Long-Term Operation – Final Environmental Impact Statement

Appendix Y – Cumulative Impacts Technical Appendix

November 2024

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Acronyms and Abbreviations

CEQ	Council on Environmental Quality
EIS	environmental impact statement
NEPA	National Environmental Policy Act
Reclamation	Bureau of Reclamation
RFFA	reasonably foreseeable future action

Appendix Y Cumulative Impacts Technical Appendix

Y.1 Background Information

Council on Environmental Quality (CEQ) regulations define a cumulative impact as the "effects on the environment that result from the incremental effects of the action when added to the effects of other past, present, and reasonably foreseeable actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 Code of Federal Regulations 1508.1(g)(3). The cumulative analysis follows applicable guidance provided by the Council on Environmental Quality guidance for Considering Cumulative Effects under the National Environmental Policy Act (NEPA) (Council on Environmental Quality 1997), Guidance on the Consideration of Past Actions in Cumulative Effects Analysis (Council on Environmental Quality 2005), and the Bureau of Reclamation's (Reclamation) NEPA Handbook (Bureau of Reclamation 2012).

Y.2 Cumulative Impacts Analysis

This appendix describes the approach that will be taken to perform the cumulative impacts analysis process, methodology and identification of past, present, and reasonably foreseeable actions that will contribute to the evaluation of cumulative impacts associated with the action alternatives and the No Action Alternative.

Y.2.1 Approach and Methodology

Cumulative impacts are the combination of impacts from:

- alternatives
- other past or present actions
- reasonably foreseeable future actions

Past and present actions contribute to the existing condition of the affected environment in the project area. In this Environmental Impact Statement (EIS), Chapters 4 through 22 contain the "Affected Environment" section which represent a combination of past and present actions and are supported by additional information provided in Appendices G through X. The additional impacts of the alternatives are discussed in each resource area specific Appendix (G through X) and summarized under the "Environmental Consequences" heading in Chapters 4 through 22. The reasonably foreseeable future actions that are similar in nature to the LTO, are not speculative, and overlap in space and time with project impacts. These reasonably foreseeable

future actions are then analyzed qualitatively for cumulative impacts. The cumulative impact analyses specific to each resource are provided in the resource area specific appendix under the Cumulative Impacts heading with a summary in the corresponding chapter, and a roll up into this appendix.

A reasonably foreseeable future action (RFFA) is one that is likely to occur in the future and does not include actions that are speculative. According to 40 CFR 1508.1 "Reasonably foreseeable" means sufficiently likely to occur such that a person of ordinary prudence would take it into account in reaching a decision. A screened list of future actions will form the basis for the cumulative effects analysis and applied specific criteria will determine whether the actions are reasonably foreseeable or speculative.

A screening will be conducted to determine which reasonably foreseeable future actions are similar in nature with the 2021 Reinitiation of Consultation for Long-Term Operation of the Central Valley Project and State Water Project, have impacts on individual resources, and which overlap temporally and spatially with project-related impacts. The screening process for determining the list of potential RFFAs is not meant to be overly restrictive, but it does set a reasonable standard for determining if enough information exists now to conduct a meaningful cumulative impacts analysis following CEQ guidance (Council on Environmental Quality 1997:3). At the same time, the RFFA list is not intended to be an exhaustive list of all past, present and reasonably foreseeable activities in the analysis area, but a thorough representation of known actions.

Y.2.1.1 Reasonably Foreseeable Future Actions Screening Process

1. Compilation of all identified potential RFFAs and initial screening to determine whether the actions are similar in nature with the LTO, if sufficient information exists to analyze impacts, and whether there would be temporal overlap with the 2021 Reinitiation of Consultation for the Coordinated Long-Term Operations of the Central Valley Project and the State Water Project.

2. For those RFFAs that pass the initial screening, additional screening to determine which resources are anticipated to be impacted by each RFFA.

3. Analysis to determine which RFFAs overlap in space with impacts from the 2021 Reinitiation of Consultation for the Coordinated Long-Term Operations of the Central Valley Project and the State Water Project, identification of impact metrics (qualitative), and assessment and disclosure of cumulative impacts.

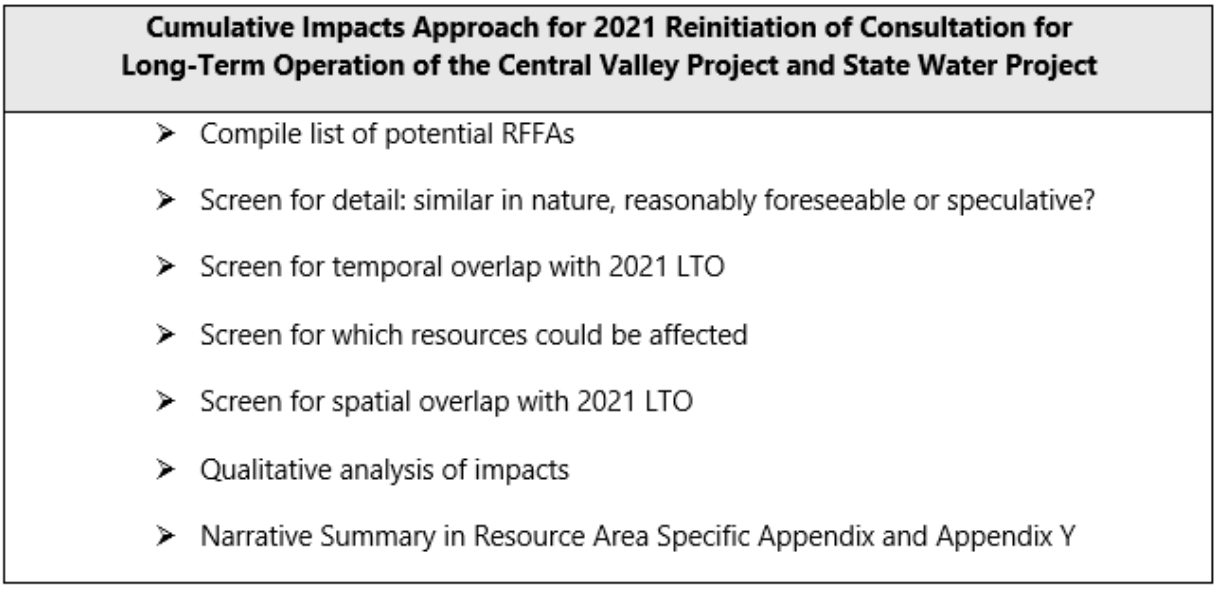

Figure Y-1. Graphical Representation of Cumulative Impacts Approach.

Based on the screening process and following the approach for cumulative impacts analysis, both past and present and reasonably foreseeable actions were identified. Table Y-1 shows the past and present actions that passed the screening criteria and will be captured as actions that contribute to the existing condition of the affected environment in the applicable resource area section. Table Y-2 shows the reasonably foreseeable future actions that passed the screening criteria and will be qualitatively analyzed in the cumulative impact section.

Table Y-1. Cumulative Impact Screening Past and Present Actions.

Project	Primary Agencies	Status	Description
CCWD CVP Water/EBMUD Freeport Project	CCWD, EMBUD	Past	In January 2004, EBMUD along with the Freeport Regional Water Authority (FRWA) and the Sacramento County Water Agency entered into a settlement agreement with CCWD to resolve litigation regarding construction of the Freeport Regional Water Project (Freeport). The settlement agreement required wheeling of 3,200 acre-feet (AF of CCWD's Central Valley Project supply annually from the Freeport point of diversion to CCWD's service area. CCWD's CVP water, which would normally be diverted in the Delta, would instead be diverted from the Sacramento River at the Freeport intake and conveyed to CCWD through Freeport facilities, Reclamation's Folsom South Canal and EBMUD's Mokelumne Aqueducts, On March 3, 2020, Reclamation approved Freeport intake as an additional Point-of-Diversion for CCWD's CVP water supply. Since completion of construction in 2011, Freeport was used to divert CCWD's CVP supply in 2014, 2021, and 2022.
Fremont Weir Adult Fish Passage Modification Project	DWR	Past	The existing fish ladder at Fremont Weir was widened and deepened and upstream and downstream adjoining channels were reconfigured to enhance flow through the structure and migratory fish passage. In addition, one agricultural road crossing along the Tule Canal that delayed migration was replaced and another removed.
Knights Landing Outfall Gates (KLOG) Fish Barrier Project	Reclamation District 108 and California Natural Resources Agency	Past	The project installed a positive fish barrier on the downstream side of the existing Knights Landing Outfall Gates to eliminate adult salmon straying off of the Sacramento River. Rehabilitation of the outfall gates repaired known structural deficiencies (including scouring found at the inlet and outlet gates), replacement of worn out appurtenances, construction of a trash barrier system to protect the gates and ease debris collection, and upgrades to the electrical and communication system to include backup capability to meet current USACE O&M standards
Wallace Weir Fish Rescue Facility Project	Reclamation District 108	Past	Constructed a permanent weir with a positive fish barrier and fish collection facility in the Yolo Bypass to prevent adult salmon from straying into the Colusa Basin Drain and to facilitate relocation of adult salmon that have strayed into the Yolo Bypass.
Del Puerto Canyon Reservoir	Del Puerto Water District and San Joaquin River Exchange Contractors Water Authority	Present	Del Puerto Water District and the Exchange Contractors would construct and operate the Del Puerto Canyon Reservoir. The project will deliver existing contracted water from the Delta-Mendota Canal into the new 80 thousand acre-feet (TAF) reservoir. The reservoir would allow water to be delivered into storage during wetter periods until it is needed in drier periods for irrigation, groundwater recharge, or wildlife beneficial uses. The reservoir would be located in Del Puerto Canyon in the Coast Range foothills west of Patterson and south of the Sacramento–San Joaquin Delta, just west of Interstate 5.
Maxwell Intertie Project	USDA and Sites Project Authority	Present	The overall purpose of the proposed Project is to increase the efficiency and reliability of water management in the western Sacramento Valley by adding to or improving existing facilities to facilitate greater flexibility in water conveyance, which would increase the drought resistance of rural communities. Rural development in California has frequently been limited by the availability and reliability of water to support the existing economic engines and the people of rural California. While rural water supplies appear to be plentiful, they are reliant on aging single-purpose

Project	Primary Agencies	Status	Description
			water management facilities and winter storm precipitation. Water shortages during droughts and regulatory constraints on the operations of the TC Canal and the GCID Main Canal have decreased the reliability of the water supplies to rural agencies in the Sacramento Valley and affected Central Valley Project deliveries. Some individual Tehama Colusa Canal Authority (TCCA) member districts have independently explored potential conveyance points between the GCID canal system and individual TCCA landowners and/or individual TCCA district facilities. The proposed Project comprehensively addresses this need and facilitates the flexibility of water conveyance to improve the resiliency of participants during dry years. The Maxwell Water Intertie (MWI) pipeline would connect existing canal systems west of the Sacramento River (the GCID Main Canal and the TC Canal) to achieve this flexibility. The proposed project is comprised of a set of new project features or facilities that would allow for the efficient bi- directional exchange of water from two existing, large water management systems in the western portion of the Sacramento Valley of California. The project features included: A 1,200-AF capacity Terminal Regulating Reservoir (TRR) covering 130 acres with a spillway to the local irrigation ditch system and bottom drain, both of which ultimately connect to Funks Creek; TRR Pumping Plant with a 900-cfs maximum pumping capacity, a 1-acre Electrical Switchyard adjacent to the plant, and a 3.5-mile power line; a GCID Main Canal Connection to TRR including a gated inlet control structure, short inlet channel, and concrete canal lining in the GCID Main Canal immediately upstream and downstream of the TRR connection; a 3.5-mile MWI pipeline sized for 900 cfs pumped capacity and 900 cfs gravity flow capacity, private access bridge over the GCID Main Canal for construction access and maintenance of the pipelines, and a 2.7-mile gravel access road that would run most of the length of the MWI pipeline alignment. The approved project included the granting of a loan from the USDA to assist in the financing of the Maxwell Water Intertie Project.
North Delta Flow Action	DWR and Reclamation	Present	In fall 2019 agricultural flows will be directed into Yolo Bypass for up to a month. The action is designed to generate a modest, seasonal positive flow pulse (e.g., 24 TAF) through the Yolo Bypass, but will be well below levels that would result in local flooding. The goal of the action is to support the Delta food web in downstream areas. By routing agricultural drain water through Yolo Bypass instead of the Sacramento River, DWR scientists predicted that a flush of plankton-rich water would provide a "seed" for the downstream Delta, enhancing food resources for delta smelt.
El Dorado Water and Power Authority Supplemental Water Rights Project	El Dorado Water and Power Authority	Present	The El Dorado Water and Power Authority (EDWPA) proposes to establish permitted water rights allowing diversion of water from the American River basin to meet planned future water demands in the El Dorado Irrigation District and Georgetown Divide Public Utility District service areas and other areas located within El Dorado County that are outside of these service areas. The EDWPA filed petitions with the SWRCB for partial assignment of State Filed Applications 5644 and 5645, and accompanying applications allowing for the total withdrawal and use of 40,000 acre-feet per year, consistent with the diversion and storage locations allowed under the El Dorado-Sacramento Municipal Utility District Cooperation Agreement (El Dorado Water and Power Authority 2010). A Notice of Preparation of an Environmental Impact Report for the Project was submitted in October 2008 (El Dorado Water and Power Authority 2008).

Project	Primary Agencies	Status	Description
Future groundwater storage and recovery projects		Past and Present	City of Roseville (City of Roseville 2019) Mokelumne River Water & Power Authority (Mokelumne River Water & Power Authority 2015) Northeastern San Joaquin County Groundwater Banking Authority (NSJCGBA) (Northeastern San Joaquin County Groundwater Banking Authority 2011) Stockton East Water District (Stockton East Water District 2012) Madera Irrigation District (Bureau of Reclamation 2011) Kings River Conservation District (Kings River Conservation District 2012) City of Los Angeles (City of Los Angeles 2013) Los Angeles County (Los Angeles County 2013) City of San Diego (City of San Diego 2009a, 2009b) Rancho California Water District (Rancho California Water District 2011, 2012) Eastern Municipal Water District (EMWD) (Eastern Municipal Water District 2014a) Jurupa Community Services District (Jurupa Community Services District et al. 2010)
System Reoperation Program	DWR	Past	DWR is conducting a system reoperation study (SRS) to identify potential reoperation strategies for the statewide flood protection and water supply systems. The SRS includes four phases. Phase 1, Plan of Study, was completed in 2011. Phase 2, Strategy Formulation and Refinements was completed in 2014. Phase 3, Preliminary Assessments of Strategies, was completed in August 2017. Phase 4, Reconnaissance Level Assessments of Strategies, is currently under development (California Department of Water Resources 2019a).
Contra Costa Canal Replacement Project	CCWD	Present	CCWD's Canal Replacement Project will replace the earth-lined portion of the canal with a pipeline along a portion of the 48-mile Contra Costa Canal near Oakley to reduce salinity and water quality impacts of groundwater seepage from adjacent agricultural areas, as well as to increase public safety and flood protection. As of late 2024, approximately 3.9 miles of the earth-lined portion of the Canal has been replaced with a buried pipeline (of only 700 feet of earth-lined canal remains) and the flood isolation structure near the fish screen has also been completed.
Alternative Intake Project	CCWD, Reclamation, and DWR	Past	The Alternative Intake Project was completed in 2010. The project located a new drinking water intake at Victoria Canal, about 2.5 miles east of CCWD's existing intake on the Old River, which allows CCWD to divert higher quality water when it is available. The new screened intake includes a 2.5-mile pipeline extension and a new pumping plant that ties into CCWD's existing conveyance system. The new intake has the same capacity and similar design as the existing Old River intake (250 cfs).
Davis-Woodland Water Supply Project	Davis, Woodland, and University of California, Davis	Past	The Davis-Woodland Water Supply Project up to 45,000 AF per year of surface water from the Sacramento River and convey it for treatment and subsequent use in Davis and Woodland and on the University of California, Davis campus. The purposes of the project are to provide a reliable water supply to meet existing and future needs, improve water quality for drinking supply purposes, and improve treated wastewater effluent quality through 2040. The Project

Project	Primary Agencies	Status	Description
			facilities were completed in July 2016 (Woodland-Davis Clean Water Agency n.d). Project activities included construction and operation of a water intake/diversion, conveyance, and water treatment facilities. Surface water supplies would be acquired through new water rights and water rights transfers from senior water rights holders. The Project is located in the east-central portion of Yolo County, between and within the cities of Woodland and Davis, the University of California, Davis campus, and west of the Sacramento River. The new water diversion facility is constructed on the Sacramento River near the Interstate 5 crossing at the location of the existing Reclamation District 2035 diversion. The water treatment plant to treat the surface water diverted from the Sacramento River would have an ultimate capacity of up to 106 mgd. Water diversions under the project was made in compliance with Standard Water Right Permit Term 91, which prohibits surface water diversions when water is being released from CVP or SWP storage reservoirs to meet in-basin entitlements, including water quality and environmental standards for protection of the Delta. Water supply needs during periods applicable to Term 91 would be satisfied by entering into water supply transfer agreements with senior water rights holders within the Sacramento River watershed.
Freeport Regional Water Project	Freeport Regional Water Authority and Reclamation	Past	Freeport Regional Water Authority, a Joint Powers Authority created by exercise of a joint powers agreement between the Sacramento County Water Agency (SCWA) and EBMUD, constructed a new water intake facility/pumping plant and 17-mile underground water pipeline within Sacramento County. The new water intake facility and pumping plant is located on the Sacramento River at the Freeport Bend, just upstream of Freeport and 10 miles south of Sacramento. The pumping plant diverts up to 185 mgd from the river and pump it through new pipelines to EBMUD and SCWA project facilities. Components of the facility include an in-river intake fish screen, sheet-piled in-river transition structure, electrical substation, surge control facility, compressed air system, sediment collection and settling basin system, and utilities. Construction of the intake was completed in 2010; the Vineyard Surface Water Treatment Plant was completed in 2012 (Freeport Regional Water Project 2019).
Eastern San Joaquin Integrated Conjunctive Use Program	NSJCGBA	Past	The Integrated Conjunctive Use Program is to develop approximately 140,000 to 160,000 AF per year of new surface water supply for the basin that will be used to directly and indirectly to support conjunctive use by the NSJCBGA member agencies. This amount of water would support groundwater recharge at a level consistent with the GBA's objectives for conjunctive use and the underlying groundwater basin. Within this framework, the program would implement the following categories of conjunctive use projects and actions: water conservation measures; water recycling; groundwater banking; water transfers; development of surface storage facilities; groundwater recharge; river withdrawals; and construction of pipelines and other facilities. To enable and facilitate sustainable and reliable management of San Joaquin County's water resources, NSJCGBA developed a series of Basin Management Objectives to support conjunctive use and address a variety of water resources issues, including groundwater overdraft, saline groundwater intrusion, degradation of groundwater quality, environmental quality, land subsidence, supply reliability, water demand, urban growth, recreation, agriculture, flood protection, and other issues. The purpose of the Basin Management Objectives is to ensure the long-term sustainability of water resources in the San Joaquin Region. A Final

Project	Primary Agencies	Status	Description
			EIR for the program was released in February 2011 (Northeastern San Joaquin County Groundwater Banking Authority 2011).
Folsom Dam Safety and Flood Damage Reduction Joint Federal Project	Reclamation, U.S. Army Corps of Engineers (USACE), Sacramento Area Flood Control Agency, and Central Valley Flood Protection Board	Past	The project represents a coordinated effort among Reclamation and USACE to address dam safety and enhanced flood control at Folsom Dam. The project includes the Joint Federal Project Auxiliary Spillway, seismic improvements to the Main Concrete Dam and Mormon Island Auxiliary Dam, static improvements to earthen structures, security upgrades, replacement of the Main Concrete Dam spillway gates, and a 3.5-foot raise to all Folsom Facility structures. Construction on the auxiliary spillway began in 2008 and was completed in 2017 (Bureau of Reclamation 2019). The modifications to the dam allow for the release of water sooner than was possible, with the potential for higher releases should the downstream levees be improved to accommodate the increased flows. These larger, earlier releases from Folsom Reservoir create and conserve flood storage space based on projected reservoir inflows resulting from a major storm impacting the upper American River watershed. The revised Folsom Water Control manual and supporting supplemental environmental compliance documentation were completed in 2019. The manual will continue to be updated with the completion of proposed structural modifications at Folsom Dam and Reservoir, at which time the full potential benefits of the proposed modifications would be realized.
Delta-Mendota Canal/California Aqueduct Intertie	Reclamation	Past	The Delta-Mendota Canal/California Aqueduct Intertie consists of constructing and operating a pumping plant and pipeline connection between the Delta-Mendota Canal (DMC) and the California Aqueduct. The Intertie, which is now operational, is used to achieve multiple benefits, including meeting current water supply demands, allowing for the maintenance and repair of the CVP Delta export and conveyance facilities, and providing operational flexibility to respond to emergencies related to both the CVP and the State Water Project. The Intertie includes a 450-cfs pumping plant at the DMC that allows up to 400 cfs to be pumped from the DMC to the California Aqueduct via an underground pipeline. The additional 400 cfs allows the Jones Pumping Plant to pump to its authorized amount of 4,600 cfs. Because the California Aqueduct is located approximately 50 feet higher in elevation than the DMC, up to 900 cfs flow can be conveyed from the California Aqueduct to the DMC using gravity flow. The Intertie is owned by the federal government and operated by the SLDMWA. An agreement among Reclamation, DWR, and SLDMWA identifies the responsibilities and procedures for operating the Intertie.
South Bay Aqueduct Improvement and Enlargement Project	Zone 7 Water Agency and DWR	Past	The South Bay Aqueduct Improvement and Enlargement Project improved and expanded the existing South Bay Aqueduct. The project increased the existing capacity of the water conveyance system up to its design capacity of 300 cfs and expand capacity in a portion of the project to add 130 cfs (total of 430 cfs). These improvements assist Zone 7 in meeting its future conveyance capacity needs and allow DWR to reduce State Water Project peak power consumption by providing for variation in pumping and delivery schedule. The enlargement project supply Zone 7's future Altamont Water Treatment Plant with additional SWP water. The enlarged South Bay Aqueduct carries an additional 130 cfs through Reach 1, and 80 cfs through reaches 2 and 4. Construction of the enlargement project was completed in 2014.

Project	Primary Agencies	Status	Description
California EcoRestore	CNRA	Present	California EcoRestore is an initiative by the California Natural Resources Agency (CNRA) to coordinate and advance habitat restoration for at least 30,000 acres by 2019 (California Natural Resources Agency 2015a, 2015b). This acreage includes 25,000 acres of habitat restoration identified in the 2008 USFWS BO and 2009 NMFS BO, and 5,000 acres of habitat enhancements. Some of these programs would be funded by federal and state water agencies that are required to mitigate impacts of the CVP and SWP. Other programs would be sponsored by a combination of funds from state bonds (Proposition 1 and 1E), Assembly Bill 32 Greenhouse Gas Reduction Fund, federal agencies, local agencies, and private investments. The California Delta Conservancy will lead implementation of identified restoration projects in collaboration with local governments and with a priority on using public lands in the Delta. Many of the programs to be implemented under California EcoRestore in Suisun Marsh, Yolo Bypass, and Cache Slough are discussed separately under the No Action Alternative and cumulative effects in this EIS.
Suisun Marsh Habitat Management, Preservation, and Restoration Plan	CDFW, USFWS, Reclamation, and Suisun Marsh Charter Group	Present	The Suisun Marsh Charter Group, a collaboration of federal, state, and local agencies with primary responsibility in Suisun Marsh, completed the Suisun Marsh Habitat Management, Preservation, and Restoration Plan in 2014. The plan balances implementation of the CALFED Program, the Suisun Marsh Preservation Agreement, and other management and restoration programs within the Suisun Marsh in a manner that is based upon voluntary participation by private landowners and that responds to the concerns of stakeholders. Charter agencies include Reclamation, DWR, USFWS, Suisun Resource Conservation District, and other agencies. The Charter Group developed a regional plan that outlines the actions needed in Suisun Marsh to preserve and enhance managed seasonal wetlands, restore tidal marsh habitat, implement a comprehensive levee protection/improvement program, and protect ecosystem and drinking water quality. The proposed plan is consistent with the goals and objectives of the Bay-Delta Program and balances those goals and objectives with the Suisun Marsh Preservation Agreement and federal and state endangered species programs within the Suisun Marsh. The Suisun Marsh Plan also provides for simultaneous protections and enhancement of: 1) existing wildlife values in managed wetlands, 2) endangered species, 3) tidal marshes and other ecosystems, and 4) water quality, including, but not limited to, the maintenance and improvement of levees (California Department of Fish and Wildlife 2018b).
Lower Yolo Restoration Project	State and Federal Contractors Water Agency, DWR, and MOA Partners	Past	The project is located in the lower Yolo Bypass and is a tidal and seasonal salmon habitat project restoring tidal flux to about 1,100 acres of existing pasture land. The project site includes the Yolo Ranch, also known as McCormack Ranch, which was purchased in 2007 by the Westlands Water District (WWD). The goal of this project is to provide important new sources of food and shelter for a variety of native fish species at the appropriate scale in strategic locations in addition to ensuring continued or enhanced flood protection. The Lower Yolo wetlands restoration project is part of an adaptive management approach in the Delta to learn the relative benefits of different fish habitats, quantify the production and transport of food and understand how fish species take advantage of new habitat.

Project	Primary Agencies	Status	Description
South Delta Temporary Barriers Project	DWR	Present	The South Delta Temporary Barriers Project, initiated as a test project in 1991, was developed partially in response to a 1982 lawsuit filed by the South Delta Water Agency. The South Delta Temporary Barriers Project consists of four rock barriers across South Delta channels. The objectives of the project are to increase water levels, improve water circulation patterns and water quality in the southern Delta for local agricultural diversions, and improve operational flexibility of the State Water Project to help reduce fishery impacts and improve fishery conditions. Of the four rock barriers, the barrier at the head of Old River serves as a fish barrier (intended to primarily benefit migrating San Joaquin River Chinook salmon) and is installed and operated in April- May and again in September-November. The remaining three barriers (Old River at Tracy, Grant Line Canal, Middle River) serve as agricultural barriers (intended to primarily benefit agricultural water users in the south Delta) and are installed and operated between April 15 and November 30 of each season. In 2008, a court order designed to protect delta smelt prohibited the installation of the spring Head of Old River barrier pending fishery agency actions or further order of the court. The remaining three barriers serve as agricultural barriers and are installed between April 15 and September 30 of each season. An experimental underwater, non-physical barrier was installed in 2009. The channel will be open to navigation.
Contra Costa Canal Fish Screen Project	CCWD	Past	CCWD diversion of water from the Delta at Rock Slough serves as a major component of its water supply. Between 120,000 and 130,000 acre-feet of water per year is diverted by the canal for irrigation and municipal and industrial uses. The diversion at Rock Slough is one of the largest unscreened Delta sites. Project construction was completed in 2012 and installed fish screens at the Rock Slough diversion to minimize the entrainment losses of sensitive fish species (Bureau of Reclamation 2012). It includes flow control and transition structures necessary to reduce tidal influences and maintain flow rates. This helps the screen perform properly and allow fish to pass by it easily. Improvements at the diversion site also reduces potential predation on target species, fulfills legal requirements that were included in USFWS's 2008 Biological Opinion for the threatened Delta smelt, completes the mitigation for the Los Vaqueros Biological Opinion, and completes CVPIA requirements in Section 3406(b)(5) (Bureau of Reclamation n.d).
Construction of Folsom Lake Temperature Control Device	El Dorado Irrigation District (EID) and Reclamation	Present	The EID, in collaboration with Reclamation, proposes to construct facilities on the bank of Folsom Reservoir to withdraw water from the warm upper reaches of the lake while preserving the cold water pool at the bottom of the reservoir to protect downstream aquatic species. The facilities will include a large diameter concrete-lined vertical shaft and five lined horizontal adits extending from the shaft. This structure, known as a Temperature Control Device, will replace EID's five existing raw pump casings that currently extract water from Folsom Lake. The new facility will be sized to accommodate over twice the current capacity.
Red Bluff Diversion Dam Fish Passage Improvement Project	Reclamation and Tehama Colusa Canal Authority	Past	The project modified the Red Bluff Diversion Dam to reduce or minimize impacts on migration of anadromous fish and improve the reliability of agricultural water supply in the Tehama-Colusa and Corning Canal systems. The project included a new pumping plant and fish screen with a pumping capacity of 2,500 cubic feet per second (cfs). The initial installed pumping capacity is 2,000 cfs. There is no increase in water diversions above 2,500 cfs. The original diversion dam is currently in the decommissioning process. Construction commenced in spring 2010 and the facility

Project	Primary Agencies	Status	Description
			began full operation in the summer of 2012 (Tehama Colusa Canal Authority 2013).
Pulse Flows on Mokelumne	EBMUD	Present	Adaptive management pulse flows to promote healthy fish populations to attract salmon and steelhead into the Mokelumne River. EBMUD implements the necessary releases to provide fish attraction pulse flows to maximize returns to the Mokelumne River by reducing straying of Mokelumne-origin salmon to other systems
Upper Sacramento River Salmon Rearing Habitat Project	River Garden Farms	Past	Installed 25 juvenile salmon shelter structures, consisting of tree trunks and root wads bolted to limestone boulders installed in the Sacramento River near Redding.
Frank's Tract Project	DWR and Reclamation	Present	DWR and Reclamation are conducting studies to evaluate the feasibility of modifying the hydrodynamic conditions near Franks Tract to improve Delta water quality and enhance the aquatic ecosystem. The results of these studies have indicated that modifying the hydrodynamic conditions near Franks Tract may substantially reduce salinity in the Delta and protect fishery resources, including populations of delta smelt, a federally listed and State-listed species that is endemic to the Delta. As a result, DWR and Reclamation propose to implement the Franks Tract Project to improve water quality and fisheries conditions in the Delta. DWR and Reclamation are evaluating the installation of operable gates to control the flow of water at key locations (Threemile Slough and/or West False River) to reduce sea water intrusion, and to positively influence movement of fish species of concern to areas that provide favorable habitat conditions. The project gates would be operated seasonally and during certain hours of the day, depending on fisheries and tidal conditions. Boat passage facilities would be included to allow for passing of watercraft when the gates are in operation. The Franks Tract Project is consistent with ongoing planning efforts for the Delta to help balance competing uses and create a more sustainable system for the future. By protecting fish resources, this project also could improve operational reliability of the SWP and CVP because curtailments in water exports (pumping restrictions) are likely to be less frequent. Franks Tract was previously evaluated as part of DWR's Flooded Island Pre-Feasibility Study Report (California Department of Water Resources 2007).
Central Valley Joint Venture Program	Central Valley Joint Venture	Past	The Central Valley Joint Venture (CVJV) is a self-directed coalition consisting of 22 state and federal agencies and private conservation organizations. The partnership directs their efforts toward the common goal of providing for the habitat needs of migrating and resident birds in the Central Valley of California. The CVJV was established in 1988 as a regional partnership focused on the conservation of waterfowl and wetlands under the North American Waterfowl Management Plan. It has since broadened its focus to the conservation of habitats for other birds, consistent with major national and international bird conservation plans and the North American Bird Conservation Initiative. The CVJV provides guidance and facilitates grant funding to accomplish its habitat goals and objectives. Integrated bird conservation objectives for wetland habitats in the Central Valley identified in the 2006 Implementation Plan include restoration of 19,170 acres of seasonal wetland, enhancement of 2,118 acres of seasonal wetland annually, restoration of 1,208 acres of semipermanent wetland, and restoration of 1,500 acres of riparian habitat.

Project	Primary Agencies	Status	Description
Bradmoor Island Tidal Habitat Restoration Project	DWR	Present	Bradmoor Island is located in northeastern Suisun Marsh. It is surrounded by Nurse Slough to the West, Denverton Slough to the East, and Little Honker Bay to the South. Elevations at Bradmoor Island are mostly intertidal and associated subtidal with a wide tidal berm on the exterior of the managed wetlands and a hill in the center of the property. The property was purchased (744 acres) at Bradmoor Island for the purpose of tidal habitat restoration and will be restoring approximately 500 acres of managed wetland to tidal habitat. The project's restoration activities include water management, revegetation, and removal of levee segments to restore tidal inundation to the property and promote the establishment of emergent marsh vegetation.
Lookout Slough Tidal Restoration Project	DWR	Present	Lookout Slough is located in unincorporated Solano County, near the border of Yolo County. It is adjacent to additional tidal habitat restoration efforts being implemented by DWR, including Yolo Flyway Farms and Lower Yolo Ranch, to create a contiguous tidal wetland restoration complex spanning 16,000 acres in the Cache Slough region of the Sacramento-San Joaquin Delta. Once completed, Lookout Slough will be the Delta's largest single tidal habitat restoration project to date. The project will restore approximately 3,000 acres of tidal wetland in the Cache Slough region, creating habitat that is beneficial to native fish and wildlife. In addition to restoring tidal wetlands, the project will also create a new setback levee to provide residents in the surrounding area greater flood protection. The new setback levee will meet objectives of the Central Valley Flood Protection Plan and the tidal restoration will provide a healthy food web and other benefits to important listed species, including delta smelt, giant garter snake and other native salmonids. The restoration of tidal wetlands will work by allowing breaches in the existing Yolo Bypass West Levee along Shag Slough. The new setback levee will provide 100-year flood protection with additional height for climate change and sea level rise resiliency.
Anadromous Fish Screen Program	Reclamation and USFWS	Present	The primary objective of the Anadromous Fish Screen Program (AFSP) is to protect juvenile Chinook salmon (all runs), Steelhead, green and White Sturgeon, striped bass and American shad from entrainment at priority diversions throughout the Central Valley. Section 3406 (b)(21) of the Central Valley Project Improvement Act (CVPIA) requires the Secretary of the Interior to assist the State of California in developing and implementing measures to avoid losses of juvenile anadromous fish resulting from unscreened or inadequately screened diversions on the Sacramento and San Joaquin rivers, their tributaries, the Delta, and the Suisun Marsh. Additionally, all AFSP projects meet Goal 3 of the CALFED Ecosystem Restoration Program's (ERP) Draft Stage 1 Implementation Plan (U.S. Fish and Wildlife 2015).

Project	Primary Agencies	Status	Description
American Basin Fish Screen and Habitat Improvement Project	Reclamation, CDFW, and Natomas Central Mutual Water Company	Present	Reclamation and CDFW authorized and provided funds to the Natomas Central Mutual Water Company (Natomas Mutual) to construct and operate the American Basin Fish Screen and Habitat Improvement Project. The purpose of the project is: (1) to avoid or minimize potentially adverse effects to fish, particularly anadromous juvenile fish, due to water diversions from the Sacramento River and Natomas Cross Canal by Natomas Mutual and other small pumps operated by individual landowners for diversion of water into the Natomas Basin; (2) to ensure reliability of Natomas Mutual's water diversion and distribution facilities for beneficial uses of its water supply within its service area; and (3) to maintain important habitat within the Natomas Basin created by the operation of the Natomas Mutual's water distribution facilities. The project would result in modifications of Natomas Mutual's water diversion and distribution system adjacent to the Sacramento River and Natomas Cross Canal in Sacramento and Sutter counties, California. The modifications include the construction and operation of one or two positive-barrier fish screen diversion facilities; decommissioning and removing the Verona Diversion Dam and lift pumps; removing five pumping plants and one small private diversion; and modifying the distribution system. The project is anticipated to be implemented in three phases. A Record of Decision was signed on April 20, 2009 (Bureau of Reclamation 2009b).
San Joaquin River Restoration Program (SJRRP)[1]	Reclamation, USFWS, NMFS, DWR, and CDFW Wildlife	Present	SJRRP is a comprehensive long-term effort to restore flows to the San Joaquin River from Friant Dam to the confluence of Merced River and restore a self-sustaining Chinook salmon fishery in the river while reducing or avoiding adverse water supply impacts from restoration flows. The restoration program is the product of more than 18 years of litigation, which culminated in a Stipulation of Settlement on the lawsuit known as NRDC, et al., v. Kirk Rodgers, et al. The settling parties reached agreement on the terms and conditions of the settlement, which was subsequently approved by Federal Court on October 23, 2006. The settling parties include the Natural Resources Defense Council, Friant Water Users Authority, and the U.S. Departments of the Interior and Commerce. The settlement's two primary goals are to: (1) Restore and maintain fish populations in "good condition" in the main stem of the San Joaquin River below Friant Dam to the confluence of the Merced River, including naturally reproducing and self-sustaining populations of salmon and other fish, and (2) The settlement requires specific releases of water from Friant Dam to the confluence of the Merced River, which are designed primarily to meet the various life stage needs for spring- and fall-run Chinook salmon. The release schedule assumes continuation of the current average Friant Dam release of 116,741 acre-feet, with additional flow requirements depending on the year type. Interim flows began in October 2009, and full restoration flows would begin no later than January 2014. There are many physical improvements within and near the San Joaquin River undertaken to fully achieve the river restoration goal. The improvements occur in two separate phases that focus on a combination of water releases from Friant Dam, as well as structural and channel improvements. The project was

[1] San Joaquin River Restoration Program is included in the No Action Alternative which reflects the 2020 Record of Decision evaluation of habitat restoration in concert with operations. The San Joaquin River Restoration Program as considered under cumulative impacts in this document refers to the overarching program that continues to be implemented to achieve the primary goals identified.

Project	Primary Agencies	Status	Description
			authorized and funded with the passage of San Joaquin River Restoration Settlement Act, part of the Omnibus Public Land Management Act of 2009 (Public Law 111-11) (San Joaquin River Restoration Program 2019).
Lower American River Temperature Reduction Modeling Project (Formerly the Lake Natoma Temperature Curtains Pilot Project)	USFWS, Anadromous Fish Restoration Program; Reclamation; Sacramento Water Forum	Past	The objective of the Lower American River Temperature Reduction Modeling Project is to develop predictive tools that will: (1) Reduce uncertainties in the performance of identified temperature control actions that could be implemented to improve the management of cold water resources in the Folsom/Natoma Reservoir system and the lower American River: and(2) Be available for daily operations, planning, and salmon and steelhead habitat studies by other project operators and other stakeholders. The project adapted, calibrated, and verified existing thermodynamic and hydrologic mathematical models for application at Folsom Reservoir, Lake Natoma and the lower American River. The models were used to assess the effectiveness of the identified actions individually and in combination in order to support a recommendation as to the development and implementation of one or more actions for the purpose of reducing temperatures in the lower American River. The actions identified to improve transport of cold water through Lake Natoma and reduce the temperature of the lower American River included a Nimbus Dam curtain, a Lake Natoma plunge zone curtain, Nimbus powerplant debris wall removal, dredging Lake Natoma, and modifying Folsom Powerplant peak loading operation.
San Francisco Bay Delta Action Plan	Environmental Protection Agency	Present	In 2012, Environmental Protection Agency identified seven key activities to advance the protection and restoration of aquatic resources and ensure a reliable water supply in the San Francisco Bay Delta Estuary watershed. EPA's Action Plan included the following actions: (1) Strengthen estuarine habitat protection standards; (2) Advance regional water quality monitoring and assessment; (3) Accelerate water quality restoration through Total Maximum Daily Loads; (4) Strengthen selenium water quality criteria; (5) Prevent pesticide pollution; (6) Restore aquatic habitats while managing methylmercury; and (7) Support the Bay Delta Conservation Plan.
Long-term and short-term water transfers[2]	Reclamation and Various Parties	Past/ Present	These projects transfer water from willing buyers to willing sellers throughout the CVP service area including in-basin transfers and inter-basin transfers through the Delta. Transferred water can be for municipal, agricultural, or ecosystem enhancement purposes including use by wildlife refuges throughout the CVP service area.
Klamath Project	Reclamation	Present	The Bureau of Reclamation Klamath Project (Project) delivers water for irrigation and related purposes in southern Oregon and northern California. Reclamation operates the Project to allow for irrigation, flood control measures, and benefits to ESA-listed species based on real-time monitoring and forecasting information.

[2] Long-term and short-term water transfers are included in Alternatives 2 and 4 which includes the operational aspect of water transfer but does not include making the water available for transfer. Additionally, long-term and short-term water transfers are also included as a reasonably foreseeable action for the purposes of the cumulative impact analysis.

Project	Primary Agencies	Status	Description
Klamath River Renewal Project	Klamath River Renewal Corporation	Present	In 2024, removal will occur of the four hydroelectric dams in the upper Klamath River (JC Boyle, Copco No. 1 and No. 2, and Iron Gate dams). The project goal is restore the natural run of the river hydrology to the Klamath basin, with long-term beneficial impacts to water quality and anadromous fish habitat. The project will open over 400 stream miles of habitat, while reducing summer water temperatures, fish disease outbreaks, and toxic algal blooms.

Table Y-2. Cumulative Impact Screening Reasonably Foreseeable Future Actions.

Project	Primary Agencies	Status	Description
Voluntary Agreements outside Reclamation's Discretion	Sacramento River Settlement Contractors, Feather River Contractors, Yuba County Water Agency, American River Parties, Mokelumne Parties, Putah Creek Parties	RFFA	The Shasta Management Plan proposes to integrate Sacramento Basin flow and non-flow measures that are part of the Voluntary Agreements (VAs) to update and implement the Bay-Delta Water Quality Control Plan. The VAs offer a watershed-wide approach that includes system-wide and tributary new flows, habitat restoration, and a governance and science program that would be deployed adaptively. VAs are not intended to conflict with the State Water Board's Narrative Salmon Objective of the Narrative Viability Objective. The VA's identified in this reasonably foreseeable future action will be implemented under the discretion of the primary agencies listed VAs under Reclamation's discretion are included in the Proposed Action and will not be analyzed in cumulative impacts.
Sites Reservoir[3]	Reclamation and Sites Project Authority	RFFA	The Sites Reservoir Project involves the construction of off-stream surface storage north of the Delta for enhanced water management flexibility in the Sacramento Valley, increased California water supply reliability, and storage and operational benefits for programs to enhance water supply reliability, both locally and Statewide, benefit Delta water quality, and improve ecosystems. Secondary objectives for the project are to: 1) allow for flexible hydropower generation to support integration of renewable energy sources, 2) develop additional recreation opportunities, and 3) provide incremental flood damage reduction opportunities (Sites Project Authority and Reclamation 2017). A Draft Environmental Impact Report/Environmental Impact Statement (EIR/EIS) was released for public review on August 14, 2017. A revised Draft Environmental Impact Report/Supplemental Draft Environmental Impact Statement (REIR/SEIS) was released for public review in November 2021. A Final Environmental Impact Report/Final Environmental Impact Statement was released in November 2023.
EBMUD Warren Act Contract execution	Reclamation and EBMUD	RFFA	EBMUD is requesting to use FSC to transport water purchased from PCWAs Water Forum Agreement environmental water. This is under a proposed long term warren act contract for up to 47TAF. The long-term Warren Act Contract would be for a period of 25 years.
Delta Conveyance Project[4]	DWR	RFFA	A Delta conveyance project that diverts water from the Sacramento River and includes a tunnel, intake structures and new pumping plants is a reasonably foreseeable project. At the time the Notice of Intent was issued for this project, California WaterFix had been approved by the State of California. DWR has stopped work on California WaterFix, but a delta conveyance project remains reasonably foreseeable given that an April 2019 Executive Order regarding how California intended to secure clean and dependable water supplies included direction to plan and modernize conveyance through the Bay-Delta with a new single tunnel project.

[3]Sites Reservoir is included programmatically in Alternative 2. Any reference to Sites Reservoir in the cumulative impacts analysis is applicable to the No Action Alternative and Alternatives 1,3, and 4.
[4]Delta Conveyance Project is included programmatically in Alternative 2. Any reference to Delta Conveyance Project in the cumulative impacts analysis is applicable to the No Action Alternative and Alternatives 1,3, and 4.

Project	Primary Agencies	Status	Description
B.F. Sisk Dam Raise and Reservoir Expansion Project5	Reclamation, DWR, and San Luis and Delta Mendota Water Authority	RFFA	Reclamation and DWR jointly manage San Luis Reservoir for the purpose of storing and reregulating CVP and SWP water from the Sacramento-San Joaquin Delta. San Luis Reservoir is an off-stream water storage facility that stores water for both projects. This project would add 10 feet to the crest of B.F. Sisk Dam in addition to the crest raise action currently being implemented under the Safety of Dams proposed action. The 10-foot embankment raise would support an increase in reservoir storage capacity of 130 TAF. The increased storage would be used to store CVP Project water, carried-over water, non-Project water, and Incremental Level 4 refuge water supplies. Increased capacity within San Luis Reservoir would only be used to help meet existing demands and would not serve any new demands in the South-of-Delta CVP and SWP service areas. The reservoir additional capacity would be filled with Delta water during excess conditions; thus, additional impacts on Delta aquatic species (e.g., juvenile salmonids and delta smelt) could result from an increase in Delta exports. The B.F. Sisk Dam Raise and Reservoir Expansion Final Supplemental EIS/EIR was released in December 2020 and the Record of Decision was published in October 2023.
Bay-Delta Water Quality Control Plan Update	State Water Resources Control Board (SWRCB)	RFFA	The SWRCB is updating the 2006 Bay-Delta Water Quality Control Plan (WQCP) in two phases (State Water Resources Control Board 2018): Phase I: The first Plan amendment is focused on San Joaquin River flows and southern Sacramento-San Joaquin Delta (Delta) salinity and modifies water quality objectives (i.e., establishes minimum flows) on the Lower San Joaquin River and Stanislaus, Tuolumne, and Merced rivers to protect the beneficial use of fish and wildlife and modifies the water quality objectives in the southern Delta to protect the beneficial use of agriculture. The proposed final amendments to the Bay-Delta Plan and the Final Supplemental Environmental Document for Phase I was released in July 2018, with some additional minor changes released in August 2018. Phase II: Phase II is focused on the Sacramento River and its tributaries, Delta eastside tributaries (including the Calaveras, Cosumnes, and Mokelumne Rivers), Delta outflows, and interior Delta flows.
Los Vaqueros Reservoir Expansion Phase 2	Reclamation, Contra Costa Water District (CCWD), DWR	RFFA	Los Vaqueros Reservoir is an off-stream reservoir in the Kellogg Creek watershed to the west of the Delta. The Los Vaqueros Reservoir initial construction was completed in 1997 as a 100,000 AF off-stream storage reservoir owned and operated by CCWD to improve delivered water quality and emergency storage reliability to their customers. In 2012, the Los Vaqueros Reservoir was expanded to a total storage capacity of 160,000 AF (Phase 1) to provide additional water quality and supply reliability benefits, and to adjust the timing of its Delta water diversions to accommodate the life cycles of Delta aquatic species, thus reducing species impact and providing a net benefit to the Delta environment. As part of the Storage Investigation Program described in the CALFED Bay Delta Program ROD, additional expansion up to 275,000 AF (Phase 2) is being evaluated by CCWD, DWR, and Reclamation. The alternatives considered in the evaluation also consider methods to convey water from Los Vaqueros Reservoir to the South Bay Aqueduct to provide water to Zone 7 Water Agency, Alameda County Water District, and Santa Clara

[5] B.F. Sisk Dam Raise and Reservoir Expansion Construction Project including the expansion of the reservoir and Safety of Dams components is being considered under cumulative impacts. The operational components that will result from implementation of the construction project are not included in the No Action Alternative but are included in Alternatives 1, 2, 3 and 4.

Project	Primary Agencies	Status	Description
			Valley Water District. The Final EIS/R was released by Reclamation and CCWD on March 15, 2010. A supplemental EIS/R was released by Reclamation and CCWD in 2020.
Pacheco Reservoir/San Luis Low Point Improvement Project	Reclamation, Santa Clara Valley Water District, San Luis & Delta-Mendota Water Authority	RFFA	Reclamation and DWR jointly manage San Luis Reservoir for the purpose of storing and reregulating CVP and SWP water from the Sacramento-San Joaquin Delta. San Luis Reservoir is an offstream water storage facility that stores water for both projects. The San Luis Low Point Improvement Project addresses water supply reliability issues in San Luis Reservoir that result when water levels fall below 369 feet above sea level (corresponding to a reservoir capacity of 300,000 acre feet) and create water quality degradation that has the potential to interrupt a portion of the San Felipe Division's water supply. The term "low point" refers to a range of minimum pool elevations in San Luis Reservoir. During the late summer months if the reservoir elevation drops below 369 feet above sea level, the conditions in San Luis Reservoir promote the growth of algae in the reservoir. The water quality during the algal blooms is not suitable for agricultural water users with drip irrigation systems in San Benito County or municipal and industrial water users relying on existing water treatment facilities in Santa Clara County. The low point issue increases progressively as the reservoir continues to drop below elevation 369 feet. In July 2019, Reclamation and Santa Clara Valley Water District (Valley Water) released a joint EIS/EIR that evaluated five action alternatives including the Pacheco Reservoir Expansion Alternative identified as the Proposed Project for CEQA purposes. The Pacheco Reservoir Expansion Alternative includes the construction of a new dam and reservoir on Pacheco Creek 0.5 mile upstream from the existing North Fork Dam and would inundate most of the existing Pacheco Reservoir. The proposed total storage for the new reservoir is 141,600 acre-feet (AF), with an active storage of 140,800 AF. Water would be collected in the new reservoir during the winter months from runoff from the local watershed area, and diversion of supplies conveyed from San Luis Reservoir through the Pacheco Conduit. The new reservoir would be operated by Valley Water to both improve habitat conditions for steelhead in Pacheco Creek and improve water supply reliability to Valley Water, including during drought periods and emergencies. In addition, Valley Water will transfer 2,000 AF of its CVP water contract supplies (in below normal water years), directly or through transfer and exchanges, in perpetuity to Reclamation and U.S. Fish and Wildlife Services' Refuge Water Supply Program (RWSP), for use in the Incremental Level 4 water supply pool for wildlife refuges. The comprehensive plan would involve increasing groundwater recharge and recovery capacity, implementing desalination measures, re-operating Santa Clara Valley Water District's raw- and treated- water systems, and implementing institutional measures. If Pacheco Reservoir were to be enlarged, the reservoir would be filled with Delta water; thus, additional impacts on Delta aquatic species (e.g., juvenile salmonids and delta smelt) could result from an increase in Delta exports.

Project	Primary Agencies	Status	Description
Long-term and short-term water transfers6	Reclamation and Various Parties	RFFA	These projects provide water to municipal, agricultural, and ecosystem water users, including wildlife refuges including programs that transfer water throughout the CVP service area.
Cache Slough Area Restoration	DWR and CDFW	RFFA	The Cache Slough Complex is located in the northern Delta where Cache Slough and the southern Yolo Bypass meet. It currently includes Liberty Island, Little Holland Tract, Prospect Island, Little Egbert Tract and the surrounding waterways. Levee height on these tracts is restricted and designed to allow overtopping in large flow events to convey water from the upper Yolo Bypass. Since 1983 and 1998 respectively, Little Holland Tract and Liberty Island have remained breached. Restoration is occurring naturally on the islands. Restoration in the Cache Slough Complex was identified as an Interim Delta Action by Governor Schwarzenegger in July 2007 and is being evaluated through the Bay Delta Conservation Plan process. Other planning processes such as Delta Vision and the Delta Risk Management Strategy have also identified the Cache Slough Area as a potential priority restoration site. The Cache Slough Complex has potential for restoration success because of its relatively high tidal range, historic dendritic channel network, minimal subsidence, and remnant riparian and vernal pool habitat. Restoration efforts would support native species, including delta smelt, longfin smelt, Sacramento splittail, and Chinook salmon, by creating or enhancing natural habitats and improving the food web fish require. Surrounding lands that are at elevations that would function as floodplain or marsh if not separated by levees could also be included in the Cache Slough Area. This broader area includes roughly 45,000 acres of existing and potential open water, marsh, floodplain and riparian habitat. The goals of restoration in the Cache Slough Complex are to: 1) re-establish natural ecological processes and habitats to benefit native species, 2) contribute to scientific understanding of restoration ecology, and 3) maintain or improve flood safety. Three restoration actions are currently contemplated in the Cache Slough Complex, including restoration actions at Calhoun Cut, Little Holland Tract, and Prospect Island (which is included as a completed past action). Calhoun Cut - Calhoun Cut is a manmade, excavated, east-west running channel that was originally created to improve navigation in the area. The channel initiates at the confluence of Lindsey and Barker sloughs and runs west in a straight line until it intersects the terminal portion of Lindsey Slough. Calhoun Cut adversely influences tidal action in the historic arms of Lindsey Slough. Restoration of tidal action would entail removal of features that restrict flow through the slough, excavating starter channels to initiate channel evolution and promote tidal flow, and potentially blocking Calhoun Cut to restore the tidal channel system in Lindsey Slough.

[6] Long-term and short-term water transfers are included in Alternatives 2 and 4. Additionally, long-term and short-term water transfers are also included as past and present actions for the purposes of the cumulative impact analysis.

Project	Primary Agencies	Status	Description
			Little Holland Tract - Little Holland Tract encompasses about 1,640 acres within the Cache Slough Complex. Similar to Prospect Island, Little Holland Tract was acquired by the federal government (USACE) in anticipation of transferring ownership to the U.S. Fish and Wildlife Service as a component of a North Delta National Wildlife Refuge. The tract has been subject to tidal influence since 1983, when levees separating Little Holland Tract and the Toe Drain failed. Since that time, the site has naturally returned to a mixture of tidally influenced emergent wetlands, mudflats, and riparian habitat. Restoration actions would complement what has occurred naturally by increasing wetland values at the site.
Prospect Island Tidal Habitat Restoration Project	DWR	RFFA	The proposed project would restore tidal action to the interior of Prospect Island, partially fulfilling the 8,000-acre tidal habitat restoration obligations that were contained within the 2009 USFWS Delta Smelt Biological Opinion and the 2009 NMFS Salmonid Biological Opinion for long-term coordinated operations of the SWP and CVP. The project is expected to result in a suite of overarching long-term ecosystem benefits, including enhancement of primary productivity and food availability for fisheries in Delta; an increase in the quantity and quality of salmonid rearing habitat and habitat for other listed species; enhancement of water quality, recreation, and carbon sequestration in tidal marshes; promotion of habitat resiliency; and promotion of habitat conditions that support native species. Current design of the project includes breaching the external Miner Slough levee and removing a portion of the internal cross levee to open the site to daily tidal inundation. This project has been identified as one of the projects that would be implemented under California EcoRestore. Construction is targeted for 2024 or later.
Chipps Island Tidal Habitat Restoration Project	DWR	RFFA	The goal of the Project is to benefit native fish species by restoring unrestricted tidal connectivity to the interior of Chipps Island and to create open water and tidal wetland habitats on the site. The Project includes the following objectives: Enhance habitat appropriate for rearing salmonids, Delta Smelt, Longfin Smelt, and other native fish species Enhance available productivity for native fish within and adjacent to the restoration site Provide connectivity to the marsh plain Avoid promoting conditions, such as invasive species infestations, that are in conflict with the above project objectives.

Y.3 Cumulative Impacts

The following resource discussions provide a summary of the expected cumulative impacts that would occur under the No Action Alternative or Alternatives 1, 2, 3, or 4. The summaries are based on the foundational information contained in each of the resource specific appendices which include detailed background information and the evaluation of alternatives for each resource topic (Appendices G through X). Reviewers of this EIS are directed to these appendices for additional information supporting the cumulative impact discussions below. The projects included in Appendix Y reflect past, present, and reasonably foreseeable projects of similar type, geographic location, and spatial occurrence as the alternatives. These projects include actions to develop water storage capacity, water conveyance infrastructure, water recycling capacity, the reoperation of existing water supply infrastructure, including surface water reservoirs and conveyance infrastructure, and habitat restoration actions.

Y.2.2 Water Quality

Past, present, and reasonably foreseeable projects may have cumulative effects on water quality, to the extent that they could affect reservoirs that store CVP water, tributaries, and agricultural land.

Y.2.2.1 No Action Alternative

The No Action Alternative would continue with the current operation of the CVP and may result in changes to water quality of reservoirs that store CVP water, tributaries, and agricultural land. These changes may potentially contribute to the cumulative impacts and were described and considered in the 2020 Record of Decision.

Y.2.2.2 Alternatives 1, 2, 3, and 4

Alternative 1 would negatively affect water quality in Clear Creek, the American River, and the Stanislaus River by reducing flows in most water year types. This flow reduction could result in less dilution, causing increased constituents of concern concentrations within Clear Creek, the American River, and the Stanislaus River compared with current conditions. Flow reductions could lead to an increase in the frequency of exceedances of water quality standards and negatively impact assigned beneficial uses. Alternative 1's contribution to water quality degradation would be anticipated to be minimal. When combined with water quality impacts from past, present, and reasonably foreseeable projects, Alternative 1 could contribute to the cumulative impacts of water quality. Alternatives 2, 3, and 4 would have similar or less impact compared with Alternative 1. Alternatives 2 and 4 would negatively affect water quality in the American River and Alternative 3 would negatively affect water quality in the Sacramento and Stanislaus Rivers. Alternatives 2, 3, and 4 would not generate substantial contributions to cumulative water quality conditions in the Trinity River, Feather River, and San Joaquin River areas. When considered in combination with past, present and reasonably foreseeable projects, Alternatives 2, 3, and 4 are not expected to contribute to the cumulative impacts on water quality.

Specific to the CVP and SWP service area, all action alternatives would result in high chloride concentrations during some months. However, the CVP/SWP would continue operation, in real-

time, to meet the Bay-Delta Water Quality Control Plan (WQCP) objectives for chloride, which aim to protect municipal and industrial beneficial uses. Thus, all action alternatives would not generate substantial contributions to cumulative water quality conditions as it pertains to chloride concentrations in the CVP and SWP service area.

Specific to the Bay-Delta region, the action alternatives would have negligible, if any, effects on selenium, organic carbon, trace metals, nutrients, dissolved oxygen, legacy contaminants (i.e., dioxin and furan compounds, PCBs, and PAHs), or pesticides. Thus, the action alternatives would not have an effect on the future cumulative conditions of these constituents and constituent groups. However, the action alternatives could have some effect on EC, chloride, bromide, methylmercury, selenium, organic carbon, and CHABs in the Delta, Suisun Marsh, Suisun Bay, and/or San Francisco Bay.

Y.2.3 Water Supply

Past, present, and reasonably foreseeable projects may have cumulative effects on water supply to the extent that they could affect reservoirs that store CVP water, tributaries, and agricultural land.

Y.2.3.1 No Action Alternative

The No Action Alternative would continue with current operations of the CVP and may result in changes to water supply of reservoir that store CVP water, tributaries, and agricultural lands over time. These changes may potentially contribute to the cumulative impact and were described and considered in the 2020 Record of Decision.

Y.2.3.2 Alternatives 1, 2, 3, and 4

Alternative 1 would improve water supply deliveries to some CVP and SWP contractors and for other water users result in reductions below 5% which would be similar to conditions anticipated under the No Action Alternative given evaluation approaches and assumptions relied on in CalSim 3 model to estimate changes across CVP and SWP. Alternatives 2 and 4 would have similar impacts to Alternative 1 and would not generate substantial contributions to cumulative water supply conditions. Alternative 3 would be similar to Alternatives 1, 2, and 4, resulting in reductions in average water supply deliveries to some CVP and SWP contractors. The reductions in surface water deliveries for many water users under Alternative 3 would be larger than the reductions anticipated under other alternatives. For Alternative 3, the reductions in average deliveries in dry and critical water year types could, for some contractor delivery types, approach 80% when compared to the No Action Alternative.

Alternative 1, 2, and 4's contribution to these conditions would be expected to be minimal. In the case of projects identified in Appendix Y that are anticipated to potentially generate temporary reductions in water supply deliveries or reduce surplus water supply availability to neighboring water users, Alternative 1, 2, and 4's improvement to water supply deliveries for many water users would help to reduce the severity of any potential cumulative impact. In the case of water users to whom Alternatives 1, 2, and 4 are not forecasted to improve deliveries, potential changes in water supply deliveries would not contribute to any cumulative water supply impacts given these alternatives' similarity to the No Action Alternative. Given Alternative 3's larger reductions in CVP and SWP deliveries, this alternative could contribute to the potential

cumulative conditions described above in the event of a dry or critical water year type occurrence during a period when a project identified in Appendix Y was generating temporary reductions in water supply deliveries or reductions of surplus water supply availability to neighboring water users. Alternative 3 could in that situation amplify its contribution to the cumulative condition.

Y.2.4 Groundwater

Past, present, and reasonably foreseeable projects may have cumulative effects on groundwater resources to the extent that they could change groundwater pumping, groundwater-surface water interaction, groundwater elevation, land subsidence, and groundwater quality.

Y.2.4.1 No Action Alternative

The No Action Alternative would continue with current operations of the CVP and is not expected to result in changes to groundwater pumping, groundwater-surface water interaction, groundwater elevation, land subsidence, and groundwater quality. Therefore, cumulative impacts to groundwater resources are not expected under the No Action Alternative.

Y.2.4.2 Alternatives 1, 2, 3, and 4

Changes in Groundwater Pumping and Groundwater Elevation

Alternatives 1, 2 and 4 would generally result in an increase in surface water supplies and a corresponding reduction in groundwater pumping. Because of this potentially beneficial effect on groundwater by reducing pumping, Alternative 1, 2 and 4 would not contribute to cumulative impacts on groundwater resources. Alternative 3 would generally result in a decrease in surface water supplies and a corresponding estimated increase in groundwater pumping of 4.9%. Because of the increase in groundwater pumping when compared to the No Action Alternative, Alternative 3 would be anticipated to contribute minimally to cumulative impacts on groundwater by increasing pumping.

Potential Changes in Groundwater-Surface Water Interaction

Alternatives 1, 2, and 4 would generally change the amount of groundwater that discharges annually to surface water by less than 1.2% on average due to a change in surface water supplies available to CVP and SWP contractors. Because this change is considered small, Alternative 1, 2, and 4's contribution to cumulative changes in groundwater elevation is expected to be minimal. Alternative 3 would have similar effects as Alternative 1 however the average change would be an increase in the loss from surface water of approximately 4.7%. Similar to Alternatives 1, 2, and 4, this change is considered small and may result in minimal contributions to cumulative impacts on groundwater-surface water interactions.

Potential Changes in Land Subsidence and Groundwater Quality

Alternatives 1, 2 and 4 would generally change the groundwater pumping conditions; however, the change is expected to be minimal and therefore, the alternative's contribution to cumulative changes in groundwater elevation is also expected to be minimal. Without a substantial change to groundwater elevations, there would also not be a substantial change to land subsidence or groundwater quality. Alternative 3 has the potential to increase groundwater pumping by approximately 4.9%. An increase in pumping, if occurring in areas susceptible to subsidence,

may result in additional subsidence or change groundwater flow patterns and change the movement of constituents in groundwater. Average groundwater levels are simulated to decrease up to approximately 160 feet for Alternative 3 in some water year types compared to the No Action Alternative. The largest decreases in groundwater levels are simulated to occur along the western portion of the Central Valley in the Sacramento Valley and in the San Joaquin Valley. Additional areas of decreased groundwater levels appear north of Modesto and south of Fresno. Given the relatively large decreases in groundwater elevations and the fact that portions of these areas are known to have historic subsidence, there is potential for additional subsidence. The location and amount of subsidence is highly dependent on the local soil conditions and historical low groundwater levels in the area. Alternative 3 may contribute to cumulative impacts resulting in subsidence or changes in groundwater quality.

Y.2.5 Indian Trust Assets

Past, present, and reasonably foreseeable projects may have cumulative effects on Indian Trust Assets to the extent that they could affect erosion or degradation of land or sites of religious or cultural importance to federally recognized Tribes, quality of water used by a federally recognized Tribe, or salmon populations.

Y.2.5.1 No Action Alternative

The No Action Alternative would continue with the current operation of the CVP and may result in changes to erosion or degradation of land or sites of religious or cultural importance to federally recognized Tribes, quality of water used by a federally recognized Tribe, and salmonid populations. These changes may potentially contribute to cumulative impacts and were described and considered in the 2020 Record of Decision.

Y.2.5.2 Alternatives 1, 2, 3, and 4

There are no ITAs in the rivers in the Central Valley that would be affected by the project. Additionally, under Alternatives 1, 2, 3, and 4, flow changes and water fluctuations would not be of a magnitude that would be expected to result in changes to erosion or degradation of land or sites of religious or cultural importance to federally recognized Tribes, quality of water used by a federally recognized Tribes, and salmonid populations in the Trinity River. Therefore, no cumulative impacts to Indian Trust Assets are expected. Any cumulative impacts resulting from the No Action Alternative and the action alternatives on salmonids are summarized below and discussed in detail in Appendix O.

Y.2.6 Cultural Resources

Past, present, and reasonably foreseeable projects may have cumulative effects on Cultural Resources to the extent that they could affect historic properties resulting from ground-disturbing activities.

Y.2.6.1 No Action Alternative

The No Action Alternative would continue with the current operation of the CVP and is not expected to affect historic properties from ground disturbing activities related to habitat restoration activities which were described and considered in the 2020 Record of Decision.

Y.2.6.2 Alternatives 1, 2, 3, and 4

Under Alternatives 1, 2, 3, and 4 there are no activities which include ground disturbing activities and/or alteration to a historic property and the range of flow fluctuations are within the range of flow fluctuations associated with the No Action Alternative. Therefore, as the action alternatives are not anticipated to effect historic properties, no cumulative impacts to cultural resources are expected.

Y.2.7 Air Quality

Past, present, and reasonably foreseeable projects may have cumulative effects on air quality to the extent that they could affect fossil-fueled powerplant emissions from hydropower generation and groundwater pumping.

Y.2.7.1 No Action Alternative

The No Action Alternative would continue with current operations of the CVP and may result in changes to air quality emissions from fossil-fueled powerplant emissions from hydropower generation and groundwater pumping. These changes may contribute to the cumulative impacts and were described and considered in the 2020 Record of Decision

Y.2.7.2 Alternatives 1, 2, 3, and 4

Alternative 1, 2, and 4 would increase emissions of CO, NOx, PM10, PM2.5, ROG, and SO2 compared to the No Action Alternative. When combined with emissions from past, present, and reasonably foreseeable projects, Alternative 1, 2 and 4 may contribute to cumulative impacts on air quality but are not expected to result in pollutant concentrations that would lead to new exceedances of the CAAQS or NAAQS or to worsen existing exceedances. Alternative 3 would decrease air quality emissions compared to the No Action Alternative. When combined with past, present, and reasonably foreseeable project. Alternative 3 is not expected to contribute to the cumulative impact of air quality emissions result in pollutant concentrations that would lead to new exceedances of the CAAQS or NAAQS or to worsen existing exceedances.

Y.2.8 Greenhouse Gas Emissions

Past, present, and reasonably foreseeable projects may have cumulative impacts on GHG emissions to the extent that they could affect fossil-fueled powerplant emissions from hydropower generation and groundwater pumping.

Y.2.8.1 No Action Alternative

The No Action Alternative would continue with current operations of the CVP and may result in changes to GHG emissions from fossil-fueled powerplant emissions from hydropower generation and groundwater pumping. These changes may contribute to the cumulative impacts and were described and considered in the 2020 Record of Decision.

Y.2.8.2 Alternatives 1, 2, 3, and 4

Alternative 1, 2, and 4 would increase GHG emissions compared to the No Action Alternative. Consequently, when combined with past, present, and reasonably foreseeable projects, Alternative 1, 2, and 4 could contribute incrementally to cumulative impacts on global climate change. Alternative 3 would decrease GHG emissions compared to the No Action Alternative.

When combined with past, present, and reasonably foreseeable project, Alternative 3 is not expected to contribute cumulative impacts on global climate change.

Y.2.9 Visual Resources

Past, present, and reasonably foreseeable projects may have cumulative impacts on visual resources to the extent that they could affect potential changes in visual resources at reservoirs that store CVP water, tributaries, and in irrigated agricultural land vistas.

Y.2.9.1 No Action Alternative

The No Action Alternative would continue with current operations of the CVP and is expected to result in potential changes in visual resources at reservoirs that store CVP water, tributaries, and in irrigated agricultural land vistas. These changes may potentially contribute to cumulative impacts and were described and considered in the 2020 Record of Decision.

Y.2.9.2 Alternatives 1, 2, 3, and 4

Potential changes in visual resources at reservoirs that store CVP water and tributaries that flow to and from reservoirs that store CVP water.

Alternatives 1, 2, 3, or 4, would have little to no adverse effects on visual resources and visual quality at locations including the Sacramento River, San Luis Reservoir, and Folsom Reservoir. These small changes to visual resources and visual quality are anticipated to be minor when considered along with the contribution to cumulative impacts made by past, present, and reasonably foreseeable projects.

Potential Changes in Vistas at Irrigated Agricultural Lands

Alternative 1 would increase irrigated acreage and therefore would not be expected to contribute to cumulative visual impacts related to vistas at irrigated agricultural lands.

For the phases of Alternative 2 without TUCPs, there would be decreases in irrigated acreage, with reductions of 4,640 to 7,038 acres in the Sacramento River region and 14,994 to 47,769 acres in the San Joaquin River region for the phases of the alternative with VAs. With TUCP Without VA, there would be a very slight decrease in irrigated acreage of 650 acres in the Sacramento River region and an increase in irrigated acreage of 4,701 acres in the San Joaquin River region when compared with the No Action Alternative under the long-term average year condition. Under dry and critical conditions, across all phases there would be decreases in irrigated acreage compared with the No Action Alternative, with decreases from 4,320 acres to 5,589 acres for the Sacramento River region and 22,585 acres to 26,171 acres for phases without VAs and 41,527 acres to 47,500 acres for phases with VAs. In both the long-term average and dry and critical year conditions, overall crop acreage would primarily decrease in the San Joaquin River and Sacramento River regions under Alternative 2 when compared with the No Action Alternative.

Under Alternative 3, there would be approximately 22,818 fewer acres of irrigated farmland in the Sacramento River region and approximately 303,764 fewer acres in the San Joaquin River region compared with the No Action Alternative in the long-term average year condition. In the dry and critical year condition, there would be a slightly smaller decrease than the long-term

average year condition. The Sacramento River region would have approximately 21,123 fewer irrigated acres, and the San Joaquin River region would have 210,633 fewer irrigated acres compared with the No Action Alternative.

Under Alternative 4, there would be approximately 1,316 more acres of irrigated farmland in the Sacramento River region and approximately 14,094 more acres in the San Joaquin River region under Alternative 4 compared with the No Action Alternative in the long-term average year condition. However, in the dry and critical year conditions there would be approximately 814 fewer acres of irrigated farmland in the Sacramento River region and approximately 10,343 fewer acres in the San Joaquin River region compared with the No Action Alternative. Therefore, Alternative 2 under several phases, Alternative 3, and Alternative 4 would contribute to the predicted increase in fallowed agricultural land and potentially the visual changes that tend to go with it.

Y.2.10 Aquatic Resources

Past, present, and reasonably foreseeable projects may have cumulative impacts on aquatic resources to the extent that they could affect potential changes in habitat, water storage capacity, water conveyance infrastructure, water recycling capacity, and the reoperation of existing water supply infrastructure.

Y.2.10.1 No Action Alternative

The No Action Alternative would continue with current operations of the CVP. Changes in CVP and SWP operations under the No Action Alternative could change the water temperature and flow that aquatic and fisheries resource depend on. These changes may potentially contribute to cumulative impacts and were described and considered in the 2020 Record of Decision.

Sacramento River

The No Action Alternative is expected to result in infrequent exposure of eggs and alevins to injuriously warm water temperatures during summer and fall, dropping water levels that lead to redd dewatering during the fall, or inadequate pulse flows for rearing and emigrating juveniles in the spring. These changes are expected to contribute to cumulative effects on winter-run Chinook salmon and spring-run Chinook salmon. Steelhead, fall-run Chinook salmon, and late fall–run Chinook salmon are less affected by the management tradeoffs under the No Action Alternative because they spawn when river water temperatures are cooler. Under the No Action Alternative there is a mixture of potential negative and positive changes. The No Action Alternative is not expected to result in population level effects to green sturgeon and, hence, will not contribute to cumulative effects on green sturgeon. The No Action Alternative is not expected to result in cumulative impacts on other focal fish species (i.e., Sacramento splittail, hardhead, Sacramento hitch, Pacific lamprey, western river lamprey, striped bass, American shad, threadfin shad, largemouth bass, smallmouth bass, and spotted bass).

Clear Creek

The No Action Alternative is expected to have effects on anadromous salmonids in Clear Creek. However, these effects are not expected to result in adverse population-level impacts. Thus, the No Action Alternative is not expected to contribute to cumulative impacts on Clear Creek

anadromous salmonids. The No Action Alternative is not expected to result in cumulative impacts on other focal fish species (i.e., hardhead and Pacific lamprey).

Lower American River

The No Action Alternative is expected to have effects on anadromous salmonids in the lower American River. The No Action Alternative may result in adverse flow effects on steelhead fry/juvenile rearing habitat. Thus, the No Action Alternative may contribute to cumulative effects on steelhead in the lower American River. The No Action Alternative is not expected to result in cumulative impacts on other focal fish species (i.e., white sturgeon, Sacramento splittail, hardhead, Pacific lamprey, western river lamprey, striped bass, American shad, threadfin shad, largemouth bass, smallmouth bass, and spotted bass).

Bay-Delta

The No Action Alternative would contribute to cumulative effects on Delta smelt and longfin smelt from seasonal operations and Delta smelt habitat operations (e.g., food availability, habitat extent) and OMR management (i.e., south Delta entrainment risk). Also, there may be offsetting, potential positive effects on Delta smelt under the No Action Alternative from food subsidies (studies related to Sacramento Deepwater Ship Channel, North Delta/Colusa Basin Drain, and Suisun Marsh RRDS) and reintroduction of Delta smelt by the Fish Conservation and Culture Laboratory and the Delta Fish Species Conservation Hatchery. Except for Delta smelt supplementation, these offsetting effects under the No Action Alternative also would benefit longfin smelt. The No Action Alternative would still be expected to contribute to cumulative effects, both positive and negative, on Delta smelt and longfin smelt.

The No Action Alternative would contribute to cumulative effects on anadromous salmonids from seasonal operations, OMR management (south Delta entrainment risk), and Delta Cross Channel operations. However, there may be offsetting, potential positive effects under the No Action for winter-run Chinook salmon from improvements at the Tracy and Skinner fish facilities, real-time OMR restrictions and performance objectives, real-time decision-making and salvage thresholds.

The No Action Alternative may result in cumulative effects to green and white sturgeon from seasonal operations, OMR management (south Delta entrainment risk), and Delta Cross Channel operations. There may be offsetting, potential positive effects for green and white sturgeon from improvements at the Tracy and Skinner fish facilities, real-time OMR restrictions and performance objectives, real-time decision-making and salvage thresholds. Nevertheless, the No Action Alternative may still contribute to cumulative effects on green and white sturgeon in the Delta. The No Action Alternative is not expected to result in cumulative impacts on other focal fish species (i.e., Sacramento hitch, Sacramento splittail, hardhead, Pacific lamprey, western river lamprey, striped bass, American shad, threadfin shad, largemouth bass, smallmouth bass, spotted bass, and starry flounder).

San Joaquin River

The No Action Alternative does not include actions that target the San Joaquin River. Reclamation will continue to operate the San Joaquin River in accordance with the SJRRP,

which is an independent action. Thus, the No Action Alternative is not expected to contribute to cumulative impacts on San Joaquin River aquatic resources.

Stanislaus River

The No Action Alternative is expected to result in adverse and beneficial flow and temperature changes for both steelhead and fall-run Chinook salmon. However, these effects are not expected to reach population level impacts. Thus, the No Action Alternative is not expected to contribute to cumulative effects of anadromous salmonids in the Stanislaus River. The No Action Alternative is not expected to result in cumulative impacts on other focal fish species (i.e., hardhead, Pacific lamprey, western river lamprey, striped bass, American shad, threadfin shad, largemouth bass, smallmouth bass, and spotted bass.)

Trinity River

The No Action Alternative will continue to implement the 2000 Trinity ROD. Although the No Action Alternative may result in negative and beneficial changes to parameters (e.g., flows, water temperatures) important for anadromous species, green and white sturgeon, and focal species (i.e. Pacific lamprey and American shad) in the Trinity River, population level adverse impacts are not identified under the No Action Alternative. Thus, the No Action Alternative is not expected to contribute to cumulative impacts on anadromous salmonids, green and white sturgeon, and other focal species in the Trinity River.

Nearshore Pacific Ocean and California Coast

In general, the analysis of the No Action Alternative noted that potential effects on Chinook Salmon prey for Southern Resident Killer Whale (Southern Residents) may be limited because of negligible differences between adult Chinook salmon abundance and biomass for adult Chinook salmon that occur in the Pacific Ocean that originate from the Central Valley or Trinity River. This coupled with the relatively high representation in the stocks by hatchery-origin fish, many of which are released downstream of the Delta, mean there would be limited impacts of the No Action Alternative. Thus, the No Action Alternative is not expected to contribute to cumulative impacts on Southern Resident Killer Whales.

Y.2.10.2 Alternatives 1, 2, 3, and 4

Sacramento River

Past, present and reasonably foreseeable projects include components that affect the timing and magnitude of flow releases and seasonal water temperatures and components that improve habitat of rearing and migrating salmonids in the Sacramento River. Flow and water temperature effects of completed projects are generally accounted for in the operational modeling of the No Action Alternative and Alternatives 1-4. Of the water supply and water quality projects that have not been completed, the most likely to have cumulative effects related to the flow and water temperature effects of Alternative 2 is the Bay-Delta Water Quality Control Plan Update.

The Bay-Delta Water Quality Control Plan Update has the potential to modify Sacramento River flow. Potential effects from the Bay-Delta Water Quality Control Plan Update would result in increased flows in spring and decreased flows in summer, with subsequent decreased water temperature in spring and increased water temperature in summer. This increase in flows may

have a cumulative beneficial flow effect on salmonids, particularly juveniles, which are migrating downstream toward the Delta.

Relative to the No Action Alternative, Alternative 2 and Alternative 4 would have impacts on Sacramento River anadromous salmonids. For winter-run Chinook salmon, these would include beneficial water temperature effects for incubating eggs and alevins (Alternative 2) and minor adverse to beneficial rearing habitat flow effects. For spring-run Chinook salmon, water temperature effects and flow effects of Alternative 2 and Alternative 4 would be similar to the No Action Alternative for incubating eggs and alevins and on rearing habitat. For steelhead, these would include beneficial water temperature effects (Alternative 2) and adverse to beneficial water temperature effects (Alternative 4) for incubating eggs and adverse to beneficial rearing habitat flow effects (Alternative 2 and 4). For fall-run Chinook salmon, these benefits would include adverse to beneficial impacts from flow (Alternative 2 and 4) on egg incubation and rearing habitat and adverse to beneficial impacts from water temperature (Alternative 2) on rearing habitat. For late fall-run Chinook salmon, these would include beneficial water temperature effects (Alternative 2) for incubating eggs and adverse to beneficial (Alternative 2) and adverse (Alternative 4) rearing habitat flow effects. Relative to the No Action Alternative, Alternative 1 and Alternative 3 would also result in impacts on Sacramento River anadromous salmonids. For winter-run Chinook salmon, these impacts would include adverse (Alternative 1) and adverse or beneficial (Alternative 3) water temperature effects for incubating eggs and alevins. For spring-run Chinook salmon, Alternative 1 and Alternative 3 would have similar effects as for winter-run Chinook salmon. For steelhead, these impacts would include adverse water temperature effects (Alternative 1) and adverse to beneficial water temperature effects (Alternative 3) for incubating eggs and adverse to beneficial rearing habitat flow effects (Alternative 1 and 3). For fall-run Chinook salmon, these impacts would include adverse impacts from water temperature on rearing (Alternative 1 and 3), beneficial impacts (Alternative 1) and adverse to beneficial impacts (Alternative 3) from flow on egg incubation, and adverse impacts from flow (Alternative 1 and 3) on rearing habitat. For late fall-run Chinook salmon, these would include adverse (Alternative 1) and beneficial water temperature effects (Alternative 3) for incubating eggs and adverse (Alternative 1) and adverse to beneficial (Alternative 3) flow effects on rearing habitat.

Given the mixture of potential adverse and beneficial effects from the components in the action alternatives, and related actions in the Bay-Delta Water Quality Control Plan Update, there is some uncertainty in how these alternatives would ultimately affect salmonids. However, under Alternatives 2, 3 and 4, population level effects are not expected as impacts are likely to be small. For Alternative 1, the potentially adverse water temperature impacts may be large. Therefore, Alternative 1 may contribute to cumulative impacts for all salmonids.

Similarly, there is some uncertainty in how the action alternatives would ultimately affect green sturgeon. Relative to the No Action Alternative, Alternative 1 is not expected to have population level effects on green sturgeon, except minor negative flow effects to all life stages. Alternative 2 compared to the No Action Alternative is not expected to result in population level effects on green sturgeon. Alternative 3 is not expected to result in population level effects on green sturgeon, except for adverse flow effects on larval and juvenile rearing and emigration. Alternative 4 is not expected to result in impacts on green sturgeon, except for minor beneficial flow effects on larval and juvenile rearing and adult upstream migration. Therefore, Alternatives

1-4 are not expected to contribute to cumulative impacts on green sturgeon. None of the proposed components under the action alternatives are expected to result in a population level effect on white sturgeon. For all white sturgeon life stages and behaviors, the alternatives are not expected to include flow or water temperature changes that would cause adverse impacts. Thus, the action alternatives are not expected to contribute to cumulative impacts on white sturgeon. For other focal species in the watershed (listed above), Alternatives 1-4 are not expected to result in cumulative impacts.

Clear Creek

Relative to the No Action Alternative, Alternative 1 is expected to result in effects on Clear Creek anadromous salmonids. For spring-run Chinook salmon, this effect would include negative and beneficial flow effects with potential negative flow effects on spawning and fry/juvenile rearing habitat and negligible water temperature effects except potential beneficial effects on spawning and egg incubation. For steelhead, this effect would include negative and beneficial flow effects with potential adverse flow effects on spawning habitat and negative flow effects on fry and juvenile rearing habitat and negligible water temperature effects except possible beneficial effects on spawning and incubation.

Relative to the No Action Alternative, Alternatives 2, 3, and 4 would have an effect on Clear Creek anadromous salmonids. For both steelhead and spring-run Chinook salmon, this would include adverse and beneficial flow and temperature effects. Alternatives 2, 3, and 4 would not include population level flow or temperature effects on steelhead or spring-run Chinook salmon.

Given the mixture of potential adverse and beneficial effects from the action alternative, there is some uncertainty in how these alternatives would ultimately affect anadromous salmonids. However, in consideration that Alternatives 2, 3, and 4 are unlikely to cause population level effects, these alternatives are not expected to contribute to cumulative effects on anadromous salmonids in Clear Creek. Alternative 1, on the other hand, may result in adverse flow effects on steelhead spawning and fry/juvenile rearing habitat. Thus, Alternative 1 may contribute to cumulative effects on steelhead in Clear Creek.

For other focal species in the watershed (listed above), Alternatives 1-4 are not expected to result in cumulative impacts.

Lower American

Relative to the No Action Alternative, Alternative 2 would have an effect on lower American River anadromous salmonids. For both steelhead and fall-run Chinook salmon, this would include adverse and beneficial flow and temperature effects. Alternatives 3 and 4 would have adverse and beneficial flow and temperature effects, including beneficial flow effects on redd dewatering in drier water year types. For fall-run Chinook salmon, Alternative 3 and 4 would include adverse and beneficial flow effects; however, none of these effects is expected to result in population level effects. Relative to the No Action Alternative, Alternative 1 would also have an effect on lower American River anadromous salmonids. For steelhead, this would include adverse and beneficial flow effects, including flow effects on redd dewatering potential in drier water year types. For fall-run Chinook salmon, this effect would include adverse and beneficial flow effects, including adverse flow effects on spawning and egg incubation and beneficial flow effects on juvenile rearing and emigration. All the action alternatives are expected to result in

cumulative effects on steelhead in the lower American River. For fall-run Chinook salmon, Alternative 1 may contribute to cumulative effects on fall-run Chinook salmon. For other focal species in the watershed (listed above), Alternatives 1-4 are not expected to result in cumulative impacts.

Bay-Delta

Alternatives 1, 2, and 4 may result in adverse impacts on longfin smelt due to entrainment. There may be offsetting potential positive effects on Delta smelt under the action alternatives from food subsidies (studies related to Sacramento Deepwater Ship Channel, North Delta/Colusa Basin Drain, and Suisun Marsh RRDS). Nevertheless, Alternatives 1, 2, and 4 would still be expected to contribute to cumulative effects on Delta smelt. Alternative 3 may result in a benefit lessening entrainment of longfin smelt; therefore, lessening cumulative effects on Delta smelt.

Alternatives 1, 2 and 4 may result in adverse impacts on both entrainment risk and survival of winter-run Chinook salmon, spring-run Chinook salmon, fall-run Chinook salmon and late fall-run Chinook salmon. Thus, Alternatives 1, 2, and 4 may contribute to cumulative effects on these species. Alternatives 2 and 4 are not anticipated to contribute to cumulative effects on steelhead. However, Alternative 1 is expected to result in adverse flow effects on entrainment risk of steelhead; thus contributing to cumulative effects for this species.

Alternative 3 may result in a beneficial impact on both entrainment risk and survival of winter-run Chinook, particularly in wet, above normal, and below normal water year types. requirements. However, Alternative 3 would result in adverse impacts on spring-run Chinook salmon, fall-run Chinook salmon and late fall-run Chinook salmon due to entrainment. Alternative 3 is expected to result in beneficial flow effects on entrainment risk of steelhead, relative to the No Action Alternative. Thus, Alternative 3 would contribute to cumulative impacts on spring-run Chinook salmon, fall-run Chinook salmon and late fall-run Chinook but lessen cumulative impacts on steelhead and winter-run Chinook salmon.

The action alternatives (Alternatives 1-4) are expected to result in negative effects on green and white sturgeon from seasonal operations, OMR management (south Delta entrainment risk), and Delta Cross Channel operations. There may be offsetting, potential positive effects for green and white sturgeon from improvements at the Tracy and Skinner fish facilities, real-time OMR restrictions and performance objectives, real-time decision-making and salvage thresholds. Nevertheless, the No Action Alternative may still contribute to cumulative effects on green and white sturgeon in the Delta. For other focal species in the watershed (listed above), Alternatives 1-4 are not expected to result in cumulative impacts.

San Joaquin River

The action alternatives (Alternative 1-4) do not include actions that target the San Joaquin River. Reclamation will continue to operate the San Joaquin River in accordance with the SJRRP, which is an independent action. Thus, the action alternatives are not expected to contribute to cumulative impacts on San Joaquin River aquatic resources.

Stanislaus River

All action alternatives are expected to result in beneficial and adverse flow and temperature related impacts on anadromous salmonids in the Stanislaus River. However, these effects are not

expected to reach population level impacts. Thus, the action alternatives are not expected to contribute to cumulative effects of anadromous salmonids in the Stanislaus River. For other focal species in the watershed (listed above), Alternatives 1-4 are not expected to result in cumulative impacts.

Trinity River

The action alternatives will continue to implement the 2000 Trinity ROD. Although, the action alternatives may result in negative and beneficial changes to parameters (e.g., flows, water temperatures) important for anadromous species, green and white sturgeon, and other focal species (listed above) in the Trinity River, population level adverse impacts are not identified under these alternatives. Thus, the action alternatives are not expected to contribute to cumulative impacts on anadromous salmonids, green and white sturgeon, or other focal species in the Trinity River.

Nearshore Pacific Ocean and California Coast

In general, the analysis of the action alternatives noted that potential effects on Chinook Salmon prey for Southern Resident Killer Whale (Southern Residents) may be limited because of negligible differences between adult Chinook salmon abundance and biomass for adult Chinook salmon that occur in the Pacific Ocean that originate from the Central Valley or Trinity River. This coupled with the relatively high representation in the stocks by hatchery-origin fish, many of which are released downstream of the Delta, mean there would be limited impacts of the action alternatives (Alternatives 1-4). Thus, Alternatives 1-4 are not expected to contribute to cumulative impacts on Southern Resident Killer Whales.

Y.2.11 Terrestrial Resources

Past, present, and reasonably foreseeable projects may have cumulative effects on terrestrial biological resources and critical habitat, to the extent that changes in vegetation, flow, and alteration to habitat availability or quality could occur.

Y.2.11.1 No Action Alternative

The No Action Alternative would continue with the current operation of the CVP and may result in changes to terrestrial biological resources in the Central Valley Project and State Water Project. These changes may potentially contribute to cumulative impacts and were described and considered in the 2020 Record of Decision.

Y.2.11.2 Alternatives 1, 2, 3, and 4

Potential Effects of Climate Change

Climate change is expected to result in changes to terrestrial resources in the study area. The most significant changes would include a gradual rise in sea level, increasing water and air temperatures, more frequent drought and extreme rainfall events, and changes in the hydrologic patterns of the rivers and the Bay-Delta channels that influence the terrestrial and aquatic habitats used by terrestrial plants and wildlife. Physical changes to conditions in the study area could change the distribution and value of habitats. For example, climate change could result in a gradual loss of tidal marshes; low-lying upland grassland and riparian areas that border the study area waterways could be gradually converted to tidal marsh; existing wildlife corridors could

change; population numbers of riparian, grassland, and tidal marsh species would be likely to decrease; and population distribution would be altered. Land subsidence, sea level rise, gradual or catastrophic levee failure, or a combination of these conditions, should they occur, would result in flooding and inundation that could significantly damage existing facilities and infrastructure, uproot and kill vegetation to an unknown extent, permanently flood Bay-Delta islands, and drastically alter the salinity of Bay-Delta waterways and wetlands. The negative elements of climate change could be a contributing factor to cumulative effects of implementing the projects listed in Appendix Y.

Cumulative Effects of the Action Alternatives

All action alternatives would result in minor increases in flows at some point in each water year scenario throughout the study area that could result in impacts on terrestrial biological resources. These changes would generally have moderate or little to no negative effect on the terrestrial biological resources of concern in the study area and would be expected to improve the long-term viability of many special-status species and their habitats. The positive effects of implementing all action alternatives are similar. There would be relatively small variations in the acres affected by flow regime changes across the alternatives, therefore there is a low to moderate potential to modify natural communities and affect special-status plants and wildlife.

Past, present, and reasonably foreseeable actions projects that have or may have the potential to impact terrestrial species include ecosystem improvement and habitat restoration actions to improve conditions for special status species whose special status in many cases constrains water supply delivery operations. Collectively, short-term cumulative impacts could occur but could also benefit terrestrial biological resources over the long-term. While flow changes in the short-term period could temporarily or permanently remove some natural communities and modeled habitat for special-status plant and wildlife species, the short-, mid-, and long-term result of flow changes would have limited impact on these species; therefore the action alternatives' contributions to cumulative impacts would be minor.

Y.2.12 Regional Economics

Past, present, and reasonably foreseeable projects may have cumulative effects on regional economics to the extent that they could affect economic output, employment, and labor income.

Y.2.12.1 No Action Alternative

The No Action Alternative would continue with the current operation of the CVP and may result in changes to the regional economy in the Sacramento River, San Joaquin River, San Francisco Bay, Central Coast, and South Coast regions. These changes may potentially contribute to cumulative impacts and were described and considered in the 2020 Record of Decision.

Y.2.12.2 Alternatives 1, 2, 3, and 4

Compared to the No Action Alternative, Alternatives 1, all phases of Alternative 2, and Alternative 4 would improve water supply deliveries to North of Delta and South of Delta M&I contractors and could lessen cumulative impacts from reasonably foreseeable projects. Alternative 3 would decrease water supply deliveries to North of Delta and South of Delta M&I contractors and increase water rates to consumers, which could, in combination with the other projects, contribute to water supply shortages and cumulative impacts on those supplies.

Potential Agriculture-Related Changes to the Regional Economy

Changes in water supply deliveries to Sacramento River Region and San Joaquin River Region agricultural contactors vary across alternatives and under average and dry conditions. Compared to the No Action Alternative, an increase in water supply deliveries increases revenue and farm labor under most alternatives and conditions. However, under Alternative 1, while water supply deliveries are forecast to improve, gross revenue in the Sacramento River Region is forecast to decrease under average and dry conditions due to a shift in some crop production from the Sacramento River Region to the San Joaquin River Region (and vice versa) which occurs disproportionally in relatively high-value crops. Similarly, increases in gross revenue typically coincide with increases in farm labor. An exception to this trend is under Alternative 3 in the Sacramento River Region, where under average conditions employment falls as revenue increases due to a change in cropping patterns.

Past, present, and reasonably foreseeable projects would improve water supply reliability, and others would reduce water supply reliability. Similar to the effects described above for the action alternatives, improvements in agricultural water supply typically improve agricultural revenue and employment. The action alternatives would have varying effects on agricultural revenue and employment depending on water year type and location, with none of the alternatives generating only improvements or only reductions in all locations and water year types. The projects described in Appendix Y could also have varying impacts with some generating positive improvements in agricultural revenue and employment and others generating negative effects. Each of the action alternatives could contribute to the cumulative impacts from reasonably foreseeable projects related to agricultural-dependent economic conditions.

Potential Fisheries-Related Changes to the Regional Economy

Changes in salmon population could potentially increase impacts to commercial and recreational ocean salmon harvest. Compared to the No Action Alternative, salmon harvest under Alternative 1 would be negligible. Consequently, revenues received by fisherman from changes to ocean salmon harvest would be minimal. Other industries that ocean fisheries support, such as fish processors and boat manufacturers, would see no changes in revenue. Overall fisheries-related changes to the regional economy under Alternative 1 would be minimal. Alternative 2, Alternative 3 and Alternative 4 are expected to have negligible impacts to annual average Central Valley Chinook salmon abundance (includes spring, winter, fall and late-fall runs) in the Bay.

Past and present human activities have substantially changed aquatic habitats in the Southern Oregon and northern California coast compared to historical conditions, contributing to cumulative adverse impacts on the ocean salmon fishing industry. In addition to the ongoing activities, several reasonably foreseeable projects may impact aquatic biological resources in the Southern Oregon and northern California coast by affecting upstream salmon habitat. Some of the projects listed in Appendix Y could result in cumulative impacts. The action alternatives could have minimal contributions to the cumulative fisheries-related regional economic conditions.

The action alternatives are not likely to negatively impact salmon populations in the Trinity River and would not contribute to the cumulative impacts related to fisheries-dependent regional economic conditions in this region.

Potential Recreation-Related Changes to the Regional Economy

Compared to the No Action Alternative, Alternatives 1 and 3 would result in water levels at Trinity Reservoir that are the same or slightly higher and would maintain recreational opportunities at Trinity Reservoir. Water levels at Trinity Reservoir under Alternative 2 and Alternative 4 compared to the No Action Alternative vary by month, though boat ramps remain usable throughout tourist season and limited impacts are forecast on camping, day use opportunities at the campgrounds surrounding Trinity Reservoir.

Past, present, and reasonably foreseeable projects have or could potentially result in cumulative effects related to recreation-related regional economics as they could impact water levels at Trinity Reservoir. The action alternatives, in combination with the other projects, could contribute to the cumulative recreation-related regional economic condition.

Potential Hydropower-Related Changes to the Regional Economy

Compared to the No Action Alternative, each of the action alternatives would result in changes in long-term average CVP net generation rates. On a monthly basis, none of the reductions in CVP net generation under Alternatives 1, 2, and 4 would require the procurement of additional power given that net generation would remain positive for all of the alternatives. All of the action alternatives would result in negative long-term average SWP net generation levels. These reductions in SWP net generation would require the procurement of additional generation elsewhere within the California energy system.

Most past, present, and reasonably foreseeable projects identified are anticipated to improve water supplies in California to reduce impacts generated by climate change, sea-level rise, increased water allocated to improve habitat conditions, and future growth. If CVP and SWP water supply reliability increase, energy used to support the conveyance of CVP and SWP water supplies would also increase.

Some of the future reasonably foreseeable actions are anticipated to potentially reduce CVP and SWP water supply reliability (e.g., Water Quality Control Plan Update). If CVP and SWP water supply reliability decreases, energy used to support the conveyance of CVP and SWP water supplies also would also decrease. The action alternatives potential impact on long-term average CVP and SWP net generation rates, in combination with the other projects, could contribute to the cumulative hydropower-related regional economic condition.

Y.2.13 Land Use and Agricultural Resources

Past, present, and reasonably foreseeable projects may have cumulative impacts on land uses to the extent that they could affect potential changes in irrigated agricultural acreage.

Y.2.13.1 No Action Alternative

The No Action Alternative would continue with current operations of the CVP. Changes in CVP and SWP operations under the No Action Alternative could change the availability of CVP and SWP water supplies. If the CVP and SWP water supplies were reduced to a level that would not support planned M&I water demands, development of future land uses may not occur. Reductions in agricultural water supplies may result in the conversion of agricultural land to

nonagricultural uses. These changes may potentially contribute to cumulative impacts and were described and considered in the 2020 Record of Decision.

Y.2.13.2 Alternatives 1, 2, 3, and 4

In both the average and dry water year conditions irrigated acreage would increase under Alternative 1 in the Sacramento River region and San Joaquin River region compared to the No Action Alternative, so no conversion of agricultural land to nonagricultural uses is expected to occur. In both the average and dry water year conditions, overall crop acreage would decrease in the San Joaquin River and Sacramento River regions under Alternatives 2, 3, and 4 when compared to the No Action Alternative. Therefore, conversion of agricultural land to non-agricultural use is anticipated.

Implementation of Alternatives 3 and 4 could contribute to cumulative impacts on local jurisdictions' ability to implement their general plans. Mitigation Measure AG-1 could reduce effects by encouraging water agencies to diversify their water portfolios, thus increasing likelihood that water users would have adequate water. However, despite implementation of mitigation, the contribution of Alternatives 3 and 4 to cumulative impacts may result in an inability of local jurisdictions to implement their general plans.

Y.2.14 Recreation

Past, present, and reasonably foreseeable projects may have cumulative impacts on recreation to the extent that they impact flow and water elevation.

Y.2.14.1 No Action Alternative

Under the No Action Alternative, Reclamation would continue with the current operation of the CVP and may result in changes to recreation in the CVP and SWP. These changes may potentially contribute to cumulative impacts and were described and considered in the 2020 Record of Decision.

Y.2.14.2 Alternatives 1, 2, 3, and 4

Many past, present, and reasonably foreseeable projects have or may potentially result in cumulative impacts to recreation. Resource management plans and programs are being implemented by communities throughout the action area. These plans, such as California EcoRestore, the Suisun Marsh Habitat Management, Preservation, and Restoration Plan, the San Joaquin River Restoration Program, the San Francisco Bay Delta Action Plan, and the Shasta Management Plan could support and enhance recreational opportunities.

Proposed restoration projects and measures, such as tidal and wetland restoration projects, fish facility improvements, and flood control improvements, could benefit wildlife, which would improve certain types of recreation (e.g., wildlife viewing, fishing, and hiking) in the action area. Additionally, projects that decrease water temperatures and increase water quality, such as the South Delta Temporary Barriers Project and the Prospect Island Tidal Habitat Restoration Project, could create beneficial changes in habitat for fish populations.

In the short-term, the implementation of resource management plans and restoration measures could have cumulative impacts resulting from the construction activities on recreation in the

surrounding area, especially if construction of multiple projects occur at the same time and in the same general area. Construction impacts could include noise, increased heavy vehicle traffic, and road and area closures, among other effects. These impacts could prevent access to recreation areas or reduce enjoyment of activities during construction. Potential cumulative effects from these alternatives would be minor, localized, and short-term because project construction would be dispersed throughout the project area, and BMPs would be implemented to reduce construction effects.

Depending on the location and season, all action alternatives could cause minor beneficial and/or negative impacts on recreation from changes to average river flows, reservoir elevations, and seasonal fluctuations (see Table S.2-2). Therefore, effects from all action alternatives could have minor contributions to beneficial and/or negative cumulative impacts on recreation. However, the contribution of the action alternatives to cumulative impacts would be anticipated to be minimal because only minor changes to recreation would occur and the changes would be dispersed throughout the project area.

Y.2.15 Environmental Justice

Past, present, and reasonably foreseeable projects may have cumulative effects on environmental justice to the extent that they could affect minority and/or low-income populations.

Y.2.15.1 No Action Alternative

The No Action Alternative would continue with the current operation of the CVP and, as described in the 2020 Record of Decision, would not result in potential changes to disproportionate economic and health effects on minority or low-income populations.

Y.2.15.2 Alternatives 1, 2, 3, and 4

Alternative 1 may have negligible adverse impacts and/or beneficial effects on minority and/or low-income populations; however, these effects would not be disproportionately high or adverse. Alternatives 2, 3, and 4 have potential to result in disproportionately high impacts on minority and/or low-income populations, with Alternative 3 having the potential to result in the largest impact resulting from changes in agricultural water supply and groundwater elevation decreases.

Past, present, and reasonably foreseeable projects may have or could potentially result in effects on minority and/or low-income populations. Cumulatively, the reasonably foreseeable water supply projects are expected to benefit minority and low-income populations by improving water supply reliability and/or increasing agricultural productivity and jobs. The reasonably foreseeable projects also include ecosystem improvement and habitat restoration actions, which could provide recreational and water quality benefits for surrounding communities, including minority and/or low-income communities. The potential impacts on minority and/or low-income populations resulting from the implementation of Alternatives 2 through 4 is generally distributed throughout the study area, which reduces the magnitude of the impact in any one location within the study area and reduces the action alternatives' contributions to the cumulative condition. Implementation of mitigation measures (EJ-1 and EJ-2) would minimize the potential cumulative impacts.

Y.2.16 Power

Past, present, and reasonably foreseeable projects may have cumulative effects on power to the extent that they could affect hydropower generation and energy use.

Y.2.16.1 No Action Alternative

Under the No Action Alternative, Reclamation would continue with current operation of the CVP, as described in the 2020 Record of Decision and subject to the 2019 Biological Opinions. The No Action Alternative would continue with the current operation of the CVP and may result in changes to Central Valley Project and State Water Project net generation. Additionally, under the No Action Alternative, Reclamation and DWR would operate the dams to provide water temperature management while minimizing impacts on power generation. Therefore, the No Action Alternative may contribute to potential cumulative changes in power resources.

Y.2.16.2 Alternatives 1, 2, 3, and 4

Each of the action alternatives would result in minor increases in long-term average CVP net generation rates, with the exception of Alternative 1 which would result in minor decreases in net generation. On a monthly basis, minor decreases in net generation would occur in some months under all of the alternatives compared to the No Action Alternative. None of the reductions in CVP monthly or annual net generation would require the procurement of additional power given that net generation would remain positive for all of the alternatives on an annual and monthly basis. All of the action alternatives would result in minor decreases in long-term average net generation for the SWP except for Alternative 3 which would result in increased net generation. However, similar to the existing conditions and No Action Alternative, negative long-term average and monthly SWP net generation levels would continue to occur. The minor reductions in SWP net generation would require the procurement of additional generation elsewhere within the California energy system similar to existing conditions. Given these minor changes in long-term average CVP and SWP net generation rates, contributions to cumulative impacts from power resources would be the same under all alternatives and would be anticipated to be minimal.

Y.2.17 Hazards

Past, present, and reasonably foreseeable projects may have cumulative effects on hazards to the extent that people or structures are exposed to a substantial risk of loss, injury, or death involving wildfires or there is an increase in the potential for creating a public or environmental hazard through the use or accidental release of hazardous materials.

Y.2.17.1 No Action Alternative

The No Action Alternative would continue with the current operation of the CVP and would not be expected to result in potential changes in exposure of people or structures to substantial risk of loss, injury, or death involving wildfires and use and accidental release of hazardous materials.

Y.2.17.2 Alternatives 1, 2, 3, and 4

Alternatives 1, 2, 3, and 4, compared to the No Action Alternative, would not result in adverse impact related to wildfires, other hazards, or hazardous materials. As such, when considered

along with past, present, and reasonably foreseeable future actions, Alternatives 1, 2, 3, and 4 would not result in cumulative impacts related to hazards and hazardous materials.

Y.2.18 Geology and Soils

Past, present, and reasonably foreseeable projects may have cumulative effects on geology and soils to the extent that they could affect soil erosion and the rate of land subsidence.

Y.2.18.1 No Action Alternative

Under the No Action Alternative, Reclamation would continue with current operation of the CVP, as described in the 2020 Record of Decision and subject to the 2019 Biological Opinions. Flows and reservoir levels would remain as under current conditions. Municipal and industrial water uses and agricultural deliveries, and thereby land use and agricultural resources, including potential for erosion of irrigable lands taken out of production, would continue to vary according to available water supply. Therefore, the No Action Alternative may contribute to potential cumulative changes in geology and soils resources at reservoirs that store CVP water, tributaries, and agricultural land across the CVP and SWP service area.

Y.2.18.2 Alternatives 1, 2, 3, and 4

The past, present, and reasonably foreseeable projects may have effects on geology and soils by enhancing surface water supplies and implementing ecosystem restoration actions. Enhancing surface water supplies may result in reduction in agricultural land fallowing as shifting water supplied for agricultural and M&I purposes from groundwater to surface water. When combined with other water supply programs and projects, this shift could result in a cumulative beneficial effect on geology and soils by reducing agricultural land fallowing, soil erosion, and land subsidence.

Trinity River

In this region, Alternative 3 under dry conditions is the only scenario in which shoreline and riverine erosion may increase relative to the No Action Alternative. Therefore Alternative 3 under dry conditions may minimally contribute to the cumulative soil erosion condition in this region. Changes in reservoir storage and river releases under Alternative 1, all phases of Alternative 2, Alternative 3 under wet conditions, and Alternative 4 would have either a negligible impact on or would lessen the cumulative condition for geology and soils in this area.

Central Valley

For Shasta Reservoir, Alternatives 2, 3 and 4, all under dry conditions, are the scenarios in which shoreline erosion may increase relative to the No Action Alternative. Therefore, these conditions may contribute to the cumulative soil erosion condition in this region. Changes in shoreline erosion under Alternative 1 and under wet conditions for Alternatives 2, 3, and 4 would be negligible and would therefore have minimal impact on the cumulative condition for geology and soils in this area. Changes in riverine erosion for all action alternatives would be negligible and would therefore have minimal impact on the cumulative condition for geology and soils in this area.

For Folsom Reservoir, Alternative 1 under dry conditions is the only scenario in which shoreline erosion may increase relative to the No Action Alternative; this alternative may minimally

contribute to the cumulative soil erosion condition in this region. Changes in shoreline erosion for Alternative 1 under wet conditions and Alternatives 2, 3, and 4 would be negligible and would therefore have minimum impact on the cumulative condition for geology and soils in this area. Changes in riverine erosion for Alternatives 1, and under wet conditions for Alternatives 2, 3, and 4 would be negligible and would therefore have minimal impact on the cumulative condition for geology and soils in this area. Changes in riverine erosion under dry conditions for Alternatives 2, 3, and 4 would decrease and would therefore lessen the impact on the cumulative condition for geology and soils in this area.

Compared to the No Action Alternative, Alternative 3 had the largest increase in lands that would be subject to fallowing in the Sacramento River Region (average year = 1.11%), which would increase the potential for wind erosion. Changes in wind erosion would contribute to the cumulative condition for geology and soils in this area.

Bay-Delta Region

For the Bay-Delta region, no changes in riverine erosion would occur under Alternatives 1, 2 and 4 relative to the No Action Alternative. Therefore, it is unlikely these alternatives would contribute to the cumulative soil erosion condition in this region. A minor increase in flow under Alternative 3 is expected through the Bay-Delta Region during January; however, this increase is within the range of high flows through the Bay-Delta Region during winter flood events through the Bay-Delta; therefore, riverine erosion is not a substantial concern but may contribute to the cumulative soil erosion condition in this region.

No conversion of agricultural land or crop idling is anticipated, and erosion of fallowed land would not change compared with the No Action Alternative. Under all phases of Alternative 2 and Alternative 3, agricultural flows to the San Francisco Bay Area would decrease, which could result in erosion of fallowed land. Under Alternative 4, agricultural flows to the San Francisco Bay Area would increase, which could increase erosion of fallowed land. These scenarios may contribute to the cumulative soil erosion condition of this region.

San Joaquin Valley

Releases to the Stanislaus River would result in negligible increases during wet periods under Alternatives 2 and 4. Alternatives 1 and 4 would result in increases of 7% and 10 %, respectively, that could increase the potential for channel erosion slightly. During dry periods, Alternative 3, channel erosion would be negligible; however, Alternatives 1, 2, and 4 would have a slight increase in potential (4-% to 13 %) for channel erosion. These scenarios may contribute to the cumulative soil erosion condition of this region.

Additional CVP and SWP Service Areas

There are no Reclamation storage reservoirs or affected stream reaches in the additional CVP and SWP service areas; therefore, erosion of fallowed land would not change relative to the No Action Alternative and would not contribute to the cumulative soil erosion condition of this region.

Potential Changes in Land Subsidence Due to Increased Use of Groundwater

Numerous groundwater storage and recovery projects are proposed or have been completed (Appendix Y). However, these projects largely involve groundwater banking, in which water is stored in groundwater and then withdrawn. Therefore, they would not exacerbate land subsidence. Additionally, the Eastern San Joaquin Integrated Conjunctive Use Program would support groundwater recharge and include groundwater banking, as described in Appendix Y, in part to address groundwater overdraft. There are also several projects meant to benefit agricultural users, such as the South Delta Temporary Barriers Project and the Red Bluff Diversion Dam Fish Passage Improvement Project. Most action alternatives would result in no change in groundwater levels and no impact on subsidence. Alternative 2 (in some phases), Alternative 3, and Alternative 4 could decrease groundwater levels in the Sacramento and San Joaquin Valleys. However, the location and amount of subsidence is highly dependent on the local soil conditions and historical low groundwater levels in the area. Average groundwater levels are simulated to decrease up to approximately 160 feet for Alternative 3 in some water year types compared to the No Action Alternative. The largest decreases in groundwater levels are simulated to occur along the western portion of the Central Valley in the Sacramento Valley and in the San Joaquin Valley. Additional areas of decreased groundwater levels appear north of Modesto and south of Fresno. Given the relatively large decreases in groundwater elevations and the fact that portions of these areas are known to have historic subsidence, there is potential for additional subsidence. The location and amount of subsidence is highly dependent on the local soil conditions and historical low groundwater levels in the area. Given that many of the reasonably foreseeable projects have the stated intent to address groundwater overdraft and agricultural supply, cumulative land subsidence impacts would not be anticipated to be adverse.

Y.2.19 Public Health and Safety

Past, present, and reasonably foreseeable projects may have cumulative effects on public health and safety to the extent that these projects could affect Valley fever occurrences resulting from changes in irrigated agricultural land, methylmercury production and resultant changes in bioaccumulation in fish for human consumption, and public exposure to cyanotoxins due to an increase in CHABs.

Y.2.19.1 No Action Alternative

The increasing frequency and severity of drought, aridity, and dust storms in California due to climate change may impact *Coccidioides* growth and spore spread, potentially leading to an increase in Valley fever infections. However, the No Action Alternative would continue with the current operation of the CVP and is not anticipated to result in potential changes in Valley fever related to changes in irrigated agricultural land. Furthermore, past, present, and reasonably foreseeable projects that have or would potentially result in the reduction or limitation of the availability of water for irrigation in the study area (e.g., the Bay-Delta Water Quality Control Plan Update) may create conditions suitable for *Coccidioides* growth and dispersal and may potentially contribute to potential cumulative impacts to public health and safety by increasing the potential for Valley fever. To the extent that CVP reservoirs would experience greater reservoir water level fluctuations under the No Action Alternative relative to existing conditions, there could be increased mercury methylation in these reservoirs, in reservoir releases and ultimately increased concentrations of methylmercury in fish. It is reasonable to assume that OEHHA standards for the consumption of fish in the study area would continue to be

implemented and, thus, would serve to protect people against the overconsumption of fish with increased body burdens of mercury. Higher water temperatures and potential increases in residence time in the Delta due to climate change may be conducive to CHABs and could increase the bloom magnitude and duration, which could result in increased public exposure to cyanotoxins. Therefore, the No Action Alternative may contribute to potential cumulative changes to the Public Health and Safety resources.

Y.2.19.2 Alternatives 1, 2, 3, and 4

Potential changes in the potential for Valley fever related to changes in irrigated agricultural land

Compared to the No Action Alternative, there would be an increase in irrigated agricultural acreages in the study area under Alternative 1. As such, an increase in the potential for Valley fever due to CVP and SWP operations under this alternative would not be expected, and the increase in irrigated agricultural acreages could decrease the potential. There would be a reduction in irrigated agricultural land in the study area under Alternatives 2 (all phases except with the TUCP and no VA in the San Joaquin River Region), 3 and 4 potentially contributing further to adverse conditions cumulatively for Valley fever. The magnitude of this reduction would be greatest under Alternative 3. Under Alternative 3 in the average and dry water year conditions, there would be an overall reduction in irrigated agricultural land in the Sacramento River region and a substantially greater reduction in the San Joaquin River region, where *Coccidioides* is endemic. However, conversion of agricultural land to non-agricultural use would not necessarily mean that the land would be fallowed or idled; land taken out of production could be converted to a different land use altogether that is not conducive to the growth of *Coccidioides*. Further, Mitigation Measure AG-1 could reduce effects by encouraging water agencies to diversify their water portfolios, thus, increasing the likelihood that water users would have adequate water for agricultural irrigation.

Potential changes in methylmercury production and resultant changes in bioaccumulation in fish for human consumption

Based on the modeling performed for the analysis in Appendix G, methylmercury concentrations in fish tissue are not expected to be substantially affected by Alternatives 1, 2 and 4; Alternative 3, through higher Delta outflow in all months except June, relative to the No Action Alternative, may make existing methylmercury water quality impairments in the Bay-Delta region worse and increased methylmercury bioaccumulation in fish under Alternative 3 could contribute to the adverse cumulative impact for methylmercury in the Delta region. OEHHA standards for the consumption of fish in the study area would continue to be implemented and, thus, would serve to protect people against the overconsumption of fish with increased body burdens of mercury. It is reasonable to assume that OEHHA standards for the consumption of fish in the study area would continue to be implemented and, thus, would serve to protect people against the overconsumption of fish with increased body burdens of mercury.

Potential changes in the potential for public exposure to cyanotoxins due to an increase in CHABs

Alternatives 1, 2, and 4 would not substantially alter Delta water temperatures or residence times relative to the No Action Alternative. However, Alternative 3 may make water temperature

and/or residence time conditions worse because it would result in substantial reductions in Sacramento River flows entering the Delta at Freeport and San Joaquin River flows entering the Delta at Vernalis and this could contribute to cumulative impacts for CHABs and public exposure to cyanotoxins.

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