved flows include: spring management of spawning locations, temperature modeling platform development, Shasta temperature control device performance evaluation, and lowering intakes near Wilkins Slough. Reclamation would work with senior water right holders to reduce the effects of releases on fall-run Chinook salmon. Reclamation would implement spawning and rearing habitat restoration components, including at Keswick Dam Gravel Injection Site, Market Street Injection Site, Redding Riffle, Turtle Bay, Tobiasson Island, Shea Levee sites, and Kapusta on the Sacramento River. Specific facility improvements include Deer Creek Irrigation District Dam (DCID) fish passage and the Knights Landing Outfall Gates Barrier to reduce adult winter-run strays. Intervention components would include winter-run Chinook salmon conservation hatchery production, adult rescue, trap and haul, director meetings, Battle Creek salmon and steelhead restoration project and Battle Creek reintroduction plan and Western yellow-billed cuckoo surveys.



Shasta Dam Temperature Control Device

Trinity River Division—Seasonal operations in Trinity Reservoir would continue to be integrated with Shasta Reservoir operations and Reclamation would continue to implement the Trinity River ROD and lower Klamath River augmentation flows (from the 2017 Lower Klamath ROD), as described in the No Action Alternative. Whiskeytown Reservoir operations would be similar to those described for the No Action Alternative, with minor changes to accommodate Clear Creek flow measures for attraction flows and geomorphic flows. Habitat restoration and spawning gravel replenishment would continue. Western yellow-billed cuckoo surveys would be conducted.

Feather River—DWR would operate Oroville Dam consistent with the NMFS, USFWS, and CDFW environmental requirements applicable for the current FERC license for the Oroville Complex (FERC Project #2100-134), as under the No Action Alternative.



Folsom Dam

American River Division—Reclamation would operate Folsom Reservoir to meet water rights, contracts, and agreements that are specific to the American River Division and to those that apply to the entire CVP, including the Delta Division. For lower American River flows (below Nimbus Dam), Reclamation would adopt the minimum flow schedule and approach proposed by the Sacramento Area Water Forum in 2017 in the 2017 Flow Management Standard Releases (2017 FMS) and a Planning Minimum. Reclamation would work together with the American River water agencies to define an appropriate amount of storage in Folsom Reservoir that represents the lower bound for typical forecasting processes at the end of calendar year (that is, the planning minimum). Other components include seasonal operation, temperature management, water operations to increase water deliveries and protect listed fish, improvements to the management of the Nimbus Hatchery, and Reclamation identified a list of named spawning and rearing habitat restoration projects on the American River and several creeks including Paradise Beach, Howe Ave, Howe Avenue to Watt Avenue, William Pond Outlet, Upper River Bend, Ancil Hoffman, Sacramento Bar—North, El Manto, Sacramento Bar—South, Lower Sunrise, Sunrise, Upper Sunrise, Lower Sailor Bar, Nimbus main channel and side channel, Discovery Park, Cordova Creek, and Carmichael Creek. Measures would include Western yellow-billed cuckoo baseline surveys of the critical habitat areas.

Bay-Delta—The CVP and SWP divert water in the Delta through the Jones and Banks Pumping Plants for delivery to the Central Valley, San Francisco Bay Area, and Southern California. Operations of these facilities would continue in Alternative 1 with the following changes:

Reclamation would operate the DCC gates to reduce juvenile salmonid entrainment risk beyond actions described in D-1641, consistent with Delta water quality requirements in D-1641.

Reclamation and DWR would operate the CVP and SWP in a manner that maximizes exports while supporting the rearing and migration of fish through the Delta and protecting critical habitat. Under Alternative 1, OMR flows would be managed through protective criteria with real-time adjustments in response to physical and biological criteria in order to limit entrainment risk and keep salvage at or below that of the previous 10 years. Alternative 1 would also include studies to understand how operations interact with fisheries. These studies include developing additional protective measures for larval and juvenile Delta Smelt, providing a population level estimate of Steelhead, and exploring methods to develop a performance measure for spring-run Chinook salmon. Reclamation and DWR would use structured decision-making to implement Delta Smelt summer and fall habitat actions.



Sacramento River (USFWS/Steve Martarano)

In managing exports to support migration and operating within performance criteria, Reclamation will work with Contra Costa Water District (CCWD) to ensure that implementation of the proposed action will not restrict CCWD operations beyond the restrictions of the separate biological opinions that apply to CCWD's operations at its facilities (CCWD Biological Opinions). Reclamation agrees to ensure that the implementation of Alternative 1 will not create new or additional restrictions on CCWD's ability to fill its Los Vaqueros Reservoir beyond the restrictions of the CCWD Biological Opinions, thereby ensuring that CCWD will have opportunities to fill Los Vaqueros Reservoir that are at least comparable to the current conditions.

Reclamation and DWR would provide an extended transfer window from July 1 through November 30 to transfer project and non-project water supplies through CVP and SWP facilities.

Specific habitat and facility projects include reducing predator intensity at the Head of Old River scour hole, continued restoration of tidal habitat, improvements to the Delta Cross Channel Gates, and continued food web and invasive species research.

Alternative 1 includes development of a supplementation strategy for Delta Smelt including the use of the existing Fish Culture and Conservation Laboratory managed by U.C. Davis and development of additional facilities.

Stanislaus River—Alternative 1 includes an operating plan intended to replace often overlapping and conflicting operational components of previous federal and state flow requirements and is representative of Reclamation’s contribution to any current or future flow objectives on the lower San Joaquin River at Vernalis. The alternative also includes habitat components such as a temperature management study and spawning and rearing habitat restoration at River Mile 58, Goodwin Canyon (at the cable crossing and float tube pool), Honolulu Bar, Buttonbush, Rodden Road, Two Mile Bar, and Kerr Park.

San Joaquin River—Reclamation would continue to implement the San Joaquin River Restoration Program. Additionally, Reclamation would implement rearing habitat restoration on the lower San Joaquin River as well as developing and conducting a Western yellow-billed cuckoo baseline survey. Reclamation would work with private landowners to create a locally driven, regional partnership to define and implement a large-scale floodplain habitat restoration effort in the lower San Joaquin River.



San Joaquin River (USFWS)

For governance of Alternative 1, Reclamation would work with DWR, NMFS, USFWS, CDFW, public water agencies, and other participants to manage operations in multiple ways. Key governance functions include core operation, scheduling, collaborative planning, and compliance and performance reporting. Core water operations would be based on real-time monitoring; scheduling recommendations would be provided by fishery agencies and water users in watershed-based groups to Reclamation and DWR on duration, timing, and magnitude of specific blocks of water; collaborative planning would be used to pursue and implement certain actions with the goal of continuing to identify and undertake actions that benefit listed species; and compliance and reporting by Reclamation and DWR would occur on water operations and fish performance seasonally and in an annual summary. Other key governance functions that would be included are drought and dry year actions, chartering of independent panels to review certain components of the alternative, and four-year reviews by an independent panel.

Alternative 2

Alternative 2 reflects a condition where Reclamation would operate the CVP to meet the legal requirements associated with its water rights but would not release additional flows for fish and wildlife purposes (Section 3.5, *Alternative 2*, and Appendix D, Section 4.4, *Alternative 2*). DWR would continue to operate Lake Oroville according to the most recent FERC license, and Delta operations would be governed by water right requirements. Most of the water right conditions are from D-1641 (SWRCB 2000), which sets forth the water right requirements to meet the objectives in the Bay-Delta WQCP (SWRCB 1995).

Alternative 3

Alternative 3 would incorporate the same flow and operations as described in Alternative 2 to meet requirements in D-1641 and other legal requirements but would also incorporate non-flow related actions such as habitat restoration and intervention measures (Section 3.6, *Alternative 3*, and Appendix D, Section 4.5, *Alternative 3*). These measures would include the spawning and rearing habitat restoration described for Alternative 1 for the Sacramento River, American River, and Stanislaus River; operation of the Trinity River system according to the 2000 Trinity River ROD with 2017 Lower Klamath ROD augmentation flows (same as No Action and Alternative 1); Clear Creek base flows of 50–100 cfs, based on the 2000 agreement between Reclamation, USFWS, and CDFW; spawning and rearing habitat restoration on the American River as described for Alternative 1; additional habitat and intervention measures for the Bay-Delta, such as food subsidies and tidal habitat restoration described in Alternative 1, the interventions described in Alternative 1, and 25,000 additional acres of new habitat restoration within the Delta; and the rearing habitat restoration described for Alternative 1 for the San Joaquin River. Measures for the Feather River would be the same as the No Action Alternative and other action alternatives.

Alternative 4

Alternative 4 includes management of storage facilities to preserve cold water pool and additional instream flows in the Sacramento, American and Feather Rivers and the Delta as proposed during scoping (Section 3.7, *Alternative 4*, and Appendix D, Section 4.6, *Alternative 4*). Alternative 4 strives to meet instream flow targets by balancing instream flows with carryover storage sufficient to protect fish. Overall, this alternative prioritizes and attempts to hold water in storage to maintain the cold water pool while increasing instream flows to the extent possible. It would continue flood management and deliveries to senior water right holders as in the No Action alternative. Under Alternative 4, Reclamation and DWR would operate the CVP and SWP to maintain a positive combined Old and Middle River (OMR) from March through May.

In the Sacramento River, Alternative 4 would increase instream flow releases while requiring carryover storage. Reclamation would release water from Shasta Reservoir to meet this flow target at the Sacramento River above Red Bluff and the confluence with the Feather River. The Trinity River system would be operated according to the 2000 Trinity River ROD with 2017 Lower Klamath ROD augmentation flows. In addition to these operations, Reclamation would modify operations at Buckhorn Dam with the goals of cueing springtime out-migration of juvenile salmonids residing in the outlet channel, maintaining habitat conditions through physical geomorphic processes (spring releases), and providing adult Coho Salmon sufficient flow for upstream migration and spawning in fall. Clear Creek, the Feather River and the American River would be operated with additional flow targets or release adjustments. This alternative would also include the SRP in Alternative 1, SJRRP flows, and increased water use efficiency (both agricultural and M&I) for CVP and SWP contractors. Alternative 4 decreases CVP and SWP municipal and industrial deliveries and average annual CVP agricultural deliveries.

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Environmentally Preferable Alternative

Section 1505.2(b) of the Council on Environmental Quality (CEQ) Regulations requires the NEPA lead agency to identify the environmentally preferable alternative in a Record of Decision. CEQ provides guidance in its 40 Most Asked Questions, answer to question 6a, stating that “the environmentally preferable alternative is the alternative that will promote the national environmental policy as expressed in NEPA's Section 101. Ordinarily, this means the alternative that causes the least damage to the biological and physical environment; it also means the alternative which best protects, preserves, and enhances historic, cultural, and natural resources.”

Alternative 1, the preferred alternative, is the environmentally preferable alternative. In choosing the environmentally preferable alternatives, Reclamation considered impacts to all resources. Both Alternative 1 and Alternative 4 have fewer environmental effects to listed species than Alternative 2 and 3. Thus, the analysis focused on the difference in effects between Alternative 1 and Alternative 4. Alternative 1 and Alternative 4 vary in the impacts to other resource areas. Alternative 4 prioritized using storage to build cold water pool and releases of additional instream flows in the Sacramento River and the Delta to support migration. Alternative 1 includes many of the measures from Alternative 4 to build and manage cold water. Alternative 1 is environmentally more beneficial because it also implements non-flow related actions for extensive habitat restoration efforts and intervention measures. While the flows from Alternative 4 provide some improvements to migration survival, Alternative 1 includes benefits to foraging and sheltering that would improve growth and survival with fewer adverse water supply impacts. In years of extreme drought, the current hydrology and habitat cannot support fish populations. Alternative 1 includes intervention measures, including refugial and supplemental hatchery operations. Overall, Alternative 1 focuses on integrating flow and non-flow related actions to optimize the water deliveries while providing suitable habitat and extensive habitat restoration and ultimately best achieves the project objectives while benefiting the environment.



Old and Middle River of the San Joaquin-Sacramento Bay-Delta (Contra Costa Water District)

Key Considerations for the Decision

Reclamation considered and weighed several important factors in reaching this Decision, including the accompanying Final EIS and input provided by the public, tribes and stakeholders. Overall, several key considerations relevant to the purpose and need informed this Decision: 1) Addressing the status of listed species with ongoing commitments to science advancements; 2) maximizing water deliveries and water reliability; 3) increasing reliability for marketable power generation; and 4) commitments to independent review. This Decision represents an integration of Reclamation's expertise with the best available science to create an approach to operations that provides decision-making authority to the operators to leverage their expertise in coordination with technical assistance provided by NMFS and the USFWS. This approach represents a shift from the rigid approach imposed in the 2008 and 2009 Biological Opinions, and recognizes that Reclamation, DWR and the Services can work better collaboratively to improve performance.

Addressing the Status of Listed Species

A key consideration is to provide for the needs of listed endangered species in accordance with Reclamation's obligation to comply with Section 7 of the ESA. The Decision recognizes that CVP and SWP operations can both beneficially and adversely affect listed species and their habitat. Significantly, the Decision relies on lessons learned on the importance of addressing drought, particularly the need for proactive measures in early dry and drought years. In addition, because baseline conditions are highly degraded and Reclamation has limited discretion to adjust operations, improving flexibility meant that Reclamation voluntarily incorporated measures to address degraded conditions, even though many of the negative effects on species are not attributable to operations.



Steelhead at Coleman National Fish Hatchery (USFWS)

The updated science recognizes the importance of prioritizing the early life stages for winter-run Chinook salmon. The new science shows a need for colder water temperatures than called for in the 2009 Biological Opinion and the recent drought identified a need for better strategies when sufficient cold water is not available. The Decision increases cold water storage and makes operational adjustments to release colder water with a focus on the location of redds, as well as making better use of the available pool through a tiered approach that targets the most sensitive egg incubation stages when water supplies are limited. Temperature management will be based on real-time information showing that winter-run Chinook salmon have spawned, which will avoid unnecessary releases of water on a specific calendar date, as directed in the 2009 Biological Opinion. Alternative 1 provides commitments based on beginning of May storage and does not rely upon speculative modeling assumptions before the available cold water is known. The Decision is more efficient and effective for winter-run incubation than the No Action or other alternatives. Shasta Cold Water Pool management also includes performance measures for temperature dependent mortality and total egg to fry survival.

The Decision includes spring pulse flows on tributaries to improve rearing and migration survival in order to increase juvenile and adult salmon abundance, providing for migration survival improvements. Pulse flows of 150,000 acre feet from Shasta Reservoir will likely occur in more than half the years, with smaller pulse flows occasionally occurring. Pulse flows would occur on Clear Creek, American River, and Stanislaus River as well. In contrast, Alternative 4 would release large quantities of water that reduce water supply, reduce power generation, and reduce storage for

subsequent dry years. The Decision provides a more reliable mechanism for releasing pulse flows than the ad hoc approach under the 2009 Biological Opinions. Reliance upon pulse flows and habitat restoration is a more efficient use of water and is expected to have higher biological performance than habitat alone or flows alone. These actions are expected to support spring-run Chinook salmon, fall-run Chinook salmon, and steelhead on CVP tributaries and in the mainstem Sacramento. Reclamation and DWR would seek technical assistance from fisheries agencies in scheduling and managing the pulse flows.

The Decision will modify actions in the Delta to focus less on managing salvage and more on managing conditions for successful migration. This includes a seasonal approach to restricting operations with proactive measures to reduce or avoid entrainment. Reclamation will use real-time information to evaluate conditions for fish with extensive involvement and technical assistance from the fisheries agencies. In consideration of increased operational flexibility, Reclamation has also committed to firm criteria for additional restrictions and performance metrics that trigger independent panels to provide an additional safeguard that Reclamation's operations continue to meet ESA requirements.



Delta smelt

The Decision includes a Delta Smelt Summer-Fall Habitat action to improve Delta Smelt food supply and habitat, thereby contributing to the recruitment, growth, and survival of Delta Smelt. The Decision provides for improved critical habitat elements in below normal years, and more low saline habitat in above normal and wet years. The Decision provides a more efficient use of water by enhancing the duration of low saline habitat and using facilities to shape Delta Smelt habitat in more water year types than the No Action or other alternatives. Actions to augment food web productivity and study sediment supplementation add additional support for Delta Smelt. Reclamation will rely on the Services and other experts to ensure that the design of the action satisfies environmental and biological goals through the use of the modern science-based framework of structured decision making. The flexibility of actions for summer-fall Delta Smelt is backstopped by a commitment to maintain X2 (the distance from the Golden Gate Bridge where the salinity on

the bottom is 2 parts per thousand) no more eastward than 80 km in above normal and wet years during September and October.

Multiple restoration actions are anticipated to improve habitat conditions for salmonids, Steelhead, and Delta Smelt. The Decision includes the construction of spawning and rearing habitat on CVP tributaries. The Decision includes completing ongoing tidal habitat restoration actions as well as a commitment to provide increased acreage of seasonal floodplain rearing habitat in the lower Sacramento river. Reclamation's proposal is expected to improve migration habitat for emigrating salmonids during summer and fall, when the diversions operate, potentially benefiting early migrating Winter-Run and late migrating Spring-Run Chinook Salmon. Specific additional habitat restoration and facility commitments include Delta Cross Channel Improvements, which is expected to improve exports and water quality; fish passage on Deer Creek (a non-Project watershed); and an Adult Straying Reduction Barrier on the Knights Landing Outfall Gate (a flood and drainage system); and modifying the Head of Old River Scour Hole to reduce predation intensity. Reclamation anticipates increased survival of migrating juvenile salmonids through removal of predator hot spots. Reclamation will also improve the Tracy Fish Collection Facility which is expected to improve survival of fish salvaged at that facility. Certainty is supported by the long track record of successful implementation of similar projects.

Reclamation has committed to performance metrics to ensure that its operations do not have impacts beyond those analyzed in the Biological Opinions and in the Final EIS. These performance metrics provide major incentives to proactively protect listed species, especially including through non-flow actions that can help improve performance.



Lower Deer Creek fish passage project (USFWS)

The Decision includes intervention measures such as increasing hatchery production, adult rescue (trapping and hauling adult salmonids and sturgeon to move them to spawning grounds); trap and haul (capturing juvenile Chinook Salmon and Steelhead and moving them downstream to waters where temperatures that are more suitable for survival) under conditions where the natural environment cannot support robust populations. Reclamation committed to work with USFWS to fund and develop a strategy to increase population abundance of wild Delta Smelt through supplementation of captive-bred Delta Smelt. The Decision includes increased use of the Livingston-Stone National Fish Hatchery to supplement winter-run Chinook salmon. Reclamation's experience with the recent drought identified that hydrologic conditions cannot support a robust population in all years, and Reclamation's operations cannot bridge the gap in such years. Therefore, intervention measures are needed to help support the species.

The Decision includes supporting continued advancements in the state of the art for science by including multiple studies to better understand how operations interact with fisheries, including studies to refine our understanding of steelhead migration and to develop population estimates of steelhead and spring-run Chinook salmon.

Advancements in Science since the 2008 and 2009 Biological Opinions

Reclamation, in coordination with DWR, reinitiated consultation on the coordinated long-term modified operations of the CVP and SWP, in large part because of new scientific information. The following selected studies particularly informed the proposed action described in this biological assessment; a complete list is attached hereto in Appendix 2 Scientific References 2009-2019:

Martin, et al. 2017: A phenomenological assessment of temperature-related Chinook Salmon egg mortality modeling, calibrated to fry survival to Red Bluff, Martin et al. concluded the ideal incubation temperature for eggs in the river was 53.6°F. Below 53.6°F, there is no mortality due to temperature according to Martin. Biophysical models of oxygen transfer across the egg membrane corroborated the difference between temperature-dependent egg mortality predicted in the laboratory versus fry survival to Red Bluff. The 2017 LOBO review (Gore et al. 2018) stated that the Martin approach represents a powerful predictive model for salmon vulnerability to temperature exposure but that the predictions of the oxygen diffusion model should be tested under field conditions because of the model's apparent sensitivity to extremely small changes in flow velocity, and it may be problematic to apply a density dependent model that lacks any mechanistic basis or site-specific information. Additionally, new laboratory studies from UC Davis (Del Rio et al. In Press) affirm earlier findings (USFWS 1999) that embryo survival is not appreciably impaired at daily mean water temperatures at or near 56°F.

Anderson 2018: Anderson reviewed Martin et al. 2017 and found that for Chinook Salmon egg incubation shifting the focus of management from meeting a compliance temperature of 53.6°F on the Sacramento River all season long to releasing cold water for just the life stage specific requirements of eggs yields efficiencies for when cold water from Shasta Reservoir is needed and when water from Shasta Reservoir can be saved.

Grimaldo 2017: Models of Delta Smelt and salmonids at both CVP and SWP showed salvage of adult Delta Smelt increased at OMR more negative than -5,000 cfs, when all other variables were held at their averages. While OMR flow was an important predictor of CVP salvage, more important than even CVP exports, the OMR threshold of -5,000 cfs was most notable in SWP salvage.

Perry 2018: Statistical modeling revealed that survival was positively related to inflow only in reaches that transitioned from bidirectional tidal flows to unidirectional flow with increasing inflows. Bidirectional to unidirectional transitions occurred in Sutter, Steamboat, and Georgiana Sloughs, and in the Sacramento River from the DCC to Rio Vista, and in the Mokelumne Rivers between the DCC and the San Joaquin River.

SST 2017: Neither Coded Wire Tag (CWT) nor acoustic tag (AT) data for juvenile Fall-Run Chinook Salmon show a strong and consistent relationship between survival of fish from the San Joaquin River and exports at Jones and Banks Pumping Plants. The evidence of relationship between exports and through-Delta survival is inconclusive, however, the authors stated that their basis of knowledge is low. “It is unknown whether equivocal findings regarding the existence and nature of a relationship between exports and through-Delta survival is due to the lack of a relationship, the concurrent and confounding influence of other variables, or the effect of low overall survival in recent years.”

Six-Year Acoustic Telemetry Study: The Six-Year Steelhead Acoustic Telemetry Study monitored yearling Steelhead migrating through the San Joaquin River and Old River during 2011 to 2016. Estimated survival was no different between the two routes in 2011, 2012, and 2014, but was greater for Steelhead that migrated through the San Joaquin River route in 2015 (average for all release groups was 0.30 [range, 0.19–0.46]), and 2016 (average was 0.45 for all release groups [range, 0.23–0.61]) (statistically significant for 2015 and 2016 survival estimates at $\alpha = 0.05$; Reclamation 2018a,b,c; Buchanan 2018a,b,c).

Buchanan 2018. Buchanan et al. summarized results of the Fall-Run Chinook acoustic tag studies in the San Joaquin River from 2010 through 2015. The results were survival of Fall-Run Chinook Salmon has been low since 2002, ranging between 0 and 0.05. Even in the high flow year of 2011, survival was only 0.02, suggesting increased flows alone are not enough to resolve low survival. Over half of the Fall-Run Chinook Salmon that made it through the San Joaquin part of the Delta to Chipps Island were salvaged at the CVP and transported to Chipps.

Hammock 2017 and Kimmerer and Rose 2018: These studies have used field research and modeling respectively to improve the scientific understanding of food limitation in Delta Smelt. Hammock et al. (2015, 2017) showed that feeding success is variable in space and time. Kimmerer and Rose (2018) used an individual-based life cycle model to show that if it were possible to achieve, a return to pre-overbite clam historical prey densities might increase the Delta Smelt’s population growth rate by 14 percent to 81 percent.

MAST / FLaSH Reports: “According to the FLaSH conceptual model, conditions are supposed to be favorable for Delta Smelt when fall X2 is approximately 74 km or less, unfavorable when X2 is approximately 85 km or greater, and intermediate in between (Reclamation 2011, 2012). The data generally supported the idea that lower X2 and greater area of the LSZ would support more subadult Delta Smelt. The greatest LSZ area and lowest X2 occurred in September and October

2011 and were associated with a high FMWT index which was followed by the highest SKT index on record, although survival from subadults to adults was lower in 2011 than in 2010 and 2006. There was little separation between the other years based on X2, LSZ area, or FMWT index. The position and area of the LSZ is a key factor determining the quantity and quality of low salinity rearing habitat available to Delta Smelt and other estuarine species...” Any perceived benefit to the Delta Smelt population of having X2 in the ‘favorable area’ throughout most of 2017 due to high outflows remains unclear, with the Delta Smelt Fall Midwater Trawl index showing a decrease from that in 2016 and remaining near all-time lows.

Bush 2017: Using isotopic analysis of otoliths from over a thousand Delta Smelt, Bush found the species exhibits partial migration through three different life history phenotypes, which include a freshwater resident fish, a brackish water resident fish, and a migratory phenotype, hatching in fresh water then occurring in brackish water during the juvenile and sub-adult stage. The relative abundance of each life history phenotype varied inter-annually with the latter most abundant, but not always dominant, in all years studied. The yearly contributions from each phenotype were found to vary with freshwater flows and temperature.

CAMT Delta Smelt Entrainment Studies: New research shows that when Delta Smelt salvage is analyzed independently for SWP and CVP fish facility data, OMR flow has smaller explanatory influence on salvage than some other variables (Grimaldo et al. 2017). Population abundance, as indexed by the CDFW FMWT program, and turbidity have high explanatory power for adult Delta Smelt salvage at the SWP and CVP, particularly during the era of OMR management per the 2008 USFWS Biological Opinion. The basis for OMR flow management partially stems from earlier work showing that adult Delta Smelt salvage (Grimaldo et al. 2009) and proportional losses (Kimmerer 2008) increased as net OMR flow increased southward towards the Projects. New statistical techniques suggest several factors to minimize salvage or entrainment risk. However, given the correlation of OMR and SWP and CVP models, salvage and entrainment risk could be achieved through management of either indexes of the hydrodynamic influence from Project exports. It is worth noting that the ultimate objective for managing Delta Smelt entrainment should not focus on observed salvage. Rather, the management objective should be to target entrainment losses, in a traditional fisheries sense, to sustainable levels that do not compromise population growth rates (Maunder and Deriso 2011; Rose et al. 2013a,b). New research performed under CAMT, can help scientists and resource managers identify circumstances when those large entrainment losses are likely to occur, which can ultimately be used to develop population risk assessment models (Grimaldo et al. 2017; Gross et al. 2019; Korman et al. 2017; Smith 2018). The question about whether the Delta Smelt population can rebound from record-low abundances, even with improved entrainment management during the winter, remains outstanding given the importance of other factors at play (i.e., poor food supply, growth, water temperatures; see Maunder and Deriso 2011; Rose et al. 2013a,b).

Ongoing Investments in Science

Reclamation’s Decision includes multiple studies that will continue to expand our understanding of the system. New temperature studies, which will be developed in coordination with NMFS, are intended to help Reclamation continue to refine operational capabilities. Reclamation will also continue work to understand how operations interact with fisheries, with substantial work being planned to study steelhead, including migration and study of San Joaquin Origin Central Valley

Steelhead, Life Cycle Monitoring of Steelhead in the Stanislaus River and Sacramento Basin to improve understanding of Steelhead demographics and population abundances. Reclamation will study spring management of spawning locations to improve understanding of how temperature influences spawning times. In coordination with the USFWS, Reclamation's sediment supplementation feasibility study will look at methods to introduce sediment in the Delta to increase turbidity for the benefit of Delta smelt. Reclamation, DWR and partners will also evaluate the value of augmenting the aquatic food web in the north Delta and in the Suisun Marsh. Reclamation will also partner with the City of West Sacramento and the West Sacramento Area Flood Control Agency to study hydraulically reconnecting the ship channel with the mainstem of the Sacramento River, which has the potential to increase food supply in the North Delta, benefiting Delta smelt and their habitat.

These key studies are:

- Upper Sacramento River Temperature Modeling Platform
- Shasta Temperature Control Device Performance Evaluation
- Stanislaus Temperature Management Study
- San Joaquin Basin Steelhead Telemetry Study
- Spring Management of Spawning Locations
- Sediment Supplementation Feasibility Study
- North Delta Food Subsidies/Colusa Basin Drain Study
- Suisun Marsh and Roaring River Distribution System Food Subsidies Study
- Sacramento Deepwater Ship Channel Food Study



Row crops in California's Central Valley

Maximizing Water Deliveries

Reclamation will maximize water deliveries, increasing long term water deliveries, by more efficient use of water through real-time operations. This strategy targets actions when fish are at risk and allowing for increased exports when fish are at low risk. The Decision takes a seasonal approach to managing exports for avoiding salmonid population impacts with proactive environmental criteria and population-scaled thresholds versus the rigid calendar-based and restrictive daily approach in the prior biological opinions. The Decision will increase water supply deliveries in comparison to the No Action Alternative to North of Delta and South of Delta M&I contractors, reducing the costs paid by customers to develop alternate water supply projects and reducing reliance on groundwater supplies and lowering operation costs.

The Decision includes more effective use of storage and results in higher carryover without restricting operations. Water deliveries will also improve in dry years. The Decision includes using exports for Delta Smelt salinity management and avoids drawing down storage after wet years. Pulse flows will support migration instead of storage drawdowns that can affect the availability of the cold water pool to support salmonid needs in subsequent years. The Decision allows for the timely allocation of water and also provides certainty as to ESA commitments.

Real-Time Operations and Monitoring

In order to better manage core water operations (Shasta and Folsom Cold Water Pool Management, Delta Cross Channel Gate Operations, Old and Middle River Reverse Flow Management, and Delta Smelt Fall Habitat), Reclamation incorporated its multiple regional monitoring programs to obtain the comprehensive data needed to ensure that real-time operation can be implemented in a manner that meets ESA requirements for listed species, which means obtaining extensive arrays of physical and biological data.

Physical information for real-time operations includes:

- Delta Flow, Temperature, Turbidity, and Salinity Stations
- Tributary Flow and Temperature Stations
- Folsom Reservoir Temperature Profiles
- Shasta Reservoir Temperature Profiles

Biological information required for real-time operations includes:

Chinook Salmon

- Redd Timing and Location: Provides the spatial and temporal risk of mortality for the different flow and temperature regimes as well as the potential for dewatering. Currently accomplished through weekly visual surveys that identify new redds by reach.
- Carcass Surveys: Supplements the redd surveys to account for unobserved redds to help assess the significance of individual redds. Currently accomplished by field crews per well-established protocols on the number of adults and the proportion that are female.
- Juvenile Abundance and Timing: Identifies the production of juveniles salmonids (Red Bluff Diversion Dam), migration of salmon for operation of the Delta Cross Channel (Knights Landing Rotary Screw Trap), and the implementation of OMR reverse flow actions (Sacramento Trawl and Chipps Island Trawl).
- Delta Distribution: Informs OMR actions and is currently supported through beach seines, acoustic tagging, and Enhanced Delta Smelt Monitoring Program (EDSM).
- Salvage Count: Informs the direct effects on listed fish.
- Genetic Identification: Informs the salvage of listed Chinook salmon species versus non-listed Chinook salmon species.

Delta Smelt

- Turbidity Stations: Informs the potential for a “turbidity bridge” that would inform OMR Actions.
- Temperature Stations: Informs the transition between life stages and the need for protective measures.

- Water Quality Stations: Tracks the movement of the low salinity zone and parameters associated with the food web, e.g. chlorophyll.
- Delta Distribution: Informs the entrainment risk due to OMR actions and is currently supported by EDSM.
- Fish Condition: Informs when adults have spawned and the need for larval protections.

Steelhead

- American River and Clear Creek Redd Surveys
- Salvage Count

Sturgeon

- Salvage Count

Final EIS Table C-1 identifies the real-time monitoring projects included in this Decision.

Table C-1. Real-time Monitoring Projects

ID	Monitoring Program	Typical Time of Year Operating	Target Species/Parameter	Site/Region
1	Adult Spring Chinook Escapement Monitoring in Clear Creek.		Chinook carcass and weir abundance counts	Clear Creek
2	Red Bluff Diversion Dam Rotary Screw Trap Juvenile Monitoring Program	January - December	Juvenile Chinook salmon productivity	Red Bluff Diversion Dam, American River, Stanislaus River
3	Juvenile Salmon Emigration Real-time Monitoring (Seines and Trawls)	October 1 - November 30	Juvenile Chinook and steelhead relative abundance	North Delta
4	Juvenile Salmon Delta Abundance Trawling (expanded DJFMP trawling)	December - May	Juvenile Chinook salmon abundance and condition	Sacramento and Chipps trawl
5	Genetic Identification of Salmonids and Smelt to Inform Central Valley Project Operations and Bay-Delta Monitoring	January - December	Chinook salmon and Smelt diversity	Central Valley (RBDD to Chipps Island)
6	Lower Sacramento River Juvenile Salmon and Steelhead Monitoring Project	August - June	Juvenile Chinook salmon and Steelhead distribution and productivity	Middle Sacramento River at Knights Landing
7	Winter-run Chinook Salmon Escapement Monitoring	May - August	Winter-run Chinook carcass and redd abundance and distribution	Sacramento

ID	Monitoring Program	Typical Time of Year Operating	Target Species/Parameter	Site/Region
8	Fish Salvage Operations	January - December	Juvenile Fish abundance	CVP and SWP Delta Fish Protection Facilities
9	Enhanced Delta Smelt Monitoring	January - December	Delta Smelt abundance, distribution, condition, and productivity	San Francisco Estuary
10	Delta Flow Measurement and Database Management	January - December	Flow and water quality	Bay-Delta
11	Operation of Thermograph Stations	January - December	Temperature and sediment loads	
12	Hatchery Marking (100% Tagging)		Winter-run Chinook, Spring-run Chinook Salmon, Late-Fall Chinook salmon, Steelhead	Livingston Stone National Fish Hatchery, Feather River Hatchery, Coleman National Fish Hatchery, Nimbus Hatchery

Marketable Power Generation

The Decision will also optimize power generation by incorporating consideration of project purposes in determining whether to implement power bypasses; a more secure water supply for water users' contribution to CVPIA costs, particularly in dry years; adding transparency through the development of science-based decisionmaking; and adding reliability for power generation by creating accountability for the results of actions in performance measures and testable outcome.

Scientific Integrity and Commitments to Independent Review

As described in Appendix A to the Final EIS, this NEPA compliance document was prepared by a Reclamation team with a combined two centuries of expertise in civil and environmental engineering, including masters and doctorate degrees in water resources, hydrology and river mechanics. Reclamation's team of experts also includes experienced staff with masters and doctorate degrees in ecology, geography, environmental science and policy, and organizational leadership. In addition, the consultants for the project also include leading experts in their fields, such as several scientists who are the primary authors of many of the primary scientific studies relied on by Reclamation and the Services.

Further, as discussed below, Reclamation's development of the proposed action was undertaken in coordination with the Services to ensure that it met the requirements of the ESA. The ESA consultation involved two peer reviews by independent experts, including review of Reclamation's proposed action. The ESA process also included involvement by the science advisor to the

Secretary of the Interior and NOAA’s scientific integrity officer, to ensure that the process was also consistent with the scientific integrity policies for both agencies. The employees who participated in this process have a deep understanding of the current state of knowledge in their field of study, a commitment to scientific integrity, and a recognition of the importance of science in informing decision-making. This process utilized the best available science and incorporates the key role of science in implementing the Decision.

Reclamation’s commitment to scientific integrity and advancing our scientific understanding of the system is ongoing. Reclamation agreed to establish independent panels to provide for ongoing scientific review of the efficacy of its actions and to recommend areas for improvement where necessary. As such, while the Decision includes additional flexibility by giving back to Reclamation the ability to exercise its discretion to manage the CVP, the Decision incorporates backstops and robust independent review.

Independent panels further demonstrate Reclamation’s commitment to a rigorous and trustworthy scientific process that continues to adhere to standards of excellence. The Decision includes independent panels in years 4 and 8 to review the Proposed Action and Incidental Take Statements and make recommendations on the state of the art for science and improvements to the action. In 2024 and 2028, Reclamation will charter independent panels to review the effectiveness of the upper Sacramento performance metrics, OMR management and measures to improve juvenile salmonid survival and Delta Smelt larval/juvenile entrainment; Delta Smelt Summer/Fall Habitat Actions and Steelhead Research and Monitoring. This review will ensure that decision-making under the framework of this ROD continues to be based on robust and credible scientific information. An independent panel may also be triggered if Reclamation’s performance does not measure up to the commitments it is making in this Decision.

Indian Trust Assets

In addition, Reclamation adhered to the requirements for Indian Trust Assets (ITA) in the development of the EIS. Multiple federally recognized tribes are located in the vicinity of the project area on the Trinity, Sacramento, American, and San Joaquin Rivers. Potentially adverse effects to federally recognized tribes evaluated include erosion of land or sites of cultural importance, degradation of water quality, any detrimental effects on salmonid populations, which are an important resource to ITAs, or impediments to access for federally recognized tribes with fishing rights. Based on the analysis conducted, there are no anticipated impacts to ITAs as a result of erosion, degradation of water quality, or impacts to fishing rights as a result of Alternative 1. Consistent with the aquatics analysis, Alternative 1 is expected to improve some conditions for salmonid populations while other conditions are not expected to vary greatly from the No Action Alternative.

Climate Change

Reclamation also incorporated the effects of climate change in making this Decision. The analysis included an extensive modeling effort that used the Bay-Delta Conservation Plan Early Long-term Q5 climate scenario, which represents the central tendency of an ensemble of climate scenarios.

The analysis shows that impacts of Alternative 1 are similar to the impacts of the no action alternative even taking into account the potential impacts of climate change. Likewise, the Decision will not have a cumulatively considerable effect on greenhouse gas emissions. The factors affecting climate change are global in nature and when considered within that broader scale, emissions related to project operations are not significant.

Alternatives 2, 3 and 4 Do Not Fully Meet the Purpose and Need

Alternative 2 only partially meets the purpose and need in that Reclamation would operate the CVP to meet the legal requirements associated with its water rights, but would not release additional flows for fish and wildlife purposes, unlike Alternative 1. Alternative 3 includes more habitat restoration and fish intervention measures, but still does not yield the same level of benefits to fish and wildlife shown from implementation of Alternative 1. Alternative 4 also only partially meets the purpose and need in that it provides slight flow benefits for fish species, but decreases water exports.

A final consideration favoring the choice of Alternative 1 over the No Action Alternative and Alternatives 2, 3 and 4 was needed to achieve the purpose and need and the statutory objectives to improve operational flexibility and determine a balance among competing demands for the use of CVP water and to meet all project purposes. Alternative 1 will provide additional economic opportunities for agriculture by augmenting operational flexibility to provide reliable deliveries to water contractors, particularly by increasing storage to support deliveries in drier periods when water is not otherwise available. The Decision will reduce reliance on alternate sources of supply, such as groundwater, and lower operational costs, thereby increasing agricultural revenues for growers and the farming support sector. The CVP will continue to maintain water quality, including meeting the State Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary plan for Delta state-designated beneficial uses.

Comments Received on the Final EIS

The Final EIS was published on Reclamation's website and a press release was issued by Reclamation on December 19, 2019. A *Federal Register* notice of the Final EIS was published by the U.S. Environmental Protection Agency (EPA) on December 20, 2019. The Final EIS includes the addition of Appendix AA which summarizes the public comment process for the Draft EIS and provides summary responses as well as unique responses to the comments received.

The period for comments on the Final EIS ended January 21, 2020. Reclamation received comments from three entities. Comments included analysis of temperature effects, CVP operations, refinement of Alternative 1 between the Draft and Final EIS, analysis of climate change, actions that may require additional NEPA review, and analysis of effects on water quality and beneficial uses of water. These comments did not raise any new issues, and are addressed in Appendix AA, as well as below.

Comments were received in support of the project and refuting specific comments made on the Draft EIS by other entities. Comments specifically stated that the EIS analyzed and disclosed the full effects of the proposed action and on the performance of the Sacramento River Settlement (SRS) Contractors. Additionally, comments were supportive of the EIS analysis of temperature-dependent mortality of winter-run Chinook salmon caused by CVP operations.

These comments are consistent with the EIS and ROD. Reclamation appreciates the commenters participation in the public review process.

Comments were received asserting that the revised Alternative 1 presented in the Final EIS was not within the range of alternatives described in the Draft EIS and, therefore, insufficiently disclosed and analyzed associated effects. Additionally, commenters felt the revised Alternative 1 presented new information which was not presented to the public appropriately and that there is no succinct summary of the modifications to Alternative 1 from Draft EIS to Final EIS which prevents a meaningful review of the Final EIS.

The revisions to Alternative 1 were developed in coordination with NMFS and the USFWS and are not outside of the range of alternatives analyzed in the Draft EIS. Analysis of the revised Alternative 1 did not reveal any new significant impacts, any substantial increases in the severity of an impact, or result in a new feasible alternative or mitigation measure that is dramatically different from what was analyzed in the Draft EIS.

Modeling of the refined proposed action is provided in Appendix F, Modeling, Attachment 1 of the Final EIS. Analysis of the revised modeling does not reveal any new significant impacts, any substantial increases in the severity of an impact, or result in a new feasible alternative or mitigation measure that is dramatically different from what was analyzed in the Draft EIS. As a result, the Draft EIS provided the information necessary to allow for meaningful public review and comment on substantial adverse environmental effects and ways to mitigate or avoid such impacts.

Commenters also expressed a desire for the opportunity to comment on the updated climate change modeling included in the Final EIS and notes that the CalSim II under the 2035 Central Tendency

(CT) climate conditions with 15 cm of sea level rise was not available to the public with the Draft EIS.

In response to comments on the Draft EIS, a climate change sensitivity analysis was performed to analyze operational changes under various climate change projections for the ROC on LTO. The sensitivity analysis is not updated climate change modeling, rather it is provided in response to comments received on the Draft EIS. This information is provided in Section 5.21.2 and Appendix F, Attachment 2, of the Final EIS. The additional analysis utilized 2035 CT climate conditions, which were applied to revised No Action Alternative and Alternative 1 to assess sensitivity of conclusions to climate conditions. These results were compared to the original analysis, which analyzed the revised No Action Alternative and Alternative 1 under ELT Q5 conditions. Findings from this analysis indicate that incremental differences observed between revised No Action Alternative and Alternative 1 under 2035 CT climate conditions remain similar to incremental differences between revised No Action Alternative and Alternative 1 under ELT Q5 climate conditions. Revised model assumptions and results are discussed in Appendix F, Attachment 1. As such, the Draft EIS provided the information necessary to allow for meaningful public review and comment.

Commenters requested that the ROD clarify the specific actions for which the EIS provides NEPA compliance and which actions may require additional NEPA review.

As described in the EIS, Alternative 1 is a mixture of project-specific and programmatic actions, and the programmatic actions are not defined in detail at this time and will be further analyzed in subsequent NEPA analyses. The No Action Alternative and the four action alternatives evaluated in the EIS are summarized in Chapter 3 and described in detail in Appendix D at a level sufficient to support the evaluation of their potential effects on all of the resource areas considered in the EIS. This includes detailed descriptions of each alternatives' components that are evaluated at a project level in the EIS and at a higher summary level for the components evaluated at a programmatic level. Subsequent NEPA analyses may be performed as needed for programmatic actions to analyze site-specific environmental impacts once these actions have been developed at more detail. See Appendix 1 of this ROD for the list of components for Alternative 1, including which are project-specific and which are programmatic.

Additionally, commenters suggested that Reclamation should identify in the ROD measures to avoid impacts to water quality and provide beneficial uses in the Bay Delta and generally recommended coordination with the SWRCB and for consistency with Porter-Cologne Water Quality Control Act and Clean Water Act.

Reclamation worked with the commenter (EPA) to further explain the preferred alternatives, which EPA stated resolved its concerns. Reclamation will operate in compliance with all applicable state and Federal laws including those which regulate water quality such as D-1641 and its associated salinity standards. Additionally, coordination with the SWRCB will be ongoing regarding the proposal to move the existing dissolved oxygen compliance point from Ripon to Orange Blossom Bridge on the Stanislaus River. The Delta Cross Channel would be operated to manage water quality and prevent exceedance of water quality thresholds. Mitigation measures are provided in the Final EIS and in Appendix 3 of this ROD to mitigate construction effects to water quality.

Section 7 of the Federal ESA

Section 7(a)(2) of the Endangered Species Act (ESA) requires federal agencies to consult with the USFWS and NMFS, depending on the species at issue, to ensure that their actions do not jeopardize the continued existence of species listed as threatened or endangered under the ESA or destroy or adversely modify their critical habitat. On August 2, 2016, Reclamation, the lead federal agency, and DWR, the applicant, jointly requested the reinitiation of Endangered Species Act consultation on the coordinated long-term modified operations of the CVP and SWP. USFWS and NMFS accepted the reinitiation request on August 3, 2016 and August 17, 2016, respectively. On January 31, 2019, Reclamation transmitted their Biological Assessment to USFWS and NMFS. Through ongoing consultation over many months, Reclamation and DWR continued to clarify and refine the proposed action and transmitted the final proposed action to the Services on October 17, 2019. The proposed action in the transmitted Biological Assessment was Alternative 1, as analyzed through the NEPA process (the Biological Assessment is incorporated in the Final EIS as Appendix AB). Several of the RPA actions from the 2008 USFWS biological opinion and the 2009 NMFS biological opinion were incorporated into the proposed action (Alternative 1). As a result, Alternative 1 was developed to be at least as protective as the previous RPAs, while incorporating the more recent scientific information.

The Biological Assessment included an environmental baseline analysis that was intended to help define the potential effects of the proposed action, serving a similar purpose to NEPA's affected environment section, by providing a starting point to determine the likely effects the proposed action will have on the environment. The Biological Assessment, as well as the biological opinions, both recognize that the environmental baseline should not include the effects of any component of the action under review in the consultation. A contrary approach—i.e., considering the effects of the action to include only the differences between current and proposed operations—would preclude a determination of whether the effects of the action as a whole comply with section 7(a)(2). For example, it would consider as part of the environmental baseline, and not the result of the action under review, every component of the operation that does not change from current to proposed. This would replace the requirements of section 7(a)(2) with the rule that absence of change equates to compliance, even if the unchanged action has adverse effects on species or habitat.

Notwithstanding these shortcomings, agencies have taken this analytical approach in the past because they had not identified a method to distinguish effects of ongoing CVP operations from other conditions influencing species and habitat. To remedy this shortcoming, both Reclamation and the Services incorporated a without action scenario as part of the environmental baseline to isolate and define potential effects of the Proposed Action apart from effects of non-Proposed Action causes. The model run representing this scenario included effects attributable to the existence of the CVP and SWP dams and operations of non-CVP and non-SWP facilities, such as operation of public and private reservoirs and diversions on the Yuba, Tuolumne, Merced, and other rivers, and in the Delta. The without action scenario plays a role in the Endangered Species Act effects analysis of establishing the likelihood of species survival and recovery under the Environmental Baseline (i.e., the effects on survival and recovery from all non-Proposed Action causes). The past and ongoing effects of habitat restoration, predation and other ecological changes stemming from long-established and more recently established non-native species, water quality degradation, and other

effects on species from Federal, state, and private actions are also part of the baseline because they represent beneficial and detrimental influences on the threatened and endangered species that exist at this time and are likely to persist for the foreseeable future.

In its Biological Assessment, Reclamation determined that once the effects of baseline conditions are isolated from the effects of the Proposed Action, and recognizing that there are associated adverse effects, the overall effects of Reclamation's operations on salmonids are largely beneficial because the proposed action improves baseline flows and water temperatures for spawning, rearing and migration of multiple listed species that allow the species to persist despite the existence of dams and other structures. For Delta Smelt, Reclamation found that the operation of the CVP and SWP results in negative effects, largely due to entrainment and the extent of low salinity rearing habitat in some year types.

The USFWS reviewed the Biological Assessment, which evaluated the impact of CVP and SWP water operations on imperiled species including Delta Smelt and 15 terrestrial species that could be impacted. In turn, NMFS evaluated the potential impacts on five listed aquatic species. Reclamation and DWR coordinated with USFWS and NMFS to modify the proposed action to minimize and offset those impacts.

Through ongoing consultation to identify areas that appeared to be magnifying the potential impacts of the proposed action, in final phase of preparing documents, the Department of the Interior and the Department of Commerce determined that creating a small, focused, multi-agency team to complete the consultation would be helpful to ensure that the proposed action was correctly characterized, the actions met their intentions and that the Biological Opinions were coordinated. The three regional directors relied on both Departments' experience of using inter- and intra-agency teams to provide expertise in complex consultations for river basins such as the Missouri, Colorado, and Columbia River, and the Everglades. Coordination between Reclamation, DWR, NMFS and USFWS was also critical to ensure Reclamation and DWR can consistently implement both opinions. The regional directors for USFWS, NMFS and Reclamation assembled fisheries biologists, environmental compliance experts, project operators and lawyers from each of the agencies to ensure that Reclamation and DWR's revised proposed action responded to the concerns raised by both NMFS and USFWS during initial consultation. The team operated independently, and the Services incorporated a second peer review to ensure that the comprehensive analysis in the biological opinions was scientifically sound and relied on the best available science. This rigorous process resulted in a final proposed action that was incorporated in the final EIS as the preferred alternative.

Reclamation and DWR made multiple modifications to the proposed action, including incorporating significant funding for measures that protect listed species such as scientific studies, habitat restoration, conservation facilities including hatcheries, and protective measures built into the operations plan. Meaningful changes made to the proposed action since the original submittal in January included new protective actions in the Bay-Delta, a more refined temperature management plan at Shasta Reservoir, funding for hatcheries and expanded habitat projects, including Battle Creek, studies to further define the needs of the species, specific drought actions and an independent periodic review process for Project actions.

With this extensive collaboration between the Services, Reclamation, and DWR, which resulted in meaningful improvements to Reclamation's and DWR's proposed operations from the January 31,

2019 iteration of the proposed action, the Services ultimately concluded that the proposed action is not likely to jeopardize threatened or endangered species or destroy or adversely modify their critical habitat.

USFWS and NMFS finalized their biological opinions on the coordinated operations of the CVP and SWP on October 21, 2019.

The Biological Assessment and biological opinions were completed before the 2019 revisions to the ESA Section 7 regulations took effect, but the revisions to the implementing regulations do not change the outcome. The 2019 regulatory clarifications to the interagency consultation process simply make it more efficient and consistent and support Reclamation's, NMFS' and USFWS' conclusions that the actions considered in the various environmental compliance documents are not likely to jeopardize threatened or endangered species or destroy or adversely modify their critical habitat.

In particular, the revisions to the definitions of “environmental baseline,” “effects of the action” and “destruction or adverse modification,” reinforce that Reclamation and the Service correctly analyzed the effects of the action.

The new regulations revised the definition of environmental baseline to make it clear that “environmental baseline” is a separate consideration from the effects of the action. They further clarified “the consequences of ongoing agency activities or existing agency facilities that are not within the agency’s discretion to modify are included in the environmental baseline.” 84 Fed. Reg. 44976, 44978 (Aug. 27, 2019) (effective date October 28, 2019, *see* 84 Fed. Reg. 50333). The Services concluded that the revised definition “was necessary to explicitly answer the question as to whether ongoing consequences of past or ongoing activities or facilities should be attributed to the environmental baseline or to the effects of the action under consultation when the agency has no discretion to modify either those activities or facilities.” This is especially true with ongoing activities such as operation of the CVP, where the effects of the existence of the dam should be included in the environmental baseline. As the Services explained, “when a Federal agency has authority for managing or operating a dam, but lacks discretion to remove or modify the physical structure of the dam, the consequences from the physical presence of the dam in the river are appropriately placed in the environmental baseline and are not considered an effect of the action under consultation.” *Id.* at 44978.

Likewise, the agencies’ analysis of the effects of the action in the Biological Assessment and biological opinions is consistent with the new regulation’s direction to consider only effects that do not occur (1) but for the proposed action and (2) that are reasonably certain to occur. The two-part test articulated in the new regulations is consistent with prior practice and interpretations. *Id.* at 44977. Finally, in the new regulations the Services clarified the definition of “destruction or adverse modification” to add the phrase “as a whole.” *Id.* at 44981. That addition, which is consistent with the Services’ longstanding interpretation, makes it clear that the determination of whether habitat is adversely modified or destroyed is made at the scale of the entire critical habitat designation. *Id.* While the Biological Assessment and biological opinions were signed under the prior regulations, they are also consistent with the clarifications and revisions adopted in the new 2019 regulations.

As the federal action agency, Reclamation is obligated to act in accordance with ESA section 7(a)(2) by ensuring that its operations are not likely to jeopardize the continued existence of any endangered

or threatened species or result in the destruction or adverse modification of critical habitat of such species. Reclamation's preferred alternative, Alternative 1, is consistent with its ESA section 7(a)(2) obligations.

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Magnuson-Stevens Fishery Conservation and Management Act

As part of the 2019 Biological Assessment, Reclamation and DWR also consulted on essential fish habitat (EFH) provisions in Section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. 1855(b)). During consultation, and largely based on the iterative nature of the ESA consultation that resulted in numerous modifications to the proposed action, NMFS decided to separate the ESA and EFH consultation analysis and conclusion documents. The EFH consultation was sent to Reclamation on January 24, 2020. Reclamation evaluated the recommendations and provided a response to NMFS on February 11, 2020, with determinations for implementation based on existing environmental compliance, the adequacy of existing conservation mechanisms, feasibility and existing requirements.

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Section 106 Compliance

Reclamation is responsible for complying with Title 54 U.S.C. § 306108, commonly known as Section 106 of the National Historic Preservation Act (NHPA). Reclamation will oversee compliance with Section 106. Project-level activities under the action alternatives will not result in changes to peak flows or reservoir levels compared to the No Action Alternative. As a result, in accordance with 36 C.F.R. § 800.3(a)(1), project level actions have no potential to cause effects on historic properties and do not require further consideration under Section 106 of the NHPA. Program-level activities under the action alternatives have the potential to cause adverse effects on historic properties due to construction of new habitat restoration sites and a new conservation hatchery facility. However, since program-level activities are broad in scope and not fully defined, these activities will be subject to additional environmental compliance procedures in the future. Once a program alternative is selected, Reclamation will comply with Section 106 of the NHPA. This may be in the form of a Programmatic Agreement or other Section 106 compliance efforts depending on supplemental NEPA documents or phasing of program level activities. Resolution of adverse effects may result in a memorandum of agreement or programmatic agreement pursuant to 36 C.F.R. § 800.6 stipulating the intended treatment of historic properties.

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Mitigation Measures

Mitigation measures are provided to avoid, minimize, rectify, reduce, or compensate for adverse effects of the action alternatives in accordance with NEPA regulations. Mitigation measures are not required to be implemented under NEPA but must be identified and analyzed. This Decision includes all practicable and reasonable means to avoid or minimize environmental harm consistent with the purpose and need of the action, including direct, indirect, and cumulative impacts (e.g., longfin smelt monitoring).

Recognizing that Alternative 1 is a mixture of project-specific and programmatic actions, and the programmatic actions are not defined in detail at this time and will be further analyzed in subsequent NEPA analyses, Appendix 3 to this ROD includes a summarized description of the mitigation measures adopted by Reclamation to avoid or minimize environmental harm from the action. The complete description of mitigation measures can be found in Appendix E of the Final EIS. Appendix 3 to this ROD also includes a discussion of monitoring programs, the time frame for implementation, and the monitoring parties, as well as a description of enforcement programs where applicable. Unless otherwise noted in Appendix 3, Reclamation would be the responsible party for the mitigation measures.

Taken together, the mitigation measures adopted in this ROD specify actions for areas important to fish and wildlife, particularly listed species, including habitat needs for Delta Smelt, North American green sturgeon, California Central Valley steelhead, Central Valley spring-run Chinook salmon and Sacramento winter-run Chinook salmon.

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References Cited

- Anderson, J. J. 2018. Using River Temperature to Optimize Fish Incubation Metabolism and Survival: A Case for Mechanistic Models. Preprint first posted online January 31, 2018. Available: doi: <http://dx.doi.org/10.1101/257154>.
- Buchanan, R. A. 2018a. [2014 Six-Year Acoustic Telemetry Steelhead Study: Statistical Methods and Results](#). Seattle: Columbia Basin Research, School of Aquatic & Fishery Sciences, University of Washington; 2018. Available from: sites/default/files/papers/UW_6yr_steelhead_report_2014_FINAL.PDF
- Buchanan, R. A. 2018b. [2015 Six-Year Acoustic Telemetry Steelhead Study: Statistical Methods and Results](#). Seattle: Columbia Basin Research, School of Aquatic and Fishery Sciences, University of Washington; 2018. Available from: sites/default/files/papers/UW_6yr_steelhead_report_2015_FINAL.pdf
- Buchanan, R. A. 2018c. [2016 Six-Year Acoustic Telemetry Steelhead Study: Statistical Methods and Results](#). Seattle: Columbia Basin Research, School of Aquatic and Fishery Sciences, University of Washington; 2018. Available from: sites/default/files/papers/UW_6yr_steelhead_report_2016_FINAL.pdf
- Bush, E. E. 2017. Migratory Life Histories and Early Growth of the Endangered Estuarine Delta Smelt (*Hypomesus transpacificus*). M.S. Thesis. University of California, Davis, Davis, CA.
- Del Rio, A., B. Davis, N. Fangue, and A. Todgham. In press. Combined effects of warming and hypoxia on early life stage Chinook salmon physiology and development. Conservation Physiology
- Gore, J. A., B. P. Kennedy, R. R. Kneib, N. E. Monsen, J. Van Sickle, D. D. Tullios. 2018. Independent Review Panel (IRP) Report for the 2017 Long-term Operations Biological Opinions (LOBO) Biennial Science Review: Report to the Delta Science Program. Delta Stewardship Council and Delta Independent Science Program.
- Grimaldo, L. F., T. Sommer, N. Van Ark, G. Jones, E. Holland, P. B. Moyle, P. Smith and B. Herbold. 2009. Factors affecting fish entrainment into massive water diversions in a freshwater tidal estuary: can fish losses be managed? North American Journal of Fisheries Management 29(5) 1253-1270. First published online on: 09 January 2011 (iFirst).
- Grimaldo, L.F., W.E. Smith, and M.L. Nobriga. 2017. After the storm: Re-examining factors that affect Delta smelt (*Hypomesus transpacificus*) entrainment in the Sacramento and San Joaquin Delta. Unpublished manuscript.
- Gross, E. S., J. Korman, L.F. Grimaldo, and M. Mac Williams. 2019. Delta Smelt Distribution Estimates for Hypothesized Swimming Behaviors. Collaborative Adaptive Management Team (CAMT): Delta Smelt Scoping Team Report.

- Hammock, B. G., J. A. Hobbs, S. B. Slater, S. Acuña and S. J. Teh. 2015. Contaminant and food limitation stress in an endangered estuarine fish. *Science of the Total Environment* 532:316-326. doi: <http://dx.doi.org/10.1016/j.scitotenv.2015.06.018>
- Hammock, B. G., S. B. Slater, R. D. Baxter, N. A. Fangué, D. Cocherell, A. Hennessy, T. Kurobe, C. Y. Tai, and S. J. 2017. Foraging and metabolic consequences of semi-anadromy for an endangered estuarine fish. *PloS one* 12, no. 3 (2017): e0173497.
- Kimmerer, W. J. 2008. Losses of Sacramento River Chinook salmon and delta smelt to entrainment in water diversions in the Sacramento-San Joaquin Delta. *San Francisco Estuary and Watershed Science*, 6:2 (2). Available on the internet at <<http://repositories.cdlib.org/jmie/sfews/vol6/iss2/art2>>.
- Kimmerer, W. J., and K. A. Rose. 2018. Individual-Based Modeling of Delta Smelt Population Dynamics in the Upper San Francisco Estuary III. Effects of Entrainment Mortality and Changes in Prey. *Transactions of the American Fisheries Society* 147(1):223-243.
- Korman, J., E. S. Gross, P. E. Smith, B. Saenz, L. F. Grimaldo. 2017. Statistical Evaluation of Particle-Tracking Models Predicting Proportional Entrainment Loss for Adult Delta Smelt in the Sacramento-San Joaquin Delta. Report to the CAMT DSST. December 29.
- Martin, B., A. Pike, S. John, N. Hamda, J. Roberts, and E. Danner. 2017. Phenomenological vs. Biophysical Models of Thermal Stress in Aquatic Eggs. *Ecology Letters* 20: 50–59.
- Maunder, M. N. and R. B. Deriso. 2011. A state–space multistage life cycle model to evaluate population impacts in the presence of density dependence: illustrated with application to delta smelt (*Hypomesus transpacificus*). *Canadian Journal of Fisheries and Aquatic Science* 68: 1285–1306 DOI:10.1139/F2011-071
- Perry, R. W., A. C. Pope, J. G. Romine, P. L. Brandes, J. R. Burau, A. R. Blake, A. J. Ammann, and C. J. Michel. 2018. Flow-Mediated Effects on Travel Time, Routing, and Survival of Juvenile Chinook Salmon in a Spatially Complex, Tidally Forced River Delta. *Canadian Journal of Fisheries and Aquatic Sciences* 75(11): 1886–1901. Available: <https://doi.org/10.1139/cjfas-2017-0310>
- Rose K. A., W. J. Kimmerer, K. P. Edwards and W. A. Bennett. 2013a. Individual-based modeling of Delta Smelt population dynamics in the upper San Francisco Estuary: I. Model description and baseline results. *Transactions of the American Fisheries Society* 142(5):1238-1259. doi: <http://dx.doi.org/10.1080/00028487.2013.799518>
- Rose, K. A., W. J. Kimmerer, K. P. Edwards and W. A. Bennett. 2013b. Individual-based modeling of Delta Smelt population dynamics in the upper San Francisco Estuary: II. Alternative baselines and good versus bad years. *Transactions of the American Fisheries Society* 142(5):1260-1272. doi: <http://dx.doi.org/10.1080/00028487.2013.799519>
- Salmonid Scoping Team (SST). 2017. Effects of Water Project Operations on Juvenile Salmonid Migration and Survival in the South Delta. Prepared for: Collaborative Adaptive Management Team. Available: <https://www.fisheries.noaa.gov/resource/document/effects-water-project-operations-juvenile-salmonid-migration-and-survival-south>.

- Smith, W. 2018. A general linear model relating an index of proportional entrainment loss to turbidity and Old and Middle River flow. Draft. 4 October. Sacramento, CA: U.S. Fish and Wildlife Service, San Francisco Bay-Delta Fish and Wildlife Office.
- State Water Resources Control Board (SWRCB). 1995. *Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary*. Available: https://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/wq_control_plans/1995wqcp/docs/1995wqcpb.pdf. Accessed: February 18, 2019.
- State Water Resources Control Board (SWRCB). 2000. *Revised Water Right Decision 1641*. Available: https://www.waterboards.ca.gov/waterrights/board_Decisions/adopted_orders/Decisions/d1600_d1649/wrd1641_1999dec29.pdf. Accessed: February 18, 2019.
- U.S. Bureau of Reclamation (Reclamation). 2011. Adaptive management of fall outflow for delta smelt protection and water supply reliability. U.S. Bureau of Reclamation, Sacramento, CA. Available at: <http://www.usbr.gov/mp/BayDeltaOffice/docs/Adaptive%20Management%20of%20Fall%20Outflow%20for%20Delta%20Smelt%20Protection%20and%20Water%20Supply%20Reliability.pdf>.
- U.S. Bureau of Reclamation (Reclamation). 2012. Adaptive management of fall outflow for delta smelt protection and water supply reliability. U.S. Bureau of Reclamation, Sacramento, CA. Available at: http://deltacouncil.ca.gov/sites/default/files/documents/files/Revised_Fall_X2_Adaptive_MgmtPlan_EVN_06_29_2012_final.pdf.
- U.S. Bureau of Reclamation (Reclamation). 2018a. NMFS Biological Opinion RPA IV.2.2: 2011 Six-Year Acoustic Telemetry Steelhead Study. Contributions by Buchanan, R., J. Israel, P. Brandes, E. Buttermore. Reclamation Bay-Delta Office, Mid-Pacific Region, Sacramento, CA. FINAL REPORT May 14, 2018, 144p.
- U.S. Bureau of Reclamation (Reclamation). 2018b. NMFS Biological Opinion RPA IV.2.2: 2012 Six-Year Acoustic Telemetry Steelhead Study. Contributions by Buchanan, P. Brandes, R., J. Israel, E. Buttermore. Reclamation Bay-Delta Office, Mid-Pacific Region, Sacramento, CA. FINAL REPORT May 16, 2018, 172p.
- U.S. Bureau of Reclamation (Reclamation). 2018c. NMFS Biological Opinion RPA IV.2.2: 2013 Six-Year Acoustic Telemetry Steelhead Study. Contributions by Buchanan, P. Brandes, R., J. Israel, E. Buttermore. Reclamation Bay-Delta Office, Mid-Pacific Region, Sacramento, CA. FINAL REPORT July 2018. 197p.
- U.S. Fish and Wildlife Service (USFWS). 1999. Effect of temperature on early-life survival of Sacramento River fall- and winter-run chinook salmon. Red Bluff, CA: Northern Central Valley Fish and Wildlife Office, January 1999.
- U.S. Fish and Wildlife Service and National Marine Fisheries Service. 2019. Biological Opinions for the Reinitiation of Consultation on the Long Term Coordinated Operations of the Central Valley Project and State Water Project, Summary. October.