

# RECLAMATION

*Managing Water in the West*

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

**Mid-Pacific Region  
Bay-Delta Office**

### **Final Environmental Impact Statement**



## **Mission Statements**

The mission of the Department of the Interior is to protect and provide access to our Nation's natural and cultural heritage and honor our trust responsibilities to Indian Tribes and our commitments to island communities.

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

# 1 **Executive Summary**

## 2 **ES.1 Introduction**

3 This Environmental Impact Statement (EIS) for the Coordinated Long-Term  
4 Operation of the Central Valley Project (CVP) and State Water Project (SWP) has  
5 been prepared by the Department of the Interior, Bureau of Reclamation  
6 (Reclamation). Reclamation is the Federal lead agency for compliance with the  
7 National Environmental Policy Act (NEPA) and is completing the EIS as ordered  
8 by the United States District Court for the Eastern District of California (District  
9 Court). In 2008 and 2009, following litigation on previous Biological Opinion  
10 (BOs), Reclamation provisionally accepted and began implementing the BOs on  
11 continued long-term operation of the CVP, in coordination with the operation of  
12 the SWP issued by the U.S. Fish and Wildlife Service (USFWS) and the National  
13 Marine Fisheries Service (NMFS), respectively, pursuant to the Federal  
14 Endangered Species Act of 1973 (ESA) as amended (United States Code [U.S.C.]  
15 1531 et. seq.). In 2014, the Ninth Circuit upheld the District Court's ruling that  
16 Reclamation's provisional acceptance and implementation of the BOs required  
17 Reclamation to comply with NEPA. The District Court remanded Reclamation's  
18 decision back to the agency to comply with the court's ruling.

19 The EIS evaluates potential long-term direct, indirect, and cumulative impacts on  
20 the environment that could result from implementation of modifications to the  
21 continued long-term operation of the CVP and SWP.

## 22 **ES.2 Background**

### 23 **ES.2.1 Central Valley Project**

24 The first Federal action authorizing the CVP was by the Rivers and Harbors Act  
25 of August 30, 1935. The CVP was reauthorized for construction, operation, and  
26 maintenance by the Secretary of the Department of the Interior (Secretary),  
27 pursuant to the Reclamation Act of 1902, as amended and supplemented (the  
28 Federal Reclamation laws), and by the Rivers and Harbors Act of  
29 August 26, 1937. In 1992, the Central Valley Project Authorization Act of  
30 August 26, 1937 was amended by Section 3406(a) of the Central Valley Project  
31 Improvement Act (CVPIA), Public Law 102-575.  
32 (<http://www.usbr.gov/history/cvpintro.html>)

1 The CVP is composed of 20 reservoirs with a combined storage capacity of more  
2 than 11 million acre-feet, over 10 hydroelectric powerplants, and more than  
3 500 miles of major canals and aqueducts. The major CVP facilities are located in  
4 the Sacramento-San Joaquin Rivers Delta Estuary (Delta) watershed including:

- 5 • **Major Reservoirs:** Trinity Lake (Trinity River), Whiskeytown Lake (Clear  
6 Creek); Shasta Lake (Sacramento River), Folsom Lake (American River),  
7 New Melones Reservoir (Stanislaus River), portions of the San Luis Reservoir  
8 complex (local drainages), and Millerton Lake (San Joaquin River).
- 9 • **Major Pumping Plants and Conveyance Facilities:** Red Bluff Pumping  
10 Plant (diverts water from Sacramento River into CVP Tehama-Colusa Canal),  
11 Folsom South Canal (diverts water from Folsom Lake to portions of  
12 Sacramento County), Contra Costa Canal Pumping Plant (diverts water from  
13 the Delta into CVP Contra Costa Canal), C.W. “Bill” Jones Pumping Plant  
14 (diverts water from the Delta into CVP Delta-Mendota Canal), Clear Creek  
15 Tunnel (conveys water from Trinity Lake to Whiskeytown Lake), Pacheco  
16 Tunnel and Conduit (conveys water from San Luis Reservoir to Santa Clara  
17 and San Benito counties), and Friant Kern and Madera canals (convey water  
18 from Millerton Lake to the eastern San Joaquin Valley).

19 These facilities are operated as an integrated project, although they are authorized  
20 and categorized in distinct units or divisions.

## 21 **ES.2.2 State Water Project**

22 The State Legislature appropriated funds to the California Department of Water  
23 Resources (DWR) to construct the SWP under the State Central Valley Project  
24 Act (Water Code section 11100 et seq.), Burns-Porter Act (California Water  
25 Resources Development Bond Act), State Contract Act (Public Contract Code  
26 section 10100 et seq.), Davis-Dolwig Act (Water Code sections 11900 - 11925),  
27 and other acts of the State Legislature.

28 Major SWP facilities include:

- 29 • **Reservoirs:** Lake Oroville and the Thermalito Complex (Feather River);  
30 Antelope Lake, Lake Davis, and Frenchman Lake (upper Feather River  
31 upstream of Lake Oroville); portions of the San Luis Reservoir complex (local  
32 drainages); reservoirs located downstream of San Luis Reservoir along the  
33 California Aqueduct and other SWP conveyance facilities (Quail Lake,  
34 Pyramid Lake, Castaic Lake, Silverwood Lake, Crafton Hills Reservoir, and  
35 Lake Perris).
- 36 • **Major Pumping Plants and Conveyance Facilities:** Barker Slough Pumping  
37 Plant (diverts water into SWP North Bay Aqueduct); Clifton Court Forebay  
38 and Harvey O. Banks Pumping Plant (diverts water from the Delta into SWP  
39 South Bay Aqueduct and the SWP California Aqueduct); California Aqueduct  
40 and associated pumping plants (convey water to the San Joaquin Valley,  
41 San Luis Obispo and Santa Barbara counties along the central coast, and  
42 southern California); Coastal Branch of the California Aqueduct (conveys

1 water to San Luis Obispo and Santa Barbara counties); and East Branch and  
2 West Branch (convey water to Southern California).

### 3 **ES.2.3 Coordinated Operation of the CVP and SWP**

4 The CVP and SWP are operated in a coordinated manner in accordance with  
5 Public Law 99-546 (October 27, 1986), directing the Secretary to execute the  
6 Coordinated Operation Agreement (COA). The CVP and SWP are also operated  
7 under State Water Resources Control Board (SWRCB) decisions and water right  
8 orders related to the CVP's and SWP's water right permits and licenses to  
9 appropriate water by diverting to storage, by directly diverting to use, or by  
10 re-diverting releases from storage later in the year or in subsequent years.

11 The CVP and SWP are permitted by SWRCB to store water, divert water and re-  
12 divert CVP and SWP water that has been stored in upstream reservoirs. The CVP  
13 and SWP have built water storage and water delivery facilities in the Central  
14 Valley to deliver water supplies to CVP and SWP contractors, including senior  
15 water users. The CVP's and SWP's water rights are conditioned by the SWRCB  
16 to protect the beneficial uses of water within the watersheds.

17 As conditions of the water right permits and licenses, SWRCB requires the CVP  
18 and SWP to meet specific water quality objectives within the Delta. Reclamation  
19 and DWR coordinate operation of the CVP and SWP, pursuant to the COA, to  
20 meet these and other operating requirements. The COA is an agreement between  
21 the Federal government and the State of California for the coordinated operation  
22 of the CVP and SWP.

23 Implementation of the COA has evolved continually since 1986 as CVP and SWP  
24 facilities, operational criteria, and physical and regulatory environment have  
25 changed. For example, adoption of the CVPIA in 1992 changed the purposes and  
26 operations of the CVP, and ESA responsibilities have affected operation of the  
27 CVP and SWP. DWR and Reclamation have operational arrangements to  
28 accommodate new facilities, water quality objectives, the CVPIA, other SWRCB  
29 criteria, and the ESA, but the COA has not been formally modified to address  
30 these newer operating conditions.

### 31 **ES.2.4 Federal Endangered Species Consultation**

32 The following species and their critical habitat listing rules were considered in  
33 recent ESA consultations with the USFWS and NMFS for the coordinated long-  
34 term operation of the CVP and SWP and in the analyses in this EIS.

- 35 • The Sacramento River winter-run Chinook Salmon (*Oncorhynchus*  
36 *tshawytscha*) evolutionarily significant unit (ESU) was originally listed as  
37 threatened in August 1989, under emergency provisions of the ESA, and  
38 formally listed as threatened in November 1990 (55 Federal Register (FR)  
39 46515). They were re-classified as an endangered species on January 4, 1994  
40 (59 FR 440).
- 41 • Central Valley spring-run Chinook Salmon (*O. tshawytscha*) ESU was listed  
42 as threatened on June 18, 2005 (70 FR 37160).

- 1 • The Central Valley Steelhead (*O. mykiss*) distinct population segment (DPS)  
2 was listed as threatened on January 5, 2006 (71 FR 834).
- 3 • Southern Oregon/Northern California Coast Coho Salmon (*O. kisutch*) ESU  
4 was listed as threatened on June 18, 2005 (70 FR 37160).
- 5 • Southern DPS of the North American Green Sturgeon (*Acipenser medirostris*)  
6 was listed as threatened on June 6, 2006 (71 FR 17757).
- 7 • The Southern Resident DPS of Killer Whales (*Orcinus orca*) was listed as  
8 endangered on November 18, 2005 (NMFS 2005).
- 9 • The Delta Smelt (*Hypomesus transpacificus*) was listed as threatened on  
10 March 5, 1993 (58 FR 12854). The species was recently proposed for re-  
11 listing as endangered under the ESA.

12 Fall and late-fall runs of Chinook Salmon are currently Federal Species of  
13 Concern, but have not been formally listed.

14 The Central California Coast Steelhead (*O. mykiss*) DPS was listed as threatened  
15 on January 5, 2006 (71 FR 834). The 2009 NMFS BO determined that the long-  
16 term operation of the CVP and SWP would not likely adversely affect Central  
17 California Coast Steelhead DPS and its critical habitat. Therefore, no further  
18 analysis of this DPS was performed and addressed in this EIS.

#### 19 **ES.2.4.1 Recent ESA Consultation Activities and Court Rulings**

20 In August 2008, Reclamation submitted a biological assessment (BA) to the  
21 USFWS and NMFS to initiate formal consultation. BO's were issued by the  
22 USFWS (December 15, 2008) and NMFS (June 4, 2009) with separate  
23 Reasonable and Prudent Alternative (RPA) actions to allow CVP and SWP to  
24 continue operating without causing jeopardy to listed species or adverse  
25 modification to designated critical habitat. Reclamation provisionally accepted  
26 and began implementing the two BOs with the RPAs.

27 Several lawsuits were filed in the District Court challenging aspects of the 2008  
28 USFWS BO and the 2009 NMFS BO and Reclamation's acceptance and  
29 implementation of the associated RPAs. Many of the lawsuits consolidated into  
30 two proceedings focused on each BO. The outcomes of the *Consolidated Delta*  
31 *Smelt Cases* and the *Consolidated Salmonid Cases* are summarized below.

- 32 • *Consolidated Delta Smelt Cases*
  - 33 – On November 16, 2009, the District Court ruled that Reclamation violated  
34 NEPA by failing to conduct a NEPA review of the potential impacts to the  
35 human environment before provisionally accepting and implementing the  
36 2008 USFWS BO, including the RPA.
  - 37 – On December 14, 2010, the District Court found certain portions of the  
38 2008 USFWS BO to be arbitrary and capricious in several respects, and  
39 remanded those portions of the BO to the USFWS without vacatur for  
40 further consideration. The District Court ordered Reclamation to review

- 1 its decision to provisionally accept and implement the BO and RPA in  
2 accordance with NEPA.
- 3 – The decision of the District Court related to the USFWS BO was appealed  
4 to the United States Court of Appeals for the Ninth Circuit (Appellate  
5 Court). On March 13, 2014, the Appellate Court reversed the District  
6 Court decision and upheld the BO. However, the Appellate Court  
7 affirmed the judgment of the District Court with respect to the NEPA  
8 claims.
- 9 – The District Court amended the Judgment on September 30, 2014  
10 consistent with the Appellate Court’s decision. Petitions for Writ of  
11 Certiorari were submitted to the U.S. Supreme Court; however, the U.S.  
12 Supreme Court decided to not hear the cases.
- 13 • *Consolidated Salmonid Cases*
- 14 – On March 5, 2010, the District Court ruled that Reclamation violated  
15 NEPA by failing to undertake a NEPA analysis of potential impacts to the  
16 human environment before provisionally accepting and implementing the  
17 2009 NMFS BO and RPA.
- 18 – On September 20, 2011, the District Court found the 2009 NMFS BO was  
19 arbitrary and capricious in several respects, and remanded the 2009 NMFS  
20 BO without vacatur for further consideration.
- 21 – The decisions of the District Court related to the 2009 NMFS BO were  
22 appealed to the Appellate Court. On December 22, 2014, the Appellate  
23 Court reversed the District Court decision and upheld the BO.
- 24 – The District Court issued the Final Order on May 5, 2015 consistent with  
25 the Appellate Court’s Decision.

### 26 **ES.3 Need to Prepare this Environmental Impact** 27 **Statement**

28 To comply with the District Court’s 2010 orders regarding NEPA for the  
29 coordinated long-term operation of the CVP and SWP, Reclamation initiated  
30 preparation of this EIS in 2011. This EIS documents Reclamation’s analysis of  
31 the effects of modifications to the coordinated long-term operation of the CVP  
32 and SWP that are likely to avoid jeopardy to listed species and destruction or  
33 adverse modification of designated critical habitat.

34 In accordance with the October 1, 2014, District Court’s order in the *Consolidated*  
35 *Delta Smelt Cases*, the Final EIS and Record of Decision are to be completed on  
36 or before December 1, 2015. By order dated October 8, 2015, this date has been  
37 extended to January 12, 2016.

38 Many of the provisions of the RPAs, as set forth in the 2008 USFWS BO and the  
39 2009 NMFS BO, require further study, monitoring, consultation, implementation

1 of adaptive management programs, and subsequent environmental documentation  
2 for future facilities to be constructed or modified. Specific actions related to these  
3 provisions are not known at this time. Therefore, this EIS assumes the  
4 completion of future actions, including provisions of the RPAs, in a manner that  
5 would be consistent with ESA and does not address impacts during construction  
6 or start-up phases of these actions.

## 7 **ES.4 Use of the Environmental Impact Statement**

8 This EIS may be used by Reclamation or cooperating agencies that are  
9 participating in the preparation of this EIS to inform future decisions related to  
10 operation of the CVP and SWP, and implementation of the RPAs in the 2008  
11 USFWS BO and 2009 NMFS BO.

## 12 **ES.5 Purpose and Need**

13 NEPA regulations require a statement regarding “the underlying purpose and need  
14 to which the agency is responding in proposing the alternatives, including the  
15 proposed action” (40 Code of Federal Regulations (CFR) 1502.13).

### 16 **ES.5.1 Purpose of the Action**

17 The purpose of the action considered in this EIS is to continue the operation of the  
18 CVP in coordination with operation of the SWP, for its authorized purposes, in a  
19 manner that:

- 20 • Is similar to historic operational parameters with certain modifications;
- 21 • Is consistent with Federal Reclamation law; other Federal laws and  
22 regulations; Federal permits and licenses; State of California water rights,  
23 permits, and licenses; and
- 24 • Enables Reclamation and DWR to satisfy their contractual obligations to the  
25 fullest extent possible.

### 26 **ES.5.2 Need for the Action**

27 Continued operation of the CVP is needed to provide river regulation, navigation;  
28 flood control; water supply for irrigation and domestic uses; fish and wildlife  
29 mitigation, protection, and restoration; fish and wildlife enhancement; and power  
30 generation. The CVP and the SWP facilities are also operated to provide  
31 recreation benefits and in accordance with the water rights and water quality  
32 requirements adopted by the SWRCB.

33 The USFWS and NMFS concluded in their 2008 and 2009 BOs, respectively, that  
34 the coordinated long-term operation of the CVP and SWP, as described in the  
35 2008 Reclamation BA, jeopardized the continued existence of listed species and  
36 adversely modified critical habitat. To remedy this, the USFWS and NMFS  
37 provided RPAs in their respective BOs.



1 The Appellate Court confirmed the District Court ruling that Reclamation must  
2 conduct a NEPA review to determine whether the provisional acceptance and  
3 implementation of the RPA actions cause a significant effect to the human  
4 environment.

## 5 **ES.6 Project Area**

6 The project area boundaries are defined by the locations of most of the CVP  
7 facilities and their service areas; and all of the SWP facilities and the SWP service  
8 areas. The CVP facilities associated with Millerton Lake, including the Madera  
9 and Friant-Kern canals and their service areas, and the San Joaquin River  
10 Restoration Program are not part of the project area for this EIS because the  
11 operations of these facilities were not addressed in either the 2008 USFWS BO or  
12 2009 NMFS BO.

## 13 **ES.7 Study Period**

14 The coordinated long-term operation of the CVP and SWP, as described in this  
15 EIS, would continue to at least 2030 before CVP and SWP operations would  
16 change. These changes could include projects considered as part of the  
17 cumulative effects analyses. Therefore, the EIS analyzes future conditions  
18 projected for the Year 2030. It is recognized that many changes between existing  
19 conditions and 2030 would occur without changes to CVP and SWP operations,  
20 including local land use decisions, implementation of new water management  
21 facilities, and climate change.

22 As the changing conditions described above and other future changes occur,  
23 changes in long-term operation of the CVP and SWP may be required. This may  
24 require the re-initiation of consultation on the 2008 USFWS BO and 2009 NMFS  
25 BO. Therefore, because the above-described changes in conditions are likely to  
26 occur by 2030 and because new BOs would be required, this EIS considers a  
27 study period that concludes in 2030.

## 28 **ES.8 Proposed Action and Preferred Alternative**

29 The Notice of Intent to prepare this EIS was published in March 2012 identified  
30 an “initial Proposed Action” that included the operational actions of the 2008  
31 USFWS BO and 2009 NMFS BO, without structural changes included in the RPA  
32 actions that would require future studies and environmental documentation to  
33 define recommended actions, including fish passage around the CVP dams. The  
34 initial Proposed Action is included in this EIS as Alternative 2.

35 Based upon the analysis in this EIS of aquatic resources by 2030, climate change  
36 may result in substantially higher air temperatures than during recent conditions.  
37 Higher air temperatures would likely increase water temperatures in both the CVP

1 reservoirs and in the rivers downstream of the CVP dams. Under these  
2 conditions, Reclamation may not be able to operate the reservoirs under the initial  
3 Proposed Action without fish passage in a manner that would meet water  
4 temperature objectives; and it may not be possible to avoid jeopardizing the  
5 continued existence of listed species and/or resulting in an adverse modification  
6 of critical habitat.

7 Based upon the results of the impact analyses presented in this EIS, the Preferred  
8 Alternative is the No Action Alternative. The No Action Alternative contains all  
9 of the RPA actions in the 2008 USFWS BO and 2009 NMFS BO, as amended,  
10 including the RPA actions to evaluate fish passage to upstream habitats that  
11 exhibit lower water temperatures. Further discussion of the selection of the  
12 Preferred Alternative will be included in the Record of Decision.

13 The Environmentally Preferred Alternative also will be identified and disclosed in  
14 the Record of Decision, as required by the Council of Environmental Quality  
15 regulations.

## 16 **ES.9 Summary Description of Alternatives**

17 Identification of the No Action Alternative and the range of alternatives for this  
18 EIS were developed to respond to the purpose and need for the action and to  
19 comments received during the scoping process and preparation of the EIS.

20 Twenty-three alternative concepts were identified during the scoping process and  
21 through meetings with stakeholders and agencies during preparation of this EIS.  
22 The alternative concepts were compared to screening criteria that were developed  
23 based on the purpose of the action. The alternative concepts were also reviewed  
24 to determine if they addressed substantial issues. Based upon the comparison of  
25 screening criteria to the alternative concepts, 17 of the 23 alternative concepts  
26 were identified to be included in one or more of the alternatives evaluated in this  
27 EIS. The alternative concepts were combined into five specific alternatives that  
28 were consistent with assumptions for the year 2030. Further development of the  
29 alternatives was informed by subsequent comments received during preparation  
30 of the EIS.

31 All of the alternatives, including the No Action Alternative, include the same  
32 assumptions related to (1) climate change and sea level rise in Year 2030, and  
33 (2) development throughout California in accordance with existing general plans,  
34 existing contracts, and implementation of reasonable and foreseeable water  
35 resources management projects.

### 36 **ES.9.1 Inclusion of the Second Basis of Comparison**

37 The No Action Alternative is defined as the projections of current conditions and  
38 trends into the future without implementation of the alternatives. These projected  
39 conditions are defined in Question 3 of the Council on Environmental Quality  
40 (CEQ) Forty Most Asked Questions as “no change’ from current management  
41 direction or level of management intensity.” The No Action Alternative also can

1 be defined as “no project” in cases where a new project is proposed for  
2 implementation. However, all of the alternatives evaluated in this EIS are to  
3 continue the coordinated long-term operation of the CVP and SWP. Therefore,  
4 the definition of the No Action Alternative used for this EIS is continuation of the  
5 current management direction and level of intensity.

6 For this EIS, the No Action Alternative is based upon the continued operation of  
7 the CVP and SWP in the same manner as was occurring at the time of the  
8 publication of the Notice of Intent in March 2012. Thus, the No Action  
9 Alternative consists of the coordinated long-term operation of the CVP and SWP,  
10 including full implementation of the RPAs in the 2008 USFWS BO and 2009  
11 NMFS BO, because Reclamation provisionally accepted the BOs in 2008 and  
12 2009, respectively, began implementing the RPAs, and continues to implement  
13 the RPAs to date. The No Action Alternative also includes changes not related to  
14 the long-term operation of the CVP and SWP or implementation of the RPAs in  
15 the 2008 USFWS BO and 2009 NMFS BO.

16 Numerous scoping comments requested that the No Action Alternative not  
17 include the RPAs in the 2008 USFWS BO and 2009 NMFS BO because, at that  
18 time, the District Court had remanded the BOs back to USFWS and NMFS. The  
19 comments indicated that the EIS should include a “basis of comparison” for the  
20 alternatives that was similar to conditions prior to implementation of the RPAs.  
21 Scoping comments also indicated that a “No Action Alternative scenario” without  
22 implementation of the RPAs in the 2008 USFWS BO and 2009 NMFS BO could  
23 be used to analyze the effects of implementing the RPAs.

24 Determining an appropriate baseline without the 2008 USFWS BO and 2009  
25 NMFS BO actions and yet continuing to meet all of Reclamation’s statutory and  
26 regulatory requirements is a difficult task. Simply analyzing a No Action  
27 Alternative that is similar to the project description described in either the 2004  
28 Biological Assessment or 2008 Biological Assessment is insufficient, as each was  
29 found to jeopardize listed species, the 2004 Biological Assessment by the District  
30 Court in 2007, and the 2008 Biological Assessment by USFWS and NMFS.  
31 Either of these operations would be inconsistent with Reclamation’s existing  
32 policy and management direction.

33 Because the RPAs were provisionally accepted and the No Action Alternative  
34 represents a continuation of existing policy and management direction, the No  
35 Action Alternative includes the RPAs. However, in response to scoping  
36 comments and subsequent comments from stakeholders and interest groups, and  
37 to provide a basis for comparison of the effects of implementation of the RPAs  
38 (per the District Court’s mandate), this EIS includes a “Second Basis of  
39 Comparison” that represents a condition in 2030 without implementation of the  
40 2008 USFWS BO and 2009 NMFS BO. All of the alternatives are compared to  
41 the No Action Alternative and to the Second Basis of Comparison to describe the  
42 effects that could occur in 2030 under both bases of comparison.

43 Several of the 2008 USFWS BO RPA and 2009 NMFS BO RPA actions had been  
44 initiated prior to issuance of the 2009 NMFS BO; those actions are included in the

1 Second Basis of Comparison. Reasonably foreseeable actions included in the No  
2 Action Alternative that are not related to the 2008 USFWS BO or 2009 NMFS  
3 BO are also included in the Second Basis of Comparison.

4 **ES.9.2 No Action Alternative**

5 The definition of the No Action Alternative is based upon the following  
6 assumptions.

- 7 • Continued long-term operation of the CVP and SWP in accordance with  
8 ongoing management policies, criteria, and regulations, including water right  
9 permits and licenses issued by the SWRCB; and operational requirements of  
10 the 2008 USFWS BO and the 2009 NMFS BO.
- 11 • Implementation of existing and future actions described in the 2008 USFWS  
12 BO and 2009 NMFS BO that would occur by 2030 without implementation of  
13 the BOs, including:
  - 14 – 2008 USFWS BO RPA Component 4, Habitat Restoration and 2009  
15 NMFS BO RPA Action I.6.1, Restoration of Floodplain Habitat; and  
16 Action I.6.2, Near-Term Actions at Liberty Island/Lower Cache Slough  
17 and Lower Yolo Bypass; Action I.6.3, Lower Putah Creek Enhancements;  
18 Action I.6.4, Improvements to Lisbon Weir; and Action I.7, Reduce  
19 Migratory Delays and Loss of Salmon, Steelhead, and Sturgeon at  
20 Fremont Weir and Other Structures in the Yolo Bypass - Restoration of  
21 more than 10,000 acres of intertidal and associated subtidal wetlands in  
22 Suisun Marsh and Cache Slough; and at least 17,000 to 20,000 acres of  
23 seasonal floodplain restoration in Yolo Bypass.
  - 24 – 2009 NMFS BO RPA Action I.1.3, Clear Creek Spawning Gravel  
25 Augmentation - Gravel augmentation in Clear Creek in addition to several  
26 gravel augmentation programs in the Sacramento Valley watershed being  
27 implemented in accordance with CVPIA.
  - 28 – 2009 NMFS BO RPA Action I.1.4, Spring Creek Temperature Control  
29 Curtain Replacement - Replacement of the Spring Creek Temperature  
30 Control Curtain.
  - 31 – 2009 NMFS BO RPA Action I.2.6, Restore Battle Creek for Winter-Run,  
32 Spring-Run, and Central Valley Steelhead - Habitat restoration of Battle  
33 Creek.
  - 34 – 2009 NMFS BO RPA Action I.3.1, Operate Red Bluff Diversion Dam  
35 with Gates Out - Implementation of Red Bluff Pumping Plant.
  - 36 – 2009 NMFS BO RPA Action I.5, Funding for CVPIA Anadromous Fish  
37 Screen Program - Implementation of the CVPIA Anadromous Fish Screen  
38 Program.
  - 39 – 2009 NMFS BO RPA Action II.1, Lower American River Flow  
40 Management - Implementation of the American River Flow Management  
41 Standard.

- 1 • Implementation of existing and future actions not described in the 2009
- 2 NMFS BO that would occur by 2030 without implementation of any
- 3 alternatives considered in this EIS, including:
- 4 – Trinity River Restoration Program.
- 5 – Clear Creek Mercury Abatement and Fisheries Restoration Project.
- 6 – Iron Mountain Mine Superfund Site cleanup.
- 7 – Mainstem Sacramento River and American River Gravel Augmentation
- 8 Programs.
- 9 – Nimbus Fish Hatchery Fish Passage Project.
- 10 – Folsom Dam Water Control Manual Update.
- 11 – FERC Relicensing for Middle Fork of the American River Project.
- 12 – Lower Mokelumne River Spawning Habitat Improvement Project.
- 13 – Dutch Slough Tidal Marsh Restoration.
- 14 – Suisun Marsh Habitat Management, Preservation, and Restoration Plan
- 15 Implementation.
- 16 – Tidal Wetland Restoration in the Delta and Suisun Marsh.
- 17 – San Joaquin River Restoration Program.
- 18 – Stockton Deep Water Ship Channel Demonstration Dissolved Oxygen
- 19 Project.
- 20 – Grasslands Bypass Project.
- 21 – Central Valley Salinity Alternatives for Long-Term Sustainability
- 22 (CV-SALTS).
- 23 – Municipal Water Supply Projects identified in Urban Water Management
- 24 Plans that have undergone environmental review and are reasonably
- 25 foreseeable.
- 26 – Water Transfer Projects.

27 **ES.9.3 Second Basis of Comparison**

28 The definition of the Second Basis of Comparison is based upon the following  
 29 assumptions.

- 30 • Continued long-term operation of the CVP and SWP in accordance with
- 31 ongoing management policies, criteria, and regulations, including water right
- 32 permits and licenses issued by the SWRCB without implementation of the
- 33 2008 USFWS BO and the 2009 NMFS BO.
- 34 • Implementation of existing and future actions that would occur by 2030
- 35 without implementation of the BOs, including actions that have already been
- 36 constructed or have substantial progress:

## Executive Summary

- 1       – Restoration of more than 10,000 acres of intertidal and associated subtidal  
2       wetlands in Suisun Marsh and Cache Slough; and at least 17,000 to  
3       20,000 acres of seasonal floodplain restoration in Yolo Bypass (as being  
4       implemented under a separate program adopted in 2014, Suisun Marsh  
5       Habitat Management, Preservation, and Restoration Plan, and referenced  
6       in 2008 USFWS BO RPA Component 4, Habitat Restoration; and as being  
7       developed under Yolo Bypass Salmonid Habitat Restoration and Fish  
8       Passage Implementation Plan and referenced in 2009 NMFS BO RPA  
9       Action I.6.1, Restoration of Floodplain Habitat; and Action I.6.2, Near-  
10      Term Actions at Liberty Island/Lower Cache Slough and Lower Yolo  
11      Bypass; Action I.6.3, Lower Putah Creek Enhancements; Action I.6.4,  
12      Improvements to Lisbon Weir; and Action I.7, Reduce Migratory Delays  
13      and Loss of Salmon, Steelhead, and Sturgeon at Fremont Weir and Other  
14      Structures in the Yolo Bypass).
- 15      – Gravel augmentation in the Sacramento Valley and Stanislaus River  
16      watershed (as being implemented under a separate program and including  
17      program under CVPIA and referenced in 2009 NMFS BO RPA  
18      Action I.1.3, Clear Creek Spawning Gravel Augmentation).
- 19      – Replacement of the Spring Creek Temperature Control Curtain (as was  
20      constructed and placed into operation in 2011 and referenced in 2009  
21      NMFS BO RPA Action I.1.4, Spring Creek Temperature Control Curtain  
22      Replacement).
- 23      – Habitat restoration of Battle Creek (as being implemented under a separate  
24      program and referenced in 2009 NMFS BO RPA Action I.2.6, Restore  
25      Battle Creek for Winter-Run, Spring-Run, and Central Valley Steelhead).
- 26      – Implementation of Red Bluff Pumping Plant (as was constructed and  
27      placed into operation in 2012 and referenced in 2009 NMFS BO RPA  
28      Action I.3.1, Operate Red Bluff Diversion Dam with Gates Out).
- 29      – Implementation of the CVPIA Anadromous Fish Screen Program (as was  
30      initiated in the 1990s and referenced in 2009 NMFS BO RPA Action I.5,  
31      Funding for CVPIA Anadromous Fish Screen Program).
- 32      – Implementation of the American River Flow Management Standard (as  
33      was initiated in 2006 and referenced in 2009 NMFS BO RPA Action II.1,  
34      Lower American River Flow Management).
- 35      – Trinity River Restoration Program.
- 36      – Clear Creek Mercury Abatement and Fisheries Restoration Project.
- 37      – Iron Mountain Mine Superfund Site cleanup.
- 38      – Mainstem Sacramento River and American River Gravel Augmentation  
39      Programs.
- 40      – Nimbus Fish Hatchery Fish Passage Project.
- 41      – FERC Relicensing for Middle Fork of the American River Project.

- 1       – Lower Mokelumne River Spawning Habitat Improvement Project.
- 2       – Dutch Slough Tidal Marsh Restoration.
- 3       – Tidal Wetland Restoration in the Delta and Suisun Marsh.
- 4       – San Joaquin River Restoration Program.
- 5       – Stockton Deep Water Ship Channel Demonstration Dissolved Oxygen
- 6       Project.
- 7       – Grasslands Bypass Project.
- 8       – Municipal Water Supply Projects identified in Urban Water Management
- 9       Plans that have undergone environmental review and are reasonably
- 10      foreseeable.
- 11      – Water Transfer Projects.

#### 12   **ES.9.4   Alternative 1**

13   Alternative 1 was created because many comments requested an alternative that  
 14   reflected conditions without implementation of the 2008 USFWS BO and the  
 15   2009 NMFS BO RPAs. Since the Second Basis of Comparison is not a true  
 16   alternative, in accordance with NEPA guidelines, Reclamation could not select  
 17   the Second Basis of Comparison as a preferred alternative. Therefore,  
 18   Alternative 1 is identical to the Second Basis of Comparison.

#### 19   **ES.9.5   Alternative 2**

20   Alternative 2 was first included in the Notice of Intent and identified as an initial  
 21   proposed action that included the operational actions of the 2008 USFWS BO and  
 22   2009 NMFS BO. Alternative 2 does not include RPA actions that would require  
 23   future studies and environmental documentation to define recommended actions  
 24   (generally, structural actions). Therefore, Alternative 2 includes the assumptions  
 25   in the No Action Alternative except:

- 26   • 2009 NMFS BO RPA Action I.2.5, Winter-Run Passage and Re-Introduction
- 27   Program at Shasta Dam.
- 28   • 2009 NMFS BO RPA Action II.3, Structural Improvements for Temperature
- 29   Management on the American River.
- 30   • 2009 NMFS BO RPA Action II.5, Fish Passage at Nimbus and Folsom Dams.
- 31   • 2009 NMFS BO RPA Action II.6, Implement Actions to Reduce Genetic
- 32   Effects of Nimbus and Trinity River Fish Hatchery Operations.
- 33   • 2009 NMFS BO RPA Action III.2.1, Increase and Improve Quality of
- 34   Spawning Habitat with Addition of Gravel.
- 35   • 2009 NMFS BO RPA Action III.2.2, Conduct Floodplain Restoration and
- 36   Inundation Flows in Winter or Spring to Inundate Steelhead Juvenile Rearing
- 37   Habitat on Stanislaus River.

- 1 • 2009 NMFS BO RPA Action III.2.3, Restore Freshwater Migratory Habitat  
2 for Juvenile Steelhead on Stanislaus River.
- 3 • 2009 NMFS BO RPA Action III.2.4, Fish Passage at New Melones, Tulloch,  
4 and Goodwin Dams.
- 5 • 2009 NMFS BO RPA Action IV.4, Tracy Fish Collection Facility  
6 Improvements to Reduce Pre-Screen Loss and Improve Screening Efficiency.
- 7 • 2009 NMFS BO RPA Action IV.4.2 Skinner Fish Collection Facility  
8 Improvements to Reduce Pre-Screen Loss and Improve Screening Efficiency.
- 9 • 2009 NMFS BO RPA Action IV.4.3 Tracy Fish Collection Facility and the  
10 Skinner Fish Collection Facility Actions to Improve Salvage Monitoring,  
11 Reporting and Release Survival Rates.
- 12 • 2009 NMFS BO RPA Action V Fish Passage.

### 13 **ES.9.6 Alternative 3**

14 Alternative 3 was developed based upon a scoping comment from the Coalition  
15 for a Sustainable Delta, including actions related to their “RPA Alternative 1,”  
16 and a scoping comment received from Oakdale Irrigation District (OID) and  
17 South San Joaquin Irrigation District (SSJID). The definition of Alternative 3 is  
18 based upon the following assumptions.

- 19 • Continued long-term operation of the CVP and SWP in accordance with  
20 ongoing management policies, criteria, and regulations, including water right  
21 permits and licenses issued by the SWRCB; without the operational  
22 requirements of the 2008 USFWS BO and the 2009 NMFS BO RPAs.
- 23 • Implementation of the 2012 operations plan for New Melones Reservoir  
24 proposed by OID and SSJID.
- 25 • Additional demands for American River water supplies for up to 17,000 acre-  
26 feet/year under a Warren Act contract for El Dorado Irrigation District and  
27 15,000 acre-feet/year under a water service contract for El Dorado County  
28 Water Agency.
- 29 • Implementation of actions described in the scoping comments letter from the  
30 Coalition for a Sustainable Delta related to their “RPA Alternative 1.”
  - 31 – The Old and Middle River (OMR) flow criteria under Alternative 3 are  
32 based on concepts addressed in the 2008 USFWS BO and 2009 NMFS BO  
33 related to adaptive restrictions for temperature, turbidity, salinity, and  
34 presence of Delta Smelt.
  - 35 – Flood control operations for the New Melones Reservoir would be the  
36 same as under the No Action Alternative. However, New Melones  
37 Reservoir would be operated for different fishery flows, water quality  
38 flows, and San Joaquin River base flows and pulse flows at Vernalis.



- 1       – Implement predator control programs for Black Bass, Striped Bass, and  
2       Pikeminnow to protect salmonids and Delta Smelt, including  
3       establishment of new catch limits.
- 4       – Restore or create at least 10,000 acres of tidally influenced seasonal or  
5       perennial wetlands (these conditions are the same as under the No Action  
6       Alternative and Second Basis of Comparison).
- 7       – Establish a trap and haul program for juvenile salmonids entering the  
8       Delta from the San Joaquin River upstream of the Head of Old River in  
9       March through June with a release site near Chipps Island.
- 10      – Modify ocean harvest limits for consistency with Viable Salmonid  
11      Population Standards; including harvest management plan to show that  
12      abundance, productivity, and diversity (age-composition) are not  
13      appreciably reduced.
- 14      • Implementation of future actions that would occur by 2030 without  
15      implementation of any alternatives considered in this EIS, as described above  
16      for the Second Basis of Comparison.

17      **ES.9.7    Alternative 4**

18      Alternative 4 was developed based upon a scoping comment from the Coalition  
19      for a Sustainable Delta, including actions related to their “RPA Alternative 2.”  
20      The definition of Alternative 4 is based upon the following assumptions.

- 21      • Continued long-term operation of the CVP and SWP in accordance with  
22      ongoing management policies, criteria, and regulations, including water right  
23      permits and licenses issued by the SWRCB; without the operational  
24      requirements of the 2008 USFWS BO and the 2009 NMFS BO, as described  
25      under Second Basis of Comparison.
- 26      • Implementation of actions described in the scoping comments letter from the  
27      Coalition for a Sustainable Delta related to their “RPA Alternative 2.”
  - 28          – Limit floodplain development to protect salmonids and Delta Smelt by  
29          incorporating guidance into flood hazard mapping to comply with ESA;  
30          prioritizing consideration of ESA listed species and critical habitats in  
31          flood insurance studies; refine community rating system to provide credits  
32          for natural and beneficial functions; prohibit new development and  
33          substantial improvements to existing development within any designated  
34          floodway or within 170 feet of the ordinary high water line of any  
35          floodway.
  - 36          – Modify the requirements of the U.S. Army Corps of Engineers related to  
37          removal of vegetation on levees to allow for the planting of trees and  
38          shrubs along the levees; and installation of vegetation, woody material,  
39          and root re-enforcement material on the levees instead of riprap for  
40          erosion protection.

- 1       – Implement predator control programs for Black Bass, Striped Bass, and  
2       Pikeminnow to protect salmonids and Delta Smelt, including  
3       establishment of new catch limits.
- 4       – Restore or create at least 10,000 acres of tidally influenced seasonal or  
5       perennial wetlands (these conditions are the same as under the No Action  
6       Alternative and Second Basis of Comparison).
- 7       – Establish a trap and haul program for juvenile salmonids entering the  
8       Delta from the San Joaquin River upstream of the Head of Old River in  
9       March through June with a release site near Chipps Island.
- 10      – Modify ocean harvest limits to reduce by-catch of winter-run and spring-  
11      run Chinook Salmon to less than 10 percent of age-3 cohort in all years.
- 12      • Implementation of future actions that would occur by 2030 without  
13      implementation of any alternatives considered in this EIS, as described above  
14      for the Second Basis of Comparison.

15      **ES.9.8    Alternative 5**

16      Alternative 5 was developed considering comments from environmental interest  
17      groups during the scoping process. Alternative 5 is similar to the No Action  
18      Alternative with reduced potential for reverse flows in April and May and with  
19      associated increased Delta outflow; and use of the SWRCB D-1641 pulse flow at  
20      Vernalis. The definition of Alternative 5 is based upon the following  
21      assumptions.

- 22      • Continued long-term operation of the CVP and SWP in accordance with  
23      ongoing management policies, criteria, and regulations, including water right  
24      permits and licenses issued by the SWRCB; including the requirements of the  
25      2008 USFWS BO and the 2009 NMFS BO.
- 26      • The OMR flow criteria similar to the RPA criteria in the 2008 USFWS BO  
27      and 2009 NMFS BO plus a requirement for positive OMR (no reverse flows)  
28      in April and May of all water year types.
- 29      • New Melones Reservoir operations are similar to assumptions under the No  
30      Action Alternative except additional requirements were added to meet the  
31      SWRCB D-1641 April and May pulse flows at Vernalis on the San Joaquin  
32      River.
- 33      • Additional demands for American River water supplies for up to 17,000 acre-  
34      feet/year under a Warren Act Contract for El Dorado Irrigation District and  
35      15,000 acre-feet/year under a water service contract for El Dorado County  
36      Water Agency.
- 37      • Implementation of future actions that would occur by 2030 without  
38      implementation of any alternatives considered in this EIS, as described above  
39      for the No Action Alternative.

## 1 **ES.10 Impact Analysis**

2 An EIS must evaluate the effects of implementation of the alternatives on the  
3 environment; and identify any adverse environmental effects which cannot be  
4 avoided, the relationship between short-term uses of the human environment and  
5 long-term productivity; and any irreversible or irretrievable commitments of  
6 resources if the alternatives are implemented. The impact analyses section of  
7 each resource chapter (Chapters 5 through 21 of the EIS) address direct, indirect,  
8 and cumulative effects of the alternatives as compared to the No Action  
9 Alternative and the Second Basis of Comparison in the following manner:

- 10 • Alternatives 1 through 5 are compared to the No Action Alternative.
- 11 • Alternatives 1 through 5 and the No Action Alternative are compared to the  
12 Second Basis of Comparison.

13 Potential mitigation measures are presented to the extent possible for each  
14 resource to avoid, minimize, rectify, reduce, eliminate, or compensate for adverse  
15 environmental effects of Alternatives 1 through 5 as compared to the No Action  
16 Alternative. Mitigation measures were not included to address adverse impacts  
17 under the alternatives as compared to the Second Basis of Comparison because  
18 this analysis was included in this EIS for information purposes only.

19 Tables ES.1 and ES.2 present summaries of the environmental changes of  
20 Alternatives 1 through 5 as compared to the No Action Alternative and the  
21 Second Basis of Comparison, respectively. These tables are located at the end of  
22 this Executive Summary.

23 These tables summarize the results of both the quantitative and qualitative impact  
24 analyses. The tables include relative quantitative differences for adverse impacts  
25 to provide a basis for consideration of mitigation measures. Differences in the  
26 quantitative analyses of 5 percent or less are considered to be “similar” because  
27 the modeling analyses are based on CalSim II model output which operates with  
28 monthly time steps. Therefore, it was determined that changes in the model of  
29 5 percent or less were related to the uncertainties in the model processing.

30 Changes in surface water conditions are provided as a basis for identifying the  
31 impacts as described in Aquatic, Terrestrial, and Recreation resources. Therefore,  
32 no mitigation measures are presented for Surface Water Resources.

## 33 **ES.11 Public Involvement and Next Steps**

34 Public involvement was initiated with the scoping process on March 28, 2012,  
35 with the publication of the Notice of Intent in the Federal Register (FR) and  
36 continued through June 28, 2012. Initially, the public scoping process was to be  
37 completed on May 29, 2012. During the public scoping process, other agencies  
38 and interested persons requested an extension of the public scoping period to  
39 allow additional opportunities to provide scoping comments. In response to these  
40 requests, Reclamation published a notice on May 25, 2012, extending the public

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1 scoping period through June 28, 2012. Reclamation held five scoping meetings  
2 which were attended by 256 individuals. Scoping comments were used in the  
3 development of a reasonable range of alternatives and identification of key issues.

4 Reclamation also posted on its website an initial range of alternatives discussed at  
5 a stakeholders meeting on October 19, 2012. Several project status meetings were  
6 held with cooperating agencies and other stakeholders during preparation of the  
7 Draft EIS. Comments received during these processes were used to refine the  
8 description of the alternatives.

9 The Draft EIS was issued for public review in July 2015. Reclamation posted  
10 notification of the availability of the Public Draft EIS and the location and timing  
11 of four public meetings on its website, in the Federal Register, and through press  
12 releases. Approximately 860 written and verbal comments were received on the  
13 Draft EIS. All of the comments received on the Draft EIS were considered in  
14 preparation of the Final EIS. Written responses to all substantive comments  
15 received are included in Appendices 1A through 1E of the Final EIS.

16 Reclamation will make the Final EIS available for 30 days before finalizing the  
17 Record of Decision (ROD). In the ROD, which is the final step in the NEPA  
18 process, Reclamation will document its decision on which actions, if any, to take  
19 to address the primary objectives. Reclamation will also identify the  
20 Environmentally Preferred Alternative, describe other risk reduction plans it  
21 considered, identify any mitigation plans, and describe factors and comments  
22 taken into consideration when making its decision.

1 **Table ES.1 Comparison of Alternatives 1 through 5 to the No Action Alternative**

	<b>Alternative 1 Compared to the No Action Alternative</b>	<b>Alternative 2 Compared to the No Action Alternative</b>	<b>Alternative 3 Compared to the No Action Alternative</b>	<b>Alternative 4 Compared to the No Action Alternative</b>	<b>Alternative 5 Compared to the No Action Alternative</b>
<b>Surface Water</b>					
Trinity Lake	Water surface elevations similar. Storage similar or increased.	No change.	Water surface elevations similar. Storage similar or increased.	Water surface elevations similar. Storage similar or increased.	Water surface elevations similar. Storage similar or increased.
Trinity River at Lewiston Dam	Flows similar or increased.	No change.	Flows similar or increased.	Flows similar or increased.	Water surface elevations similar. Storage similar.
Shasta Lake	Water surface elevations similar. Storage similar or increased.	No change.	Water surface elevations similar. Storage similar or increased.	Water surface elevations similar. Storage similar or increased.	Water surface elevations similar. Storage similar.
Sacramento River at Keswick Dam	Flows similar or increased except reduced in September and November (up to 44%).	No change.	Flows similar or increased except reduced in September and November (up to 42%).	Flows similar or increased except reduced in September and November (up to 44%).	Flows similar.
Sacramento River at Freeport	Flows similar or increased except reduced in September and November (up to 47%).	No change.	Flows similar or increased except reduced in September and November (up to 48%).	Flows similar or increased except reduced in September and November (up to 47%).	Flows similar.
Clear Creek near Igo	Flows same except reduced in May (41%).	No change.	Flows same except reduced in May (29%).	Flows same except reduced in May (41%).	No change.
Lake Oroville	Water surface elevations similar. Storage reduced except in June (up to 22%).	No change.	Water surface elevations similar. Storage similar or increased.	Water surface elevations similar. Storage reduced except in June (up to 22%).	Water surface elevations similar. Storage similar.

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	<b>Alternative 1 Compared to the No Action Alternative</b>	<b>Alternative 2 Compared to the No Action Alternative</b>	<b>Alternative 3 Compared to the No Action Alternative</b>	<b>Alternative 4 Compared to the No Action Alternative</b>	<b>Alternative 5 Compared to the No Action Alternative</b>
Feather River downstream of Themalito Complex	Flows similar or increased except reduced in July-September and November-December (up to 65%).	No change.	Flows similar or increased except reduced in July-September and October-January (up to 70%).	Flows similar or increased except reduced in July-September and November-December (up to 65%).	Flows similar or increased except reduced in April-May (up to 27%).
Folsom Lake	Water surface elevations similar Storage similar or increased except reduced in June-August in above normal and below normal years (up to 15%).	No change.	Water surface elevations similar Storage similar or increased except reduced in July-August in above normal and August-September in below normal years (up to 10%).	Water surface elevations similar Storage similar or increased except in reduced June-August in above normal and below normal years (up to 15%).	Water surface elevations similar. Storage similar.
American River at Nimbus Dam	Flows similar or increased except reduced in September-November and June-July (up to 48%).	No change.	Flows similar or increased except reduced in August-November and June (up to 46%).	Flows similar or increased except reduced in September-November and June-July (up to 48%).	Flows similar or increased except reduced in September and April-May (up to 14%).
New Melones Reservoir	Water surface elevations similar Storage similar or increased.	No change.	Water surface elevations similar Storage similar or increased.	Water surface elevations similar Storage similar or increased.	Water surface elevations similar. Storage reduced in July-September in above normal years (up to 6%); and all months in below normal, dry, and critical dry years (up to 19 percent).
Stanislaus River at Goodwin Dam	Flows similar or increased except reduced in July-August, December, and March (up to 18%).	No change.	Flows similar or increased except reduced in October and February-July (up to 73%).	Flows similar or increased except reduced in July-August, December, and March (up to 18%).	Flows similar or increased except reduced in June-August (up to 18%).

	<b>Alternative 1 Compared to the No Action Alternative</b>	<b>Alternative 2 Compared to the No Action Alternative</b>	<b>Alternative 3 Compared to the No Action Alternative</b>	<b>Alternative 4 Compared to the No Action Alternative</b>	<b>Alternative 5 Compared to the No Action Alternative</b>
San Joaquin River at Vernalis	Flows similar or increased except reduced in October and April (up to 19%).	No change.	Flows similar or increased except reduced in October and May-June (up to 21%).	Flows similar or increased except reduced in October and April (up to 19%).	Flows similar or increased.
San Luis Reservoir	Water surface elevations similar Storage similar or increased.	No change.	Water surface elevations similar Storage similar or increased.	Water surface elevations similar Storage similar or increased.	Water surface elevations similar Storage similar or increased except in below normal years in June-July (up to 9%); in dry years in April-September (up to 17%); and in critical dry years in April-January (up to 18%).
Flows into Yolo Bypass	Flows similar or increased except in October in wet years (20%).	No change.	Flows similar or increased except in October in wet years (25%).	Flows similar or increased except in October in wet years (20%).	Flows similar.
Delta Outflow	Reduced flows in many months. Increased flows in some months, including in December, February-March, and June in wet years (up to 1,492 cfs); and similar or increased flows in June and September in dry years (up to 385 cfs).	No change.	Reduced flows in many months. Increased flows in some months, including in December-March, in wet years (up to 3,307cfs); and increased flows in January-February and June-July in dry years (up to 277 cfs).	Reduced flows in many months. Increased flows in some months, including in December, February-March, and June in wet years (up to 1,492 cfs); and similar or increased flows in June and September in dry years (up to 385 cfs).	Flows would be similar or increased.
Reverse Flows in Old and Middle Rivers	Increased negative flows except in July-September.	No change.	Increased negative flows except in July-September.	Increased negative flows except in July-September.	Increased positive flows except in July-August.

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	<b>Alternative 1 Compared to the No Action Alternative</b>	<b>Alternative 2 Compared to the No Action Alternative</b>	<b>Alternative 3 Compared to the No Action Alternative</b>	<b>Alternative 4 Compared to the No Action Alternative</b>	<b>Alternative 5 Compared to the No Action Alternative</b>
<b>Water Supplies</b>					
Non-CVP and Non-SWP Deliveries	Deliveries similar. No mitigation needed.	No change. No mitigation needed.	Deliveries similar. No mitigation needed.	Deliveries similar. No mitigation needed.	Deliveries similar. No mitigation needed.
CVP Water Deliveries (including CVP agricultural and municipal and industrial water service contracts; Sacramento River Settlement Contracts, San Joaquin River Exchange Contracts, and Eastside Division Contracts)	Deliveries similar or increased. No mitigation needed.	No change. No mitigation needed.	Deliveries similar or increased. No mitigation needed.	Deliveries similar or increased. No mitigation needed.	Deliveries similar or increased in wet to dry years. Reduced deliveries in the Eastside Division Contractors in critical dry years (8%). Potential Mitigation measure: Reclamation would support water transfers from other basin water rights holders.
SWP Water Deliveries (In accordance with Table A contracts without Article 21 water)	Deliveries similar or increased. No mitigation needed.	No change. No mitigation needed.	Deliveries similar or increased. No mitigation needed.	Deliveries similar or increased. No mitigation needed.	Deliveries similar or increased. No mitigation needed.



	<b>Alternative 1 Compared to the No Action Alternative</b>	<b>Alternative 2 Compared to the No Action Alternative</b>	<b>Alternative 3 Compared to the No Action Alternative</b>	<b>Alternative 4 Compared to the No Action Alternative</b>	<b>Alternative 5 Compared to the No Action Alternative</b>
<b>Surface Water Quality</b>					
Salinity in Northern Delta (near Emmaton)	Salinity increased in fall and winter months (up to 377%). Reduced in June in wet to dry years (up to 30%). Potential Mitigation Measures: Continued coordination of CVP and SWP operations to reduce salinity to the extent possible. Other mitigation measures have not been identified at this time.	No change. No mitigation needed.	Salinity increased in fall and winter months in wet and above normal years (up to 378%). Reduced in June of above normal years and September of below normal years (up to 8%). Potential Mitigation Measures: Continued coordination of CVP and SWP operations to reduce salinity to the extent possible. Other mitigation measures have not been identified at this time.	Salinity increased in the western Delta in fall and winter months (up to 377%). Potential Mitigation Measures: Continued coordination of CVP and SWP operations to reduce salinity to the extent possible. Other mitigation measures have not been identified at this time.	Salinity increased in January-February in all years (up to 8%). Reduced in April-June in critical dry years (up to 15%). Potential Mitigation Measures: Continued coordination of CVP and SWP operations to reduce salinity to the extent possible. Other mitigation measures have not been identified at this time.
Salinity in Western Delta (near Port Chicago)	Salinity increased in Oct-March in below normal, dry, and critical dry years, and September wet and above normal years (up to 96%). Potential Mitigation Measures: Continued coordination of CVP and SWP operations to reduce salinity to the extent possible. Other mitigation measures have not been identified at this time.	No change. No mitigation needed.	Salinity increased in October-January, April-May, June, and September in wet and above normal years (up to 95%). Potential Mitigation Measures: Continued coordination of CVP and SWP operations to reduce salinity to the extent possible. Other mitigation measures have not been identified at this time.	Salinity increased in Oct-March in below normal, dry, and critical dry years, and September wet and above normal years (up to 96%). Potential Mitigation Measures: Continued coordination of CVP and SWP operations to reduce salinity to the extent possible. Other mitigation measures have not been identified at this time.	Salinity similar in most months except reduced in April-May in dry and critical dry years (up to 8%). No mitigation needed.

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	<b>Alternative 1 Compared to the No Action Alternative</b>	<b>Alternative 2 Compared to the No Action Alternative</b>	<b>Alternative 3 Compared to the No Action Alternative</b>	<b>Alternative 4 Compared to the No Action Alternative</b>	<b>Alternative 5 Compared to the No Action Alternative</b>
Salinity in Western Central Delta (near Antioch)	Salinity increased in fall and winter months (up to 265%). Reduced in June in wet to below normal years (up to 14%). Potential Mitigation Measures: Continued coordination of CVP and SWP operations to reduce salinity to the extent possible. Other mitigation measures have not been identified at this time.	No change. No mitigation needed.	Salinity increased in fall and winter months (up to 262%). Potential Mitigation Measures: Continued coordination of CVP and SWP operations to reduce salinity to the extent possible. Other mitigation measures have not been identified at this time.	Salinity increased in fall and winter months (up to 265%). Reduced in June in wet to below normal years (up to 14%). Potential Mitigation Measures: Continued coordination of CVP and SWP operations to reduce salinity to the extent possible. Other mitigation measures have not been identified at this time.	Salinity increased in February in critical dry years (7%). Reduced in April-May in below normal to critical dry years, and in June in critical dry years (up to 20%). Potential Mitigation Measures: Continued coordination of CVP and SWP operations to reduce salinity to the extent possible. Other mitigation measures have not been identified at this time.
Salinity in Western Central Delta (near Contra Costa Water District Intakes)	Salinity increased in October-January and September in wet and above normal years (up to 65%). Reduced in March-June in wet to below normal years (up to 32%). Potential Mitigation Measures: Continued coordination of CVP and SWP operations to reduce salinity to the extent possible. Other mitigation measures have not been identified at this time.	No change. No mitigation needed.	Salinity increased in October-December in all year types, and January in above normal to dry years, and in September in wet and above normal years (up to 76%). Reduced in April-June (up to 34%). Potential Mitigation Measures: Continued coordination of CVP and SWP operations to reduce salinity to the extent possible. Other mitigation measures have not been identified at this time.	Salinity increased in October-January and September in wet and above normal years (up to 65%). Reduced in March-June in wet to below normal years (up to 32%). Potential Mitigation Measures: Continued coordination of CVP and SWP operations to reduce salinity to the extent possible. Other mitigation measures have not been identified at this time.	Salinity increased in April-June in below normal to critical dry years (up to 40%). Potential Mitigation Measures: Continued coordination of CVP and SWP operations to reduce salinity to the extent possible. Other mitigation measures have not been identified at this time.

	<b>Alternative 1 Compared to the No Action Alternative</b>	<b>Alternative 2 Compared to the No Action Alternative</b>	<b>Alternative 3 Compared to the No Action Alternative</b>	<b>Alternative 4 Compared to the No Action Alternative</b>	<b>Alternative 5 Compared to the No Action Alternative</b>
Salinity in Southern Delta (near CVP and SWP intakes)	Salinity increased in fall and early winter months (up to 65%). Reduced in February-June (up to 22%). Potential Mitigation Measures: Continued coordination of CVP and SWP operations to reduce salinity to the extent possible. Other mitigation measures have not been identified at this time.	No change. No mitigation needed.	Salinity increased in October-December (up to 29% at Jones Pumping Plant intake and up to 41% at Clifton Court intake). Reduced in June (up to 13% at Jones Pumping Plant intake and up to 19% at Clifton Court intake). Potential Mitigation Measures: Continued coordination of CVP and SWP operations to reduce salinity to the extent possible. Other mitigation measures have not been identified at this time.	Salinity increased in fall and early winter months (up to 65%). Reduced in February-June (up to 22%). Potential Mitigation Measures: Continued coordination of CVP and SWP operations to reduce salinity to the extent possible. Other mitigation measures have not been identified at this time.	Salinity increased in June in dry and critical dry years (up to 12%). Potential Mitigation Measures: Continued coordination of CVP and SWP operations to reduce salinity to the extent possible. Other mitigation measures have not been identified at this time.
Mercury in Delta Fish	Mercury concentrations similar or reduced concentrations. No mitigation needed.	No change. No mitigation needed.	Mercury concentrations similar or reduced concentrations. No mitigation needed.	Mercury concentrations similar or reduced concentrations. No mitigation needed.	Mercury concentrations similar concentrations. No mitigation needed.
Selenium in Delta and Delta Fish	Selenium concentrations similar concentrations. No mitigation needed.	No change. No mitigation needed.	Selenium concentrations similar concentrations. No mitigation needed.	Selenium concentrations similar concentrations. No mitigation needed.	Selenium concentrations similar concentrations. No mitigation needed.
<b>Groundwater Resources</b>					
Trinity River Region	Similar groundwater conditions. No mitigation needed.	No change. No mitigation needed.	Similar groundwater conditions. No mitigation needed.	Similar groundwater conditions. No mitigation needed.	Similar groundwater conditions. No mitigation needed.

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	<b>Alternative 1 Compared to the No Action Alternative</b>	<b>Alternative 2 Compared to the No Action Alternative</b>	<b>Alternative 3 Compared to the No Action Alternative</b>	<b>Alternative 4 Compared to the No Action Alternative</b>	<b>Alternative 5 Compared to the No Action Alternative</b>
Central Valley Region: Sacramento Valley	Similar groundwater conditions. No mitigation needed.	No change. No mitigation needed.	Similar groundwater conditions. No mitigation needed.	Similar groundwater conditions. No mitigation needed.	Similar groundwater conditions. No mitigation needed.
Central Valley Region: San Joaquin Valley	Reduced groundwater pumping (8%); and higher groundwater elevations (2-200 feet). Potentially improved groundwater quality. Reduced subsidence potential. No mitigation needed.	No change. No mitigation needed.	Reduced groundwater pumping (6%); and higher groundwater elevations (2-200 feet). Potentially improved groundwater quality. Reduced subsidence potential. No mitigation needed.	Reduced groundwater pumping (8%); and higher groundwater elevations (2-200 feet). Potentially improved groundwater quality. Reduced subsidence potential. No mitigation needed.	Similar groundwater pumping; and similar to higher groundwater elevations (2-25 feet). Similar groundwater quality. Similar subsidence potential. No mitigation needed.
San Francisco Bay Area, Central Coast, and Southern California Region	Potentially reduced groundwater pumping; and potentially higher groundwater elevations. Potentially improved groundwater quality. Less subsidence potential. No mitigation needed.	No change. No mitigation needed.	Potentially reduced groundwater pumping; and potentially higher groundwater elevations. Potentially improved groundwater quality. Less subsidence potential. No mitigation needed.	Potentially reduced groundwater pumping; and potentially higher groundwater elevations. Potentially improved groundwater quality. Less subsidence potential. No mitigation needed.	Similar groundwater pumping; and groundwater elevations. Potentially similar groundwater quality. Similar subsidence potential. No mitigation needed.
<b>CVP and SWP Energy Resources</b>					
Energy Generated and Used by CVP and SWP Water Users	Similar CVP net generation. Decreased SWP net generation over the long-term (41%). Potentially reduced energy use by CVP and SWP water users. No mitigation needed.	No change. No mitigation needed.	Similar CVP net generation. Decreased SWP net generation over the long-term (27%). Potentially reduced energy use by CVP and SWP water users. No mitigation needed.	Similar CVP net generation. Decreased SWP net generation over the long-term (41%). Potentially reduced energy use by CVP and SWP water users. No mitigation needed.	Similar CVP and SWP net generation. Similar reduced energy use. No mitigation needed.

	<b>Alternative 1 Compared to the No Action Alternative</b>	<b>Alternative 2 Compared to the No Action Alternative</b>	<b>Alternative 3 Compared to the No Action Alternative</b>	<b>Alternative 4 Compared to the No Action Alternative</b>	<b>Alternative 5 Compared to the No Action Alternative</b>
<b>Aquatic Resources</b>					
Trinity River: Coho Salmon	Similar conditions. No mitigation needed.	No change. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.
Trinity River: Spring-run Chinook Salmon	Similar conditions. No mitigation needed.	No change. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.
Trinity River: Fall-run Chinook Salmon	Similar conditions. No mitigation needed.	No change. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.
Trinity River: Steelhead	Similar conditions. No mitigation needed.	No change. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.
Trinity River: Green Sturgeon	Similar conditions. No mitigation needed.	No change. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.
Trinity Lake and Lewiston Reservoir: Reservoir Fish	Similar conditions. No mitigation needed.	No change. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.
Trinity River: Pacific Lamprey	Similar conditions. No mitigation needed.	No change. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.
Trinity River: Eulachon	Similar conditions. No mitigation needed.	No change. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.

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	<b>Alternative 1 Compared to the No Action Alternative</b>	<b>Alternative 2 Compared to the No Action Alternative</b>	<b>Alternative 3 Compared to the No Action Alternative</b>	<b>Alternative 4 Compared to the No Action Alternative</b>	<b>Alternative 5 Compared to the No Action Alternative</b>
Sacramento River System: Winter-run Chinook Salmon	Reduced habitat conditions due to lack of measures to address high water temperatures caused by climate change by 2030. Potential mitigation measure: Implement fish passage around dams.	Reduced habitat conditions due to lack of measures to address high water temperatures caused by climate change by 2030; reduced pulse flows along lower Clear Creek; and lack of measures to increase efficiency of fish handling facilities at Banks and Jones pumping plants. Potential mitigation measure: Implement fish passage around dams to reduce temperature impacts. No mitigation measures have been identified for remaining impacts.	Reduced habitat conditions due to lack of measures to address high water temperatures caused by climate change by 2030. Improved conditions due to predator controls. Potential mitigation measure: Implement fish passage around dams.	Reduced habitat conditions due to lack of measures to address high water temperatures caused by climate change by 2030. Improved conditions due to predator controls. Potential mitigation measure: Implement fish passage around dams.	Similar conditions. No mitigation needed.

	<b>Alternative 1 Compared to the No Action Alternative</b>	<b>Alternative 2 Compared to the No Action Alternative</b>	<b>Alternative 3 Compared to the No Action Alternative</b>	<b>Alternative 4 Compared to the No Action Alternative</b>	<b>Alternative 5 Compared to the No Action Alternative</b>
Sacramento River System: Spring-run Chinook Salmon	Reduced habitat conditions due to lack of measures to address high water temperatures caused by climate change by 2030. Potential mitigation measure: Implement fish passage around dams.	Reduced habitat conditions due to lack of measures to address high water temperatures caused by climate change by 2030; reduced pulse flows along lower Clear Creek; and lack of measures to increase efficiency of fish handling facilities at Banks and Jones pumping plants. Potential mitigation measure: Implement fish passage around dams to reduce temperature impacts. No mitigation measures have been identified for remaining impacts.	Reduced habitat conditions due to lack of measures to address high water temperatures caused by climate change by 2030. Improved conditions due to predator controls. Potential mitigation measure: Implement fish passage around dams.	Reduced habitat conditions due to lack of measures to address high water temperatures caused by climate change by 2030. Improved conditions due to predator controls. Potential mitigation measure: Implement fish passage around dams.	Similar conditions. No mitigation needed.
Sacramento River System: Fall-run Chinook Salmon	Similar conditions. No mitigation needed.	Reduced habitat conditions due to reduced pulse flows along lower Clear Creek; and lack of measures to increase efficiency of fish handling facilities at Banks and Jones pumping plants. No mitigation measures have been identified for remaining impacts.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.

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	<b>Alternative 1 Compared to the No Action Alternative</b>	<b>Alternative 2 Compared to the No Action Alternative</b>	<b>Alternative 3 Compared to the No Action Alternative</b>	<b>Alternative 4 Compared to the No Action Alternative</b>	<b>Alternative 5 Compared to the No Action Alternative</b>
Sacramento River System: Late Fall-run Chinook Salmon	Similar conditions. No mitigation needed.	Reduced habitat conditions due to lack of measures to increase efficiency of fish handling facilities at Banks and Jones pumping plants. Potential mitigation measure: Implement fish passage around dams to reduce temperature impacts. No mitigation measures have been identified for remaining impacts.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.
Sacramento River System: Steelhead	Reduced habitat conditions due to lack of measures to address high water temperatures caused by climate change by 2030. Potential mitigation measure: Implement fish passage around dams.	Reduced habitat conditions due to lack of measures to address high water temperatures caused by climate change by 2030. Potential mitigation measure: Implement fish passage around dams.	Reduced habitat conditions due to lack of measures to address high water temperatures caused by climate change by 2030. Potential mitigation measure: Implement fish passage around dams.	Reduced habitat conditions due to lack of measures to address high water temperatures caused by climate change by 2030. Potential mitigation measure: Implement fish passage around dams.	Similar conditions. No mitigation needed.
Sacramento River System: Green Sturgeon and White Sturgeon	Likely to result in improved conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Likely to result in improved conditions. No mitigation needed.	Likely to result in improved conditions. No mitigation needed.	Similar conditions. No mitigation needed.



	<b>Alternative 1 Compared to the No Action Alternative</b>	<b>Alternative 2 Compared to the No Action Alternative</b>	<b>Alternative 3 Compared to the No Action Alternative</b>	<b>Alternative 4 Compared to the No Action Alternative</b>	<b>Alternative 5 Compared to the No Action Alternative</b>
Delta: Delta Smelt	Reduced habitat conditions due to increased potential for entrainment during larval and juvenile stages, and increased salinity in the fall in the western Delta. No mitigation measures have been identified at this time.	Similar conditions. No mitigation needed.	Reduced habitat conditions due to increased potential for entrainment during larval and juvenile stages, and increased salinity in the fall in the western Delta. No mitigation measures have been identified at this time.	Reduced habitat conditions due to increased potential for entrainment during larval and juvenile stages, and increased salinity in the fall in the western Delta. No mitigation measures have been identified at this time.	Similar conditions. No mitigation needed.
Delta: Longfin Smelt	Reduced habitat conditions due to more negative Old and Middle River flows and other factors (as indicated by lower Longfin Smelt abundance indices). No mitigation measures have been identified at this time.	Similar conditions. No mitigation needed.	Reduced habitat conditions due to more negative Old and Middle River flows and other factors (as indicated by lower Longfin Smelt abundance indices). No mitigation measures have been identified at this time.	Reduced habitat conditions due to more negative Old and Middle River flows and other factors (as indicated by lower Longfin Smelt abundance indices). No mitigation measures have been identified at this time.	Similar conditions. No mitigation needed.
Delta: Sacramento Splittail	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.
Sacramento River System: Reservoir Fish	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.
Sacramento River System: Pacific Lamprey	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.

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	<b>Alternative 1 Compared to the No Action Alternative</b>	<b>Alternative 2 Compared to the No Action Alternative</b>	<b>Alternative 3 Compared to the No Action Alternative</b>	<b>Alternative 4 Compared to the No Action Alternative</b>	<b>Alternative 5 Compared to the No Action Alternative</b>
Sacramento River System: Striped Bass, American Shad, and Hardhead	<p>Similar conditions for Hardhead.</p> <p>Reduced habitat conditions for Striped Bass and American Shad due to reduced survival in larval and juvenile stages and increased salinity in the spring in the western Delta.</p> <p>No mitigation measures have been identified at this time.</p>	<p>Similar conditions.</p> <p>No mitigation needed.</p>	<p>Similar conditions for Hardhead.</p> <p>Reduced habitat conditions for Striped Bass and American Shad due to reduced survival in larval and juvenile stages and increased salinity in the spring in the western Delta.</p> <p>Adverse conditions for Striped Bass due to changes in harvest limitations.</p> <p>No mitigation measures have been identified at this time.</p>	<p>Similar conditions for Hardhead.</p> <p>Reduced habitat conditions for Striped Bass and American Shad due to reduced survival in larval and juvenile stages and increased salinity in the spring in the western Delta.</p> <p>Adverse conditions for Striped Bass due to changes in harvest limitations.</p> <p>No mitigation measures have been identified at this time.</p>	<p>Similar conditions.</p> <p>No mitigation needed.</p>

	<b>Alternative 1 Compared to the No Action Alternative</b>	<b>Alternative 2 Compared to the No Action Alternative</b>	<b>Alternative 3 Compared to the No Action Alternative</b>	<b>Alternative 4 Compared to the No Action Alternative</b>	<b>Alternative 5 Compared to the No Action Alternative</b>
Stanislaus River: Fall-run Chinook Salmon	Similar conditions. No mitigation needed.	Reduced habitat conditions due to lack of measures to address high water temperatures caused by climate change by 2030; and lack of measures to increase efficiency of fish handling facilities at Banks and Jones pumping plants. Potential mitigation measure: Implement fish passage around dams to reduce temperature impacts. No mitigation measures have been identified for remaining impacts.	Potential improved habitat conditions due to predator controls, trap and haul operations, and harvest restrictions; however, the effectiveness of these measures is uncertain. No mitigation needed.	Potential improved habitat conditions due to predator controls, trap and haul operations, and harvest restrictions; however, the effectiveness of these measures is uncertain. No mitigation needed.	Similar conditions. No mitigation needed.

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	<b>Alternative 1 Compared to the No Action Alternative</b>	<b>Alternative 2 Compared to the No Action Alternative</b>	<b>Alternative 3 Compared to the No Action Alternative</b>	<b>Alternative 4 Compared to the No Action Alternative</b>	<b>Alternative 5 Compared to the No Action Alternative</b>
Stanislaus River: Steelhead	<p>Reduced habitat conditions due to lack of measures to address high water temperatures caused by climate change by 2030; and lack of measures to increase efficiency of fish handling facilities at Banks and Jones pumping plants.</p> <p>Potential mitigation measure: Implement fish passage around dams to reduce temperature impacts. No mitigation measures have been identified for remaining impacts.</p>	<p>Reduced habitat conditions due to lack of measures to address high water temperatures caused by climate change by 2030; and lack of measures to increase efficiency of fish handling facilities at Banks and Jones pumping plants.</p> <p>Potential mitigation measure: Implement fish passage around dams to reduce temperature impacts. No mitigation measures have been identified for remaining impacts.</p>	<p>Reduced habitat conditions due to lack of measures to address high water temperatures caused by climate change by 2030; and lack of measures to increase efficiency of fish handling facilities at Banks and Jones pumping plants.</p> <p>Potential improved habitat conditions due to predator controls and trap and haul operations; however, the effectiveness of these measures is uncertain.</p> <p>Potential mitigation measure: Implement fish passage around dams to reduce temperature impacts. No mitigation measures have been identified for remaining impacts.</p>	<p>Reduced habitat conditions due to lack of measures to address high water temperatures caused by climate change by 2030; and lack of measures to increase efficiency of fish handling facilities at Banks and Jones pumping plants.</p> <p>Potential improved habitat conditions due to predator controls and trap and haul operations; however, the effectiveness of these measures is uncertain.</p> <p>Potential mitigation measure: Implement fish passage around dams to reduce temperature impacts. No mitigation measures have been identified for remaining impacts.</p>	<p>Similar conditions.</p> <p>No mitigation needed.</p>
Stanislaus River: White Sturgeon	<p>Conditions may be similar; however, adverse impacts could occur due to higher water temperatures.</p> <p>No mitigation measures have been identified at this time.</p>	<p>Similar conditions.</p> <p>No mitigation needed.</p>	<p>Conditions may be similar; however, adverse impacts could occur due to higher water temperatures.</p> <p>No mitigation measures have been identified at this time.</p>	<p>Conditions may be similar; however, adverse impacts could occur due to higher water temperatures.</p> <p>No mitigation measures have been identified at this time.</p>	<p>Similar conditions.</p> <p>No mitigation needed.</p>

	<b>Alternative 1 Compared to the No Action Alternative</b>	<b>Alternative 2 Compared to the No Action Alternative</b>	<b>Alternative 3 Compared to the No Action Alternative</b>	<b>Alternative 4 Compared to the No Action Alternative</b>	<b>Alternative 5 Compared to the No Action Alternative</b>
New Melones Reservoir; Reservoir Fish	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.
Stanislaus River: Other Fish	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions for lampreys and Hardheads. Adverse conditions for Striped Bass due to changes in harvest limitations. No mitigation needed for lamprey and Hardhead. No mitigation measures have been identified at this time for Striped Bass.	Similar conditions for lampreys and Hardheads. Adverse conditions for Striped Bass due to changes in harvest limitations. No mitigation needed for lamprey and Hardhead. No mitigation measures have been identified at this time for Striped Bass.	Similar conditions. No mitigation needed.
Pacific Ocean: Killer Whale	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.
<b>Terrestrial Resources</b>					
Terrestrial Resources along Shoreline of CVP and SWP Reservoirs	Similar conditions. No mitigation needed.	No change. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.
Terrestrial Resources along Rivers Downstream of CVP and SWP Reservoirs	Similar or improved conditions along Trinity, Sacramento, American, and Feather rivers. Reduced conditions along Stanislaus River. No mitigation measures identified at this time for changes along the Stanislaus River.	No change. No mitigation needed.	Similar or improved conditions along Trinity, Sacramento, American, and Feather rivers. Reduced conditions along Stanislaus River. No mitigation measures identified at this time for changes along the Stanislaus River.	Similar or improved conditions along Trinity, Sacramento, American, and Feather rivers. Reduced conditions along Stanislaus River. No mitigation measures identified at this time for changes along the Stanislaus River.	Similar or improved conditions along Trinity, Sacramento, American, and Feather rivers. Improved conditions along Stanislaus River. No mitigation needed.

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	<b>Alternative 1 Compared to the No Action Alternative</b>	<b>Alternative 2 Compared to the No Action Alternative</b>	<b>Alternative 3 Compared to the No Action Alternative</b>	<b>Alternative 4 Compared to the No Action Alternative</b>	<b>Alternative 5 Compared to the No Action Alternative</b>
Terrestrial Resources in Yolo Bypass	Similar conditions in Yolo Bypass. No mitigation needed.	No change. No mitigation needed.	Similar or improved conditions in Yolo Bypass. No mitigation needed.	Similar conditions in Yolo Bypass. No mitigation needed.	Similar conditions in Yolo Bypass. No mitigation needed.
Terrestrial Resources in Western Delta	Increased extent of salt water in the fall months of wet and above normal years in western Delta which could adversely affect terrestrial resources that use freshwater habitat. No mitigation measures identified at this time.	No change. No mitigation needed.	Increased extent of salt water in the fall months of wet and above normal years in western Delta which could adversely affect terrestrial resources that use freshwater habitat. No mitigation measures identified at this time.	Increased extent of salt water in the fall months of wet and above normal years in western Delta which could adversely affect terrestrial resources that use freshwater habitat. No mitigation measures identified at this time.	Similar habitat in western Delta. No mitigation needed.
<b>Geology and Soils Resources</b>					
Geology and Soils Resources	Similar conditions. No mitigation needed.	No change. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.
<b>Agricultural Resources</b>					
Agricultural Production and Employment	Similar conditions. No mitigation needed.	No change. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.
<b>Land Use</b>					
Municipal and Industrial Land Use	Similar conditions. No mitigation needed.	No change. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.
<b>Visual Resources</b>					
Visual Resources of Land Irrigated with CVP and SWP Water	Similar conditions. No mitigation needed.	No change. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.
Visual Resources at Reservoirs that Store CVP and SWP Water	Similar or improved conditions. No mitigation needed.	No change. No mitigation needed.	Similar or improved conditions. No mitigation needed.	Similar or improved conditions. No mitigation needed.	Similar conditions. No mitigation needed.

	<b>Alternative 1 Compared to the No Action Alternative</b>	<b>Alternative 2 Compared to the No Action Alternative</b>	<b>Alternative 3 Compared to the No Action Alternative</b>	<b>Alternative 4 Compared to the No Action Alternative</b>	<b>Alternative 5 Compared to the No Action Alternative</b>
<b>Recreation Resources</b>					
Recreation Resources at Reservoirs that Store CVP and SWP Water	Similar or improved conditions. No mitigation needed.	No change. No mitigation needed.	Similar or improved conditions. No mitigation needed.	Similar or improved conditions. No mitigation needed.	Similar conditions. No mitigation needed.
Recreation Resources in Rivers downstream of CVP and SWP Reservoirs	Similar or improved conditions. No mitigation needed.	No change. No mitigation needed.	Similar or improved conditions. Reduced opportunities for Striped Bass and sport ocean salmon fishing. No mitigation measures identified at this time.	Similar or improved conditions. Reduced opportunities for Striped Bass and sport ocean salmon fishing. No mitigation measures identified at this time.	Similar conditions. No mitigation needed.
<b>Air Quality and Greenhouse Gas Emissions</b>					
Emissions of Criteria Air Pollutants and Precursors and/or Exposure of Sensitive Receptors to Substantial Concentrations of Air Contaminants from Diesel Engines at Groundwater Wells	Similar air quality conditions in the Trinity River Region and Sacramento Valley. Improved air quality conditions in the San Joaquin Valley and the San Francisco Bay Area, Central Coast, and Southern California regions. No mitigation needed.	No change. No mitigation needed.	Similar air quality conditions in the Trinity River Region and Sacramento Valley. Reduced air quality conditions in the San Joaquin Valley and the San Francisco Bay Area, Central Coast, and Southern California regions. No mitigation needed.	Similar air quality conditions in the Trinity River Region and Sacramento Valley. Improved air quality conditions in the San Joaquin Valley and the San Francisco Bay Area, Central Coast, and Southern California regions. No mitigation needed.	Similar air quality conditions in the Trinity River Region and Sacramento Valley. Similar air quality conditions in the San Joaquin Valley and the San Francisco Bay Area, Central Coast, and Southern California regions. No mitigation needed.

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	<b>Alternative 1 Compared to the No Action Alternative</b>	<b>Alternative 2 Compared to the No Action Alternative</b>	<b>Alternative 3 Compared to the No Action Alternative</b>	<b>Alternative 4 Compared to the No Action Alternative</b>	<b>Alternative 5 Compared to the No Action Alternative</b>
Increased Greenhouse Gas Emissions (GHG) due to Changes in Energy Resources Related to CVP and SWP Water Use	Overall changes are not known at this time due to complexity of energy demands associated with alternative water supplies. However, GHG emissions could increase in the San Francisco Bay Area, Central Coast, and Southern California regions.	No change.	Overall changes are not known at this time due to complexity of energy demands associated with alternative water supplies. However, GHG emissions could increase in the San Francisco Bay Area, Central Coast, and Southern California regions.	Overall changes are not known at this time due to complexity of energy demands associated with alternative water supplies. However, GHG emissions could increase in the San Francisco Bay Area, Central Coast, and Southern California regions.	Overall changes are not known at this time due to complexity of energy demands associated with alternative water supplies. However, GHG emissions could increase in the San Francisco Bay Area, Central Coast, and Southern California regions.
<b>Cultural Resources</b>					
Potential for Disturbance of Cultural Resources	Similar conditions. No mitigation needed.	No change. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.
<b>Public Health</b>					
Water Supply Availability for Wildland Firefighting	Similar conditions. No mitigation needed.	No change. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.
Potential Exposure to Mercury in Fish in Delta	Similar or reduced concentrations. No mitigation needed.	No change. No mitigation needed.	Similar or reduced concentrations. No mitigation needed.	Similar or reduced concentrations. No mitigation needed.	Similar concentrations. No mitigation needed.
<b>Socioeconomics</b>					
Agricultural and Municipal and Industrial Employment	Similar conditions. No mitigation needed.	No change. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.
Municipal and Industrial Water Supply Operating Expenses	Similar conditions. No mitigation needed.	No change. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.
Recreational Economics CVP and SWP Reservoirs	Similar or improved conditions. No mitigation needed.	No change. No mitigation needed.	Similar or improved conditions. No mitigation needed.	Similar or improved conditions. No mitigation needed.	Similar or improved conditions. No mitigation needed.



	<b>Alternative 1 Compared to the No Action Alternative</b>	<b>Alternative 2 Compared to the No Action Alternative</b>	<b>Alternative 3 Compared to the No Action Alternative</b>	<b>Alternative 4 Compared to the No Action Alternative</b>	<b>Alternative 5 Compared to the No Action Alternative</b>
Recreational Economics Related to Striped Bass Fishing in Delta	Similar conditions. No mitigation needed.	No change. No mitigation needed.	Reduced recreational opportunities and associated economics. No mitigation identified at this time.	Reduced recreational opportunities and associated economics. No mitigation identified at this time.	Similar conditions. No mitigation needed.
Commercial and Sport Ocean Salmon Fishing	Similar conditions. No mitigation needed.	No change. No mitigation needed.	Reduced commercial and sport ocean salmon fishing and associated economics. No mitigation identified at this time.	Reduced commercial and sport ocean salmon fishing and associated economics. No mitigation identified at this time.	Similar conditions. No mitigation needed.
<b>Indian Trust Assets</b>					
Potential for Disturbance of Indian Trust Assets	No change. No mitigation needed.	No change. No mitigation needed.	No change. No mitigation needed.	No change. No mitigation needed.	No change. No mitigation needed.
<b>Environmental Justice</b>					
Emissions of Criteria Air Pollutants and Precursors and/or Exposure of Sensitive Receptors to Substantial Concentrations of Air Contaminants from Diesel Engines at Groundwater Wells	Improved air quality conditions. No mitigation needed.	No change. No mitigation needed.	Reduced air quality conditions. No mitigation needed.	Improved air quality conditions. No mitigation needed.	Similar air quality conditions. No mitigation needed.
Potential Exposure to Mercury in Fish in Delta	Similar or reduced concentrations. No mitigation needed.	No change. No mitigation needed.	Similar or reduced concentrations. No mitigation needed.	Similar or reduced concentrations. No mitigation needed.	Similar concentrations. No mitigation needed.

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1 **Table ES.2 Comparison of Alternatives 1 through 5 and the No Action Alternative to the Second Basis of Comparison**

	No Action Alternative Compared to Second Basis of Comparison	Alternative 1 Compared to the Second Basis of Comparison	Alternative 2 Compared to the Second Basis of Comparison	Alternative 3 Compared to the Second Basis of Comparison	Alternative 4 Compared to the Second Basis of Comparison	Alternative 5 Compared to the Second Basis of Comparison
<b>Surface Water Conditions</b>						
Trinity Lake	Water surface elevations similar Storage would be similar in most months, except reduced in November-December in above normal years (up to 6%) and all months in critical dry years (up to 10%).	No change.	Water surface elevations similar Storage would be similar in most months, except reduced in November-December in above normal years (up to 6%) and all months in critical dry years (up to 10%).	Water surface elevations similar Storage similar or increased.	No change.	Water surface elevations similar Storage would be similar in most months, except reduced in all months in critical dry years (up to 10%).
Trinity River at Lewiston Dam	Flows similar or increased except reduced in December-February in wet to below normal years (up to 30%).	No change.	Flows similar or increased except reduced in December-February in wet to below normal years (up to 30%).	Flows similar or increased.	No change.	Flows similar or increased except reduced in December-February in wet to below normal years (up to 21%).
Shasta Lake	Water surface elevations similar Storage reduced in September-February in wet to dry years (up to 11%) and in all months in critical dry years (up to 14%).	No change.	Water surface elevations similar Storage reduced in September-February in wet to dry years (up to 11%) and in all months in critical dry years (up to 14%).	Water surface elevations similar Storage similar or increased.	No change.	Water surface elevations similar Storage reduced in September-February in most months of wet to dry years (up to 10%), and in all months in critical dry years (up to 17%).

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Sacramento River at Keswick Dam	Flows reduced (up to 21%) except September and November.	No change.	Flows reduced (up to 21%) except September and November.	Flows similar or increased except reduced in August in below normal years (up to 6%).	No change.	Flows reduced (up to 16%) except September and November.
Sacramento River at Freeport	Flows similar or increased except reduced in May and June (up to 27%).	No change.	Flows similar or increased except reduced in May and June (up to 27%).	Flows similar or increased except reduced in June in below normal years (up to 13%).	No change.	Flows similar or increased except reduced in May and June (up to 28%).
Clear Creek near Igo	Flows similar or increased.	No change.	Flows similar or increased.	No change.	No change.	Flows similar or increased.
Lake Oroville	Water surface elevations similar. Similar in most months May-July in wet to dry years and in all months in critical dry years. Reduced in many months from September-February in all year types (up to 18%).	No change.	Water surface elevations similar. Similar in most months May-July in wet to dry years and in all months in critical dry years. Reduced in many months from September-February in all year types (up to 18%).	Water surface elevations similar. Storage similar.	No change.	Water surface elevations similar. Similar in most months May-July in wet to dry years and in all months in critical dry years. Reduced in many months from September-February in all year types (up to 18%).
Feather River downstream of Thermalito Complex	Flows similar or increased except reduced in August-June (up to 52%).	No change.	Flows similar or increased except reduced in August-June (up to 52%).	Flows similar or increased except reduced in August-June (up to 28%).	No change.	Flows similar or increased except reduced in August-June (up to 58%).

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Folsom Lake	Water surface elevations similar Storage similar in many months except reduced flows in September-January (up to 12%) in wet to below normal years and July-September in critical dry years (up to 11%).	No change.	Water surface elevations similar Storage similar in many months except reduced flows in September-January (up to 12%) in wet to below normal years and July-September in critical dry years (up to 11%).	Water surface elevations similar Storage similar.	No change.	Water surface elevations similar Storage similar in many months except reduced flows in August-January (up to 13%) in wet to below normal years and July in critical dry years (8%).
American River at Nimbus Dam	Flows similar or increased except reduced in June-August, December, February, and April (up to 25%).	No change.	Flows similar or increased except reduced in June-August, December, February, and April (up to 25%).	Flows similar or increased except reduced flows in June-August and April (up to 17%).	No change.	Flows similar or increased except reduced in December-February, April, June, and August (up to 25%).
New Melones Reservoir	Water surface elevations similar Storage similar in wet, below normal, and dry years, and in most months in above normal and critical dry years. Storage reduced in October in above normal water years (6%) and in October-January and April-June in critical dry years (up to 7%).	No change.	Water surface elevations similar Storage similar in wet, below normal, and dry years, and in most months in above normal and critical dry years. Storage reduced in October in above normal water years (6%) and in October-January and April-June in critical dry years (up to 7%).	Water surface elevations similar Storage similar or increased.	No change.	Water surface elevations similar Storage reduced in all months in all water year types (up to 23%).

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Stanislaus River at Goodwin Dam	Flows similar or increased except reduced in November-March and May-June (up to 25%).	No change.	Flows similar or increased except reduced in November-March and May-June (up to 25%).	Flows reduced in all months (up to 79%) except April and August.	No change.	Flows reduced in all months (up to 25%) except October, April, and May.
San Joaquin River at Vernalis	Flows similar or increased except reduced in November and May-June (up to 9%).	No change.	Flows similar or increased except reduced in November and May-June (up to 9%).	Flows similar or increased except reduced in May-June (up to 27%).	No change.	Flows similar or increased except reduced in November and June (up to 10%).

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San Luis Reservoir	Water surface elevations reduced in all months in wet to below normal water years and in February-September in dry and critical dry years (up to 16%). Storage reduced in October-June in most water years (up to 71%).	No change.	Water surface elevations reduced in all months in wet to below normal water years and in February-September in dry and critical dry years (up to 16%). Storage reduced in October-June in most water years (up to 71%).	Water surface elevations similar except reduced in January-February in above normal years (up to 6%) and February-August in critical dry years (up to 7%). Storage similar or increased in some months except in December-February and June in wet years (up to 16%), October-July in above normal and below normal years (up to 40%), January-September in dry years (up to 19%), and October-August in critical dry years (up to 29%).	No change.	Water surface elevations reduced in all months in all year types (up to 70%). Storage would be reduced in October-August in wet to below normal years (up to 17%), in January-September in dry years (up to 14%), and in all months in critical dry years (up to 14%).

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Flows into Yolo Bypass	Flows similar or increased except reduced in November-December in wet years (up to 15%), January-March in above normal years (14%), December-March in below normal years (up to 25%), and December in dry years (6%).	No change.	Flows similar or increased except reduced in November-December in wet years (up to 15%), January-March in above normal years (14%), December-March in below normal years (up to 25%), and December in dry years (6%).	Flows similar except reduced in October of wet years (6%).	No change.	Flows similar or increased except reduced in November-January in wet years (up to 15%), January-March in above normal years (15%), December-March in below normal years (up to 24%), and December in dry years (7%).
Delta Outflow	Flows similar or increased in many months. Reduced flows in some months, including in December, February-March, and June in wet years (up to 1,590 cfs).	No change.	Flows similar or increased in many months. Reduced flows in some months, including in December, February-March, and June in wet years (up to 1,590 cfs).	Flows would increase in many months. Reduced flows in some months, including October and March-June in wet years (up to 1,127 cfs), and October and May-June in dry years (up to 373 cfs).	No change.	Flows similar or increased in many months. Reduced flows in some months, including in December, February-March, and June in wet years (up to 1,713 cfs), and June in dry years (526 cfs).
Reverse Flows in Old and Middle Rivers	Increased positive flows except in June-August in most years and March in wet years.	No change.	Increased positive flows except in June-August in most years and March in wet years.	Increased negative flows in June-August in most years and March in wet years.	No change.	Increased negative flows in July-August in most years and March and June in wet years.

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<b>Water Supplies</b>						
Non-CVP and Non-SWP Deliveries	Deliveries similar.	Deliveries similar.	Deliveries similar.	Deliveries similar.	Deliveries similar.	Deliveries similar.
North of Delta CVP Water Deliveries: Agricultural Water Contractors	Deliveries reduced up to 16% over the long-term to 34% in critical dry years.	No change.	Deliveries reduced up to 16% over the long-term to 34% in critical dry years.	Deliveries similar over the long-term. Reduced up to 9% in dry years to 11% in critical dry years.	No change.	Deliveries reduced up to 16% over the long-term to 31% in critical dry years.
North of Delta CVP Water Deliveries: Municipal and Industrial Water Contractors	Deliveries similar.	No change.	Deliveries similar.	Deliveries similar.	No change.	Deliveries similar.
South of Delta CVP Water Deliveries: Agricultural Water Contractors	Deliveries reduced up to 23% over the long-term to 33% in critical dry years.	No change.	Deliveries reduced up to 23% over the long-term to 33% in critical dry years.	Deliveries similar over the long-term. Reduced up to 8% in dry years to 14% in critical dry years.	No change.	Deliveries reduced up to 24% over the long-term to 33% in critical dry years.
South of Delta CVP Water Deliveries: Municipal and Industrial Water Contractors	Deliveries reduced up to 10% over the long-term to 5% in critical dry years.	No change.	Deliveries reduced up to 10% over the long-term to 5% in critical dry years.	Deliveries similar.	No change.	Deliveries reduced up to 10% over the long-term to 8% in critical dry years.
CVP Water Deliveries: Eastside Division Contractors	Deliveries reduced up to 19% in critical dry years.	No change.	Deliveries reduced up to 19% in critical dry years.	Deliveries similar.	No change.	Deliveries reduced up to 19% in critical dry years.
North of Delta: SWP Water Deliveries under Table A without Article 21 water	Deliveries reduced up to 13% over the long-term to 20% in critical dry years.	No change.	Deliveries reduced up to 13% over the long-term to 20% in critical dry years.	Deliveries similar over the long-term and in dry years. Reduced by 10% in critical dry years.	No change.	Deliveries reduced up to 19% over the long-term to 21% in critical dry years.



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North of Delta: SWP Water Deliveries under Table A without Article 21 water	Deliveries reduced up to 18% over the long-term to 22% in critical dry years.	No change.	Deliveries reduced up to 18% over the long-term to 22% in critical dry years.	Deliveries similar over the long-term and in dry years. Reduced by 11% in critical dry years.	No change.	Deliveries reduced up to 19% over the long-term to 23% in critical dry years.
<b>Surface Water Quality</b>						
Salinity in Northern Delta (near Emmaton)	Salinity increased in June in wet to dry years (up to 21%). Reduced in fall and winter months in wet and above normal years (up to 79%).	No change.	Salinity increased in June in wet to dry years (up to 21%). Reduced in fall and winter months in wet and above normal years (up to 79%).	Salinity increased in June in wet to dry years (up to 35%). Reduced in fall and winter months in wet and above normal years (up to 24%).	No change.	Salinity increased in June in wet to dry years (up to 21%). Reduced in fall and winter months in wet and above normal years (up to 79%).
Salinity in Western Delta (near Port Chicago)	Salinity reduced in September-May (up to 49%).	No change.	Salinity reduced in September-May (up to 49%).	Salinity increased in June in wet to below normal years (up to 9%). Reduced in January-March (up to 25%).	No change.	Salinity reduced in September-May (up to 49%).
Salinity in Western Central Delta (near Antioch)	Salinity increased in June in wet to below normal years (up to 16%). Reduced in fall and winter months (up to 73%).	No change.	Salinity increased in June in wet to below normal years (up to 16%). Reduced in fall and winter months (up to 73%).	Salinity increased in May in wet years and June in wet to dry years (up to 20%). Reduced in January-April (up to 40%).	No change.	Salinity increased in June in wet to below normal years (up to 14%). Reduced in fall and winter months (up to 73%).

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Salinity in Western Central Delta (near Contra Costa Water District Intakes)	Salinity increased in March-June (up to 47%). Reduced in October-January and September (up to 42%).	No change.	Salinity increased in March-June (up to 47%). Reduced in October-January and September (up to 42%).	Salinity increased in March-April in dry and critical dry years (up to 16%). Reduced in December-February in dry and critical dry years (up to 23%).	No change.	Salinity increased in March-June (up to 63%). Reduced in October-January and September (up to 41%).
Salinity in Southern Delta (near CVP and SWP intakes)	Salinity increased in February-June (up to 23%). Reduced in October-January (up to 28%).	No change.	Salinity increased in February-June (up to 23%). Reduced in October-January (up to 28%).	Salinity increased in February-May in dry and critical dry years (up to 23%).	No change.	Salinity increased in February-June (up to 26%). Reduced in October-January (up to 28%).
Mercury in Delta Fish	Mercury concentrations increased near Rock Slough, San Joaquin River at Antioch, and Montezuma Slough (up to 7%).	No change.	Mercury concentrations increased near Rock Slough, San Joaquin River at Antioch, and Montezuma Slough (up to 7%).	Similar conditions.	No change.	Mercury concentrations increased near Rock Slough, San Joaquin River at Antioch, and Montezuma Slough (up to 7%).
Selenium in Delta and Delta Fish	Selenium concentrations similar concentrations.	No change.	Selenium concentrations similar concentrations.	Selenium concentrations similar concentrations.	No change.	Selenium concentrations similar concentrations.
<b>Groundwater Resources</b>						
Trinity River Region	Similar groundwater conditions.	No change.	Similar groundwater conditions.	Similar groundwater conditions.	No change.	Similar groundwater conditions.
Central Valley Region: Sacramento Valley	Similar groundwater conditions.	No change.	Similar groundwater conditions.	Similar groundwater conditions.	No change.	Similar groundwater conditions.

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Central Valley Region: San Joaquin Valley	Increased groundwater pumping (8%); and lower groundwater elevations (2-200 feet). Potentially reduced groundwater quality. Increased subsidence potential.	No change.	Increased groundwater pumping (8%); and lower groundwater elevations (2-200 feet). Potentially reduced groundwater quality. Increased subsidence potential.	Similar groundwater pumping; and similar to lower groundwater elevations (2-25 feet). Similar groundwater quality. Similar subsidence potential.	No change.	Increased groundwater pumping (8%); and lower groundwater elevations (2-200 feet). Potentially reduced groundwater quality. Increased subsidence potential.
San Francisco Bay Area, Central Coast, and Southern California Region	Potentially increased groundwater pumping; and potentially lower groundwater elevations. Potentially reduced groundwater quality. Increased subsidence potential.	No change.	Potentially increased groundwater pumping; and potentially lower groundwater elevations. Potentially reduced groundwater quality. Increased subsidence potential.	Potentially increased groundwater pumping; and potentially lower groundwater elevations. Potentially reduced groundwater quality. Increased subsidence potential.	No change.	Potentially increased groundwater pumping; and potentially lower groundwater elevations. Potentially reduced groundwater quality. Increased subsidence potential.
<b>CVP and SWP Energy Resources</b>						
Energy Generated and Used by CVP and SWP Water Users	Similar CVP net generation. Increased net generation over the long-term (29%). Potentially increased energy use by CVP and SWP water users.	No change.	Similar CVP net generation. Increased net generation over the long-term (29%). Potentially increased energy use by CVP and SWP water users.	Similar CVP net generation. Increased net generation over the long-term (10%). Potentially increased energy use by CVP and SWP water users.	No change.	Similar CVP net generation. Increased net generation over the long-term (30%). Potentially increased energy use by CVP and SWP water users.

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<b>Aquatic Resources</b>						
Trinity River: Coho Salmon	Similar conditions.	No change.	Similar conditions.	Similar conditions.	No change.	Similar conditions.
Trinity River: Spring-run Chinook Salmon	Similar conditions.	No change.	Similar conditions.	Similar conditions.	No change.	Similar conditions.
Trinity River: Fall-run Chinook Salmon	Similar conditions.	No change.	Similar conditions.	Similar conditions.	No change.	Similar conditions.
Trinity River: Steelhead	Similar conditions.	No change.	Similar conditions.	Similar conditions.	No change.	Similar conditions.
Trinity River: Green Sturgeon	Similar conditions.	No change.	Similar conditions.	Similar conditions.	No change.	Similar conditions.
Trinity Lake and Lewiston Reservoir: Reservoir Fish	Similar conditions.	No change.	Similar conditions.	Similar conditions.	No change.	Similar conditions.
Trinity River: Pacific Lamprey	Similar conditions.	No change.	Similar conditions.	Similar conditions.	No change.	Similar conditions.
Trinity River: Eulachon	Similar conditions.	No change.	Similar conditions.	Similar conditions.	No change.	Similar conditions.
Sacramento River System: Winter-run Chinook Salmon	Improved habitat conditions due to fish passage at dams and other actions to address high water temperatures caused by climate change by 2030.	No change.	Similar conditions.	Improved habitat conditions due to improved escapement potential and predator controls.	Similar conditions.	Improved habitat conditions due to fish passage at dams and other actions to address high water temperatures caused by climate change by 2030.

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Sacramento River System: Spring-run Chinook Salmon	Improved habitat conditions due to fish passage at dams and other actions to address high water temperatures caused by climate change by 2030.	No change.	Similar conditions.	Improved habitat conditions due to harvest limitations and predator controls.	Similar conditions.	Improved habitat conditions due to fish passage at dams and other actions to address high water temperatures caused by climate change by 2030.
Sacramento River System: Fall-run Chinook Salmon	Similar conditions.	No change.	Similar conditions.	Similar conditions.	Similar conditions.	Similar conditions.
Sacramento River System: Late Fall-run Chinook Salmon	Improved habitat conditions due to measures to increase efficiency of fish handling facilities at Banks and Jones pumping plants.	No change.	Similar conditions.	Similar conditions.	Similar conditions.	Improved habitat conditions due to measures to increase efficiency of fish handling facilities at Banks and Jones pumping plants.

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Sacramento River System: Steelhead	Improved habitat conditions due to fish passage programs to address high water temperatures caused by climate change by 2030; and measures to increase efficiency of fish handling facilities at Banks and Jones pumping plants.	No change.	Similar conditions.	Similar conditions.	Similar conditions.	Improved habitat conditions due to fish passage programs to address high water temperatures caused by climate change by 2030; and measures to increase efficiency of fish handling facilities at Banks and Jones pumping plants.
Sacramento River System: Green Sturgeon and White Sturgeon	Reduced habitat conditions due to lack of measures to address high water temperatures caused by climate change by 2030 that are not improved by other actions.	No change.	Similar conditions.	Improved habitat conditions due to lower water temperatures.	No change.	Reduced habitat conditions due to lack of measures to address high water temperatures caused by climate change by 2030 that are not improved by other actions.
Delta: Delta Smelt	Improved habitat conditions due to reduced potential for entrainment during larval and juvenile stages, and reduced salinity in the fall in the western Delta.	No change.	Similar conditions.	Similar conditions.	No change.	Improved habitat conditions due to reduced potential for entrainment during larval and juvenile stages, and reduced salinity in the fall in the western Delta.

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Delta: Longfin Smelt	Improved habitat conditions due to more positive Old and Middle River flows and other factors (as indicated by higher Longfin Smelt abundance indices).	No change.	Similar conditions.	Similar conditions.	No change.	Improved habitat conditions due to more positive Old and Middle River flows and other factors (as indicated by higher Longfin Smelt abundance indices).
Delta: Sacramento Splittail	Similar conditions.	No change.	Similar conditions.	Similar conditions.	No change.	Similar conditions.
Sacramento River System: Reservoir Fish	Similar conditions.	No change.	Similar conditions.	Similar conditions.	No change.	Similar conditions.
Sacramento River System: Pacific Lamprey	Similar conditions.	No change.	Similar conditions.	Similar conditions.	No change.	Similar conditions.
Sacramento River System: Striped Bass, American Shad, and Hardhead	Similar conditions for Hardhead. Improved habitat conditions for Striped Bass and American Shad due to improved survival in larval and juvenile stages and reduced salinity in the spring in the western Delta.	No change.	Similar conditions.	Similar habitat conditions for Hardhead, Striped Bass, and American Shad. Adverse conditions for Striped Bass due to changes in harvest limitations.	No change in habitat conditions for Hardhead, Striped Bass, and American Shad. Adverse conditions for Striped Bass due to changes in harvest limitations.	Similar conditions for Hardhead. Improved habitat conditions for Striped Bass and American Shad due to improved survival in larval and juvenile stages and reduced salinity in the spring in the western Delta.

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Stanislaus River: Fall-run Chinook Salmon	Similar or improved conditions.	No change.	Similar conditions.	Potential improved habitat conditions due to predator controls, trap and haul operations, and harvest restrictions; however, the effectiveness of these measures is uncertain.	Potential improved habitat conditions due to predator controls, trap and haul operations, and harvest restrictions; however, the effectiveness of these measures is uncertain.	Similar or improved conditions.
Stanislaus River: Steelhead	Improved habitat conditions due to measures to address high water temperatures caused by climate change by 2030; and measures to increase efficiency of fish handling facilities at Banks and Jones pumping plants.	No change.	Similar conditions.	Potential improved habitat conditions due to predator controls and trap and haul operations; however, the effectiveness of these measures is uncertain.	Potential improved habitat conditions due to predator controls and trap and haul operations; however, the effectiveness of these measures is uncertain.	Improved habitat conditions due to measures to address high water temperatures caused by climate change by 2030; and measures to increase efficiency of fish handling facilities at Banks and Jones pumping plants.
Stanislaus River: White Sturgeon	Conditions may be similar; however, improved conditions could occur due to lower water temperatures.	No change.	Similar conditions.	Similar conditions.	No change.	Conditions may be similar; however, improved conditions could occur due to lower water temperatures.
New Melones Reservoir; Reservoir Fish	Similar conditions.	No change.	Similar conditions.	Improved conditions for black bass nest survival.	No change.	Similar conditions.



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Stanislaus River: Other Fish	Similar conditions.	No change.	Similar conditions.	Similar conditions for lamprey and Hardhead. Adverse conditions for Striped Bass due to changes in harvest limitations.	Similar conditions for lamprey and Hardhead. Adverse conditions for Striped Bass due to changes in harvest limitations.	Similar conditions.
Pacific Ocean: Killer Whale	Similar conditions.	No change.	Similar conditions.	Similar conditions.	No change.	Similar conditions.
<b>Terrestrial Resources</b>						
Terrestrial Resources along Shoreline of CVP and SWP Reservoirs	Similar conditions.	No change.	Similar conditions.	Similar conditions.	No change.	Similar conditions.
Terrestrial Resources along Rivers Downstream of CVP and SWP Reservoirs	Similar or improved conditions along Trinity, Sacramento, American, and Stanislaus rivers. Reduced conditions along Feather River. No mitigation measures identified at this time for changes along Feather River.	No change.	Similar or improved conditions along Trinity, Sacramento, American, and Stanislaus rivers. Reduced conditions along Feather River. No mitigation measures identified at this time for changes along Feather River.	Similar or improved conditions along Trinity, Sacramento, Feather, and American rivers. Reduced conditions along Stanislaus River. No mitigation measures identified at this time for changes along Stanislaus River.	No change.	Similar or improved conditions along Trinity, American, and Stanislaus rivers. Reduced conditions along Feather and Sacramento rivers. No mitigation measures identified at this time for changes along Feather and Sacramento rivers.
Terrestrial Resources in Yolo Bypass	Similar conditions in Yolo Bypass.	No change.	Similar conditions in Yolo Bypass.	Similar conditions in Yolo Bypass.	No change.	Similar or reduced conditions in Yolo Bypass.

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Terrestrial Resources in Western Delta	Increased extent of freshwater habitat in western Delta.	No change.	Increased extent of freshwater habitat in western Delta.	Similar conditions.	No change.	Increased extent of freshwater habitat in western Delta.
<b>Geology and Soils Resources</b>						
Geology and Soils Resources	Similar conditions.	No change.	Similar conditions.	Similar conditions.	No change.	Similar conditions.
<b>Agricultural Resources</b>						
Agricultural Production and Employment	Similar conditions.	No change.	Similar conditions.	Similar conditions.	No change.	Similar conditions.
<b>Land Use</b>						
Municipal and Industrial Land Use	Similar conditions.	No change.	Similar conditions.	Similar conditions.	No change.	Similar conditions.
<b>Visual Resources</b>						
Visual Resources of Land Irrigated with CVP and SWP Water	Similar conditions.	No change.	Similar conditions.	Similar conditions.	No change.	Similar conditions.

	<b>No Action Alternative Compared to Second Basis of Comparison</b>	<b>Alternative 1 Compared to the Second Basis of Comparison</b>	<b>Alternative 2 Compared to the Second Basis of Comparison</b>	<b>Alternative 3 Compared to the Second Basis of Comparison</b>	<b>Alternative 4 Compared to the Second Basis of Comparison</b>	<b>Alternative 5 Compared to the Second Basis of Comparison</b>
Visual Resources at Reservoirs that Store CVP and SWP Water	<p>Similar conditions at Trinity Lake, Shasta Lake, Lake Oroville, and New Melones Reservoir.</p> <p>Similar conditions at San Luis Reservoir in above normal to dry years.</p> <p>Reduced conditions at San Luis Reservoir in wet and critical dry years (up to 6%).</p> <p>Potentially reduced conditions in the San Francisco Bay Area, Central Coast, and Southern California regions (up to 18%).</p>	No change.	<p>Similar conditions at Trinity Lake, Shasta Lake, Lake Oroville, and New Melones Reservoir.</p> <p>Similar conditions at San Luis Reservoir in above normal to dry years.</p> <p>Reduced conditions at San Luis Reservoir in wet and critical dry years (up to 6%).</p> <p>Potentially reduced conditions in the San Francisco Bay Area, Central Coast, and Southern California regions (up to 18%).</p>	Similar conditions.	No change.	<p>Similar conditions at Trinity Lake, Shasta Lake, Lake Oroville, and New Melones Reservoir.</p> <p>Similar conditions at San Luis Reservoir in above normal to dry years.</p> <p>Reduced conditions at San Luis Reservoir in wet and critical dry years (up to 9%).</p> <p>Potentially reduced conditions in the San Francisco Bay Area, Central Coast, and Southern California regions (up to 18%).</p>

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	<b>No Action Alternative Compared to Second Basis of Comparison</b>	<b>Alternative 1 Compared to the Second Basis of Comparison</b>	<b>Alternative 2 Compared to the Second Basis of Comparison</b>	<b>Alternative 3 Compared to the Second Basis of Comparison</b>	<b>Alternative 4 Compared to the Second Basis of Comparison</b>	<b>Alternative 5 Compared to the Second Basis of Comparison</b>
<b>Recreation Resources</b>						
Recreation Resources at Reservoirs that Store CVP and SWP Water	<p>Similar conditions at Trinity Lake, Shasta Lake, Lake Oroville, and New Melones Reservoir.</p> <p>Similar conditions at San Luis Reservoir in above normal to dry years.</p> <p>Reduced conditions at San Luis Reservoir in wet and critical dry years (up to 6%).</p> <p>Potentially reduced conditions in the San Francisco Bay Area, Central Coast, and Southern California regions (up to 18%).</p>	No change.	<p>Similar conditions at Trinity Lake, Shasta Lake, Lake Oroville, and New Melones Reservoir.</p> <p>Similar conditions at San Luis Reservoir in above normal to dry years.</p> <p>Reduced conditions at San Luis Reservoir in wet and critical dry years (up to 6%).</p> <p>Potentially reduced conditions in the San Francisco Bay Area, Central Coast, and Southern California regions (up to 18%).</p>	Similar conditions.	No change.	<p>Similar conditions at Trinity Lake, Shasta Lake, Lake Oroville, and New Melones Reservoir.</p> <p>Similar conditions at San Luis Reservoir in above normal to dry years.</p> <p>Reduced conditions at San Luis Reservoir in wet and critical dry years (up to 9%).</p> <p>Potentially reduced conditions in the San Francisco Bay Area, Central Coast, and Southern California regions (up to 18%).</p>

	<b>No Action Alternative Compared to Second Basis of Comparison</b>	<b>Alternative 1 Compared to the Second Basis of Comparison</b>	<b>Alternative 2 Compared to the Second Basis of Comparison</b>	<b>Alternative 3 Compared to the Second Basis of Comparison</b>	<b>Alternative 4 Compared to the Second Basis of Comparison</b>	<b>Alternative 5 Compared to the Second Basis of Comparison</b>
Recreation Resources in Rivers downstream of CVP and SWP Reservoirs	Similar or improved conditions; except reduced conditions in June and August along the Feather and American rivers, and in May along the Feather River and Sacramento River near Freeport.	No change.	Similar or improved conditions; except reduced conditions in June and August along the Feather and American rivers, and in May along the Feather River and Sacramento River near Freeport.	Similar or improved conditions along rivers. Reduced opportunities for Striped Bass and sport ocean salmon fishing.	No change along rivers. Reduced opportunities for Striped Bass and sport ocean salmon fishing.	Similar or improved conditions; except reduced conditions in May and June and August along the Sacramento and Feather rivers, in August along the American River; and in June-August along Stanislaus River.
<b>Air Quality and Greenhouse Gas Emissions</b>						
Emissions of Criteria Air Pollutants and Precursors and/or Exposure of Sensitive Receptors to Substantial Concentrations of Air Contaminants from Diesel Engines at Groundwater Wells	Similar air quality conditions in the Trinity River Region and Sacramento Valley. Potential increase in emissions (up to 18%) in the San Joaquin Valley and the San Francisco Bay Area, Central Coast, and Southern California regions.	No change.	Similar air quality conditions in the Trinity River Region and Sacramento Valley. Potential increase in emissions (up to 18%) in the San Joaquin Valley and the San Francisco Bay Area, Central Coast, and Southern California regions.	Similar conditions.	No change.	Similar air quality conditions in the Trinity River Region and Sacramento Valley. Potential increase in emissions (up to 18%) in the San Joaquin Valley and the San Francisco Bay Area, Central Coast, and Southern California regions.

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	<b>No Action Alternative Compared to Second Basis of Comparison</b>	<b>Alternative 1 Compared to the Second Basis of Comparison</b>	<b>Alternative 2 Compared to the Second Basis of Comparison</b>	<b>Alternative 3 Compared to the Second Basis of Comparison</b>	<b>Alternative 4 Compared to the Second Basis of Comparison</b>	<b>Alternative 5 Compared to the Second Basis of Comparison</b>
Increased Greenhouse Gas Emissions due to Changes in Energy Resources Related to CVP and SWP Water Use	Overall changes are not known at this time due to complexity of energy demands associated with alternative water supplies. However, GHG emissions could be reduced in the San Francisco Bay Area, Central Coast, and Southern California regions.	No change.	Overall changes are not known at this time due to complexity of energy demands associated with alternative water supplies. However, GHG emissions could be reduced in the San Francisco Bay Area, Central Coast, and Southern California regions.	Overall changes are not known at this time due to complexity of energy demands associated with alternative water supplies. However, GHG emissions could be reduced in the San Francisco Bay Area, Central Coast, and Southern California regions.	No change.	Overall changes are not known at this time due to complexity of energy demands associated with alternative water supplies. However, GHG emissions could be reduced in the San Francisco Bay Area, Central Coast, and Southern California regions.
<b>Cultural Resources</b>						
Potential for Disturbance of Cultural Resources	Similar conditions.	No change.	Similar conditions.	Similar conditions.	No change.	Similar conditions.
<b>Public Health</b>						
Water Supply Availability for Wildland Firefighting	Similar conditions at Trinity Lake, Shasta Lake, Lake Oroville, Folsom Lake, and New Melones Reservoir. Reduced potential at San Luis Reservoir (6%).	No change.	Similar conditions at Trinity Lake, Shasta Lake, Lake Oroville, Folsom Lake, and New Melones Reservoir. Reduced potential at San Luis Reservoir (6%).	Similar conditions.	No change.	Similar conditions at Trinity Lake, Shasta Lake, Lake Oroville, Folsom Lake, and New Melones Reservoir. Reduced potential at San Luis Reservoir (9%).
Potential Exposure to Mercury in Fish in Delta	Increased near Rock Slough, San Joaquin River at Antioch, and Montezuma Slough (up to 7%).	No change.	Increased near Rock Slough, San Joaquin River at Antioch, and Montezuma Slough (up to 7%).	Similar conditions.	No change.	Increased near Rock Slough, San Joaquin River at Antioch, and Montezuma Slough (up to 7%).

	<b>No Action Alternative Compared to Second Basis of Comparison</b>	<b>Alternative 1 Compared to the Second Basis of Comparison</b>	<b>Alternative 2 Compared to the Second Basis of Comparison</b>	<b>Alternative 3 Compared to the Second Basis of Comparison</b>	<b>Alternative 4 Compared to the Second Basis of Comparison</b>	<b>Alternative 5 Compared to the Second Basis of Comparison</b>
<b>Socioeconomics</b>						
Agricultural and Municipal and Industrial Employment	Similar conditions.	No change.	Similar conditions.	Similar conditions.	No change.	Similar conditions.
Municipal and Industrial Water Supply Operating Expenses	Similar conditions.	No change.	Similar conditions.	Similar conditions.	No change.	Similar conditions.
Recreational Economics CVP and SWP Reservoirs	Similar conditions at Trinity Lake, Shasta Lake, Lake Oroville, Folsom Lake, and New Melones Reservoir. Reduced potential at San Luis Reservoir and reservoirs that store CVP and SWP water in San Francisco Bay Area, Central Coast, and Southern California regions.	No change.	Similar conditions at Trinity Lake, Shasta Lake, Lake Oroville, Folsom Lake, and New Melones Reservoir. Reduced potential at San Luis Reservoir and reservoirs that store CVP and SWP water in San Francisco Bay Area, Central Coast, and Southern California regions.	Similar conditions.	No change.	Similar conditions at Trinity Lake, Shasta Lake, Lake Oroville, Folsom Lake, and New Melones Reservoir. Reduced potential at San Luis Reservoir and reservoirs that store CVP and SWP water in San Francisco Bay Area, Central Coast, and Southern California regions.
Recreational Economics Related to Striped Bass Fishing in Delta	Similar conditions.	No change.	Similar conditions.	Reduced recreational opportunities and associated economics.	Reduced recreational opportunities and associated economics.	Similar conditions.
Commercial and Sport Ocean Salmon Fishing	Similar conditions.	No change.	Similar conditions.	Reduced commercial and sport ocean salmon fishing and associated economics.	Reduced commercial and sport ocean salmon fishing and associated economics.	Similar conditions.

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	<b>No Action Alternative Compared to Second Basis of Comparison</b>	<b>Alternative 1 Compared to the Second Basis of Comparison</b>	<b>Alternative 2 Compared to the Second Basis of Comparison</b>	<b>Alternative 3 Compared to the Second Basis of Comparison</b>	<b>Alternative 4 Compared to the Second Basis of Comparison</b>	<b>Alternative 5 Compared to the Second Basis of Comparison</b>
<b>Indian Trust Assets</b>						
Potential for Disturbance of Indian Trust Assets	No change.	No change.	No change.	No change.	No change.	No change.
<b>Environmental Justice</b>						
Emissions of Criteria Air Pollutants and Precursors and/or Exposure of Sensitive Receptors to Substantial Concentrations of Air Contaminants from Diesel Engines at Groundwater Wells	Potential increase in emissions (up to 18%).	No change.	Potential increase in emissions (up to 18%).	Similar conditions.	No change.	Potential increase in emissions (up to 18%).
Potential Exposure to Mercury in Fish in Delta	Increased near Rock Slough, San Joaquin River at Antioch, and Montezuma Slough (up to 7%).	No change.	Increased near Rock Slough, San Joaquin River at Antioch, and Montezuma Slough (up to 7%).	Similar conditions.	No change.	Increased near Rock Slough, San Joaquin River at Antioch, and Montezuma Slough (up to 7%).



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# 1 Abbreviations and Acronyms

2	µg/g	Micrograms per gram
3	µg/L	Micrograms/liter
4	µg/m <sup>3</sup>	Micrograms per cubic meter
5	µmhos/cm	Micromhos per centimeter
6	µS/cm	MicroSiemens per centimeter
7	AB	Assembly Bill
8	ACID	Anderson-Cottonwood Irrigation District
9	ACS	American Community Survey
10	AF	Acre-foot/Acre-feet
11	AFRP	Anadromous Fish Restoration Program
12	AFSP	Anadromous Fish Screen Program
13	AIP	Alternative Intake Project
14	ANN	Artificial Neural Network
15	AQMP	Air Quality Management Plan
16	ARB	California Air Resources Board
17	ARG	American River Group
18	AVEK	Antelope Valley-East Kern Water Agency
19	(b)(2)IT	B2 Interagency Team
20	BA	Biological Assessment
21	BARDP	Bay Area Regional Desalination Project
22	BCAA	bromochloroacetic acid
23	BCC	Birds of Conservation Concern
24	BCDC	San Francisco Bay Conservation and Development Commission
25		
26	BCSD	Bias-correction and Spatial Disaggregation
27	BDCP	Bay Delta Conservation Plan
28	BIA	Bureau of Indian Affairs
29	BKD	Bacterial Kidney Disease
30	BLM	Bureau of Land Management
31	BO	Biological Opinion
32	BP	Before Present
33	BRT	Biological Review Team
34	BSPP	Barker Slough Pumping Plant
35	BVWD	Bella Vista Water District

## Abbreviations and Acronyms

1	°C	Centigrade degrees
2	CA	California Aqueduct
3	CAA	Clean Air Act
4	CAAQS	California Ambient Air Quality Standard
5	CAL FIRE	California Department of Forestry and Fire Prevention
6	CASGEM	California Statewide Groundwater Elevation Monitoring
7		Program
8	CalEPA	California Environmental Protection Agency
9	CAISO	California Independent System Operator Corporation
10	CALFED	CALFED Bay-Delta Program
11	CAL FIRE	California Department of Forestry and Fire Prevention
12	CAT	California Climate Action Team
13	CBMWD	Central Basin Municipal Water District
14	CCAA	California Clean Air Act
15	CCC	Criteria Continuous Concentration
16	CCF	Clifton Court Forebay
17	CCSD	Cambria Community Services District
18	CCTT	Clear Creek Technical Team
19	CCWD	Contra Costa Water District
20	CDFW	California Department of Fish and Wildlife
21		(previously known as Department of Fish and Game)
22	CDP	Census Designated Place
23	CDPH	California Department of Public Health
24	CDWA	Central Delta Water Agency
25	CEC	California Energy Commission
26	CEQ	Council on Environmental Quality
27	CEQA	California Environmental Quality Act
28	CESA	California Endangered Species Act
29	CFR	Code of Federal Regulations
30	cfs	Cubic feet per second
31	CGS	California Geological Survey
32	CH <sub>4</sub>	Methane
33	CHRIS	California Historical Resources Information System
34	cm	centimeter
35	CMARP	Comprehensive Monitoring, Assessment and Research
36		Program
37	CMC	Criteria Maximum Concentration
38	CMIP3	Coupled Model Intercomparison Project Phase 3



1	CNAGPRA	California Native American Grave Protection and Repatriation Act
2		
3	CNAHC	California Native American Heritage Commission
4	CNDDDB	California Natural Diversity Database
5	CNPS	California Native Plant Society
6	CPUC	California Public utilities Commission
7	CO	Carbon monoxide
8	CO <sub>2</sub>	Carbon dioxide
9	CO <sub>2e</sub>	Carbon dioxide equivalent
10	COA	Coordinated Operation Agreement
11	COC	Constituents of Concern
12	CRD	Contract Rate of Delivery
13	CRHR	California Register of Historical Resources
14	CRPR	California Rare Plant Rank
15	CSD	Community Service District
16	CSJWCD	Central San Joaquin Water Conservation District
17	CTR	California Toxics Rule
18	CVHM	Central Valley Hydrologic Model
19	CVOO	Central Valley Operations Office
20	CVP	Central Valley Project
21	CVPA	Central Valley Project Act
22	CVPIA	Central Valley Project Improvement Act
23	CVPM	Central Valley Production Model
24	CVRWQCB	Central Valley Regional Water Quality Control Board
25	CV-Salts	Central Valley Salinity Alternatives for Long-term Sustainability
26		
27	CWA	Clean Water Act
28	CZMA	Coastal Zone Management Act
29	D-893	State Water Resources Control Board Decision 893
30	D-1422	State Water Resources Control Board Decision 1422
31	D-1485	State Water Resources Control Board Decision 1485
32	D-1616	State Water Resources Control Board Decision 1616
33	D-1629	State Water Resources Control Board Decision 1629
34	D-1641	State Water Resources Control Board Decision 1641
35	DAT	Data Assessment Team
36	DBCP	Dibromochloropropane
37	DBP	Disinfection byproducts
38	DBW	Department of Boating and Waterways

## Abbreviations and Acronyms

1	DCC	Delta Cross Channel
2	DCCA	Dichloroacetic Acid
3	DCID	Deer Creek Irrigation District
4	DCT	Delta Condition Team
5	DDD	Dichlorodiphenyldichloroethane
6	DDE	Dichlorodiphenyldichloroethylene
7	DDT	Dichlorodiphenyltrichloroethane
8	Delta	Sacramento-San Joaquin Rivers Delta Estuary
9	Delta Reform Act	Sacramento-San Joaquin Delta Reform Act of 2009
10	DFA	California Department of Food and Agriculture
11	DICU	Delta Island Consumptive Use
12	District Court	U.S. District Court for the Eastern District of California
13	DMC	Delta-Mendota Canal
14	DMC/CA Intertie	Delta-Mendota Canal and California Aqueduct Intertie
15	DO	Dissolved Oxygen
16	DOC	Dissolved organic carbon
17	DOI	Department of the Interior
18	DOM	Dissolved Organic Matter
19	DOSS	Delta Operations Salmonid and Sturgeon
20	DPC	Delta Protection Commission
21	DPM	Delta Passage Model
22	DPS	Distinct Population Segment
23	DSRAM	Delta Smelt Risk Assessment Matrix
24	dw	dry weight
25	DWR	California Department of Water Resources
26	EDWPA	El Dorado Water and Power Authority
27	EBMUD	East Bay Municipal Utility District
28	EC	Electrical Conductivity
29	ECe	Electrical Conductivity of a Saturated Soil Index
30	ECw	Electrical Conductivity
31	EFH	Essential Fish Habitat
32	E:I	Export to Inflow Ratio
33	EID	El Dorado Irrigation District
34	EIR	Environmental Impact Report
35	EIS	Environmental Impact Statement
36	EJ	Environmental Justice
37	EO	Executive Order
38	EOM	end-of-month

1	EOS	End-of-September
2	EQ	exceedance quotient
3	ERP	Ecosystem Restoration Program
4	ESA	Endangered Species Act
5	ESU	Evolutionary Significant Unit
6	ET	evapotranspiration
7	ETM	Estuarine Turbidity Maximum
8	EWA	Environmental Water Account
9	EWP	Environmental Water Program
10	°F	Fahrenheit degrees
11	FCAA	Federal Clean Air Act
12	FEMA	Federal Emergency Management Agency
13	FERC	Federal Energy Regulatory Commission
14	FID	Fresno Irrigation District
15	FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
16	FMMP	Farmland Mapping and Monitoring Program
17	FMP	Farm Process
18	FMS	Flow Management Standard
19	FMWT	Fall Midwater Trawl Survey
20	FP	Fully-Protected Species
21	FPPA	Farmland Protection Policy Act
22	FR	Federal Register
23	FRFH	Feather River Fish Hatchery
24	FRPA	Fish Restoration Program Agreement
25	FRPP	Farm and Ranch Land Protection Program
26	FRWP	Freeport Regional Water Project
27	ft	Foot/Feet
28	ft/s	Feet per second
29	FTE	full-time equivalent
30	GAMA	Groundwater Ambient Monitoring and Assessment
31	GBP	Grasslands Bypass Project
32	GCID	Glenn-Colusa Irrigation District
33	GCM	global climate model
34	GDP	gross domestic product
35	GHG	Greenhouse Gas
36	GIS	geographic information system
37	gpm	Gallons per minute

## Abbreviations and Acronyms

1	GORT	Gate Operations Review Team
2	GSA	Groundwater Sustainability Agency
3	GSP	Groundwater Sustainability Plan
4	GWh	Gigawatt-hour
5	GWMP	Groundwater Management Plans
6	GWP	Global Warming Potential
7	HAP	Hazardous Air Pollutants
8	HC	Hydrocarbons
9	HCP	Habitat Conservation Plan
10	HFC	hydrofluorocarbons
11	HFC	High Flow Channel
12	HGMP	Hatchery Genetic Management Plan
13	HOR	Head of Old River
14	HORB	Head of Old River Barrier
15	I/E or I:E	Inflow to Export Ratio (San Joaquin River)
16	I-O	Input-Output Model
17	ID	Irrigation District
18	IEP	Interagency Ecological Program
19	IEUA	Inland Empire Utilities Agency
20	IFIM	Instream Flow Incremental Methodology
21	IHN	Infectious Hematopoietic Necrosis
22	ILRP	Irrigated Lands Regulatory Program
23	in	Inch/Inches
24	IPCC	Intergovernmental Panel on Climate Change
25	IPO	Interim Plan of Operation
26	IRWMP	Integrated Regional Water Management Plan
27	ISRMA	Interlakes Special Recreation Management Area
28	ITA	Indian Trust Assets
29	JCSD	Jurupa Community Services District
30	JPOD	Joint Point of Diversion
31	Km	Kilometers
32	KRCD	Kings River Conservation District
33	LACSD	Los Angeles County Sanitation District
34	lbs	Pounds
35	LFC	Low Flow Channel
36	LIM	Land Inventory and Monitoring System

1	LYRA	Lower Yuba River Accord
2	m	meter
3	m/day	meters per day
4	M&I	Municipal and Industrial
5	m/s	meter per second
6	MACT	Maximum Achievable Control Technology
7	MAF	Million acre-feet or Million acre-foot
8	MBTA	Migratory Bird Treaty Act
9	MCAA	Monochloroacetic Acid
10	MCL	Maximum Contaminant Level
11	MERP	Mercury Exposure Reduction Program
12	Metropolitan	Metropolitan Water District of Southern California
13	mg/L	Milligrams per liter
14	mgd	Million gallons per day
15	MIDS	Morrow Island Distribution System
16	MLD	Most Likely Descendent
17	mm	Millimeter
18	mmhos/cm	millimhos per centimeter
19	MMPA	Marine Mammal Protection Act
20	MOA	Memorandum of Agreement
21	MORE	Mokelumne River Water & Power Authority
22	MOU	Memorandum of Understanding
23	MRR	minimum release requirements
24	msl	Mean Sea Level
25	mS/cm	MilliSiemens per Centimeter
26	MVCD	Mosquito and Vector Control Districts
27	MW	Megawatt
28	MWDOC	Metropolitan Water District of Orange County
29	MWDSC	Metropolitan Water District of Southern California
30	MWh	Megawatt-hours
31	N	Nitrogen
32	N <sub>2</sub> O	Nitrous oxide
33	NAA	No Action Alternative
34	NAAQS	National Ambient Air Quality Standard
35	NAGPRA	Native American Graves Protection and Repatriation Act
36	NAHC	Native American Heritage Commission
37	NAICS	North American Industry Classification

## Abbreviations and Acronyms

1	NASS	National Agricultural Statistics Service
2	NAWMP	North American Waterfowl Management Plan
3	NBA	North Bay Aqueduct
4	NCPA	Northern California Power Agency
5	NCCP	Natural Community Conservation Plan
6	NDMA	N-nitrosodimethylamine
7	NDWA	North Delta Water Agency
8	NESHAP	National Emission Standards for Hazardous Air Pollutants
9	NEPA	National Environmental Policy Act
10	ng/L	nanograms per liter
11	NHPA	National Historic Preservation Act
12	NHTSA	National Highway and Traffic Safety Administration
13	NMFS	National Marine Fisheries Service
14	NMFS BO	National Marine Fisheries Service 2009 Biological Opinion
15	NO <sub>2</sub>	nitrogen dioxide
16	NOAA	National Oceanic and Atmospheric Administration
17	NOI	Notice of Intent
18	NO <sub>x</sub>	Nitrogen oxides
19	NPDES	National Pollutant Discharge Elimination System
20	NPPA	Native Plant Protection Act
21	NPS	National Park Service
22	NRA	National Recreation Area
23	NRCS	Natural Resources Conservation Service
24	NRHP	National Register of Historic Places
25	NRWQC	National Recommended Water Quality Criteria
26	NSJCGBA	Northeastern San Joaquin County Groundwater Banking
27		Authority
28	NSPS	New Source Performance Standards
29	NSR	New Source Review
30	NTR	National Toxics Rule
31	NTU	Nephelometric Turbidity Unit
32	NWR	National Wildlife Refuge
33	O <sub>3</sub>	Ozone
34	OBB	Orange Blossom Bridge
35	OBTCC	Oak Bottom Temperature Control Curtain
36	OCAP	Operations Criteria and Plan
37	OEHHA	California Office of Environmental Health Hazard
38		Assessment

1	OFF	Operations and Fishery Forum
2	OID	Oakdale Irrigation District
3	OMR	Old and Middle Rivers
4	OMWD	Olivenhain Municipal Water District
5	OWA	Oroville Wildlife Area
6	P	Phosphorous
7	PAH	Polycyclic Aromatic Hydrocarbons
8	Pb	Lead
9	PBDE	Polybrominated Diphenyl Ethers
10	PBO	Programmatic Biological Opinion
11	PCB	Polychlorinated Biphenyls
12	PCE	Perchloroethylene
13	PCE	Primary Constituent Element
14	PCWA	Placer County Water Agency
15	PDA	Public-Domain Allotments
16	PEIS	Programmatic Environmental Impact Statement
17	PFC	perfluorocarbons
18	PFMC	Pacific Fishery Management Council
19	PG&E	Pacific Gas & Electric Company
20	PHG	Public Health Goal
21	PM	Particulate matter
22	PM <sub>10</sub>	Particulate matter less than 10 microns in aerodynamic
23		diameter
24	PM <sub>2.5</sub>	Particulate matter less than 2.5 microns in aerodynamic
25		diameter
26	POD	Pelagic Organism Decline
27	Porter-Cologne Act	Porter Cologne Water Quality Control Act
28	ppb	Parts per billion (by volume)
29	ppm	Parts per million (by volume)
30	PRC	California Public Records Code
31	Projects	Central Valley Project and State Water Project
32	PSD	Federal Prevention of Significant Deterioration
33	psu	Practical Salinity Unit
34	PTE	Potential To Emit
35	PWD	Palmdale Water District
36	RBDD	Red Bluff Diversion Dam
37	RBPP	Red Bluff Pumping Plant
38	RCWD	Rancho California Water District

## Abbreviations and Acronyms

1	Reclamation	Department of the Interior, Bureau of Reclamation
2	RHNA	Regional Housing Needs Assessment
3	RM	River Mile
4	RMP	Resource Management Plan
5	ROD	Record of Decision
6	ROG	Reactive Organic Gas
7	RPA	Reasonable and Prudent Alternative
8	RPS	California Renewable Portfolio Standard
9	RRDS	Roaring River Distribution System
10	RWQCB	Regional Water Quality Control Board
11	SA	Settlement Agreement
12	SAFCA	Sacramento Area Flood Control Agency
13	SB	Senate Bill
14	SBA	South Bay Aqueduct
15	SBC	Second Basis of Comparison
16	SBCWD	San Benito County Water District
17	SCDD	Spring Creek Debris Dam
18	SCE	Southern California Edison
19	SCI	Sacramento Catch Index
20	SCVWD	Santa Clara Valley Water District
21	SDWA	Safe Drinking Water Act
22	Secretary	Secretary of the Department of the Interior
23	SED	Substitute Environmental Document
24	SEWD	Stockton East Water District
25	SF6	sulfur hexafluoride
26	SGA	Sacramento Groundwater Authority
27	SGMA	California Sustainable Groundwater Management Act
28	Shasta-Trinity LRMP	Shasta-Trinity National Forest Land and
29		Resource Management Plan
30	SHPO	State Historic Preservation Officer
31	SIP	State Implementation Plan
32	SJRRRP	San Joaquin River Restoration Program
33	SJRTC	San Joaquin River Technical Committee
34	SJVAPCD	San Joaquin Valley Air Pollution Control District
35	SLC	State Lands Commission
36	SLE	St. Louis Encephalitis Virus
37	SMP	Suisun Marsh Habitat Management, Preservation,
38		and Restoration Plan



1	SMPA	Suisun Marsh Preservation Agreement
2	SMSCG	Suisun Marsh Salinity Control Gate
3	SMUD	Sacramento Municipal Utilities District
4	SNMP	Salt and Nitrate Management Plan
5	SO <sub>2</sub>	Sulfur Dioxide
6	SO <sub>x</sub>	sulfur oxides
7	SOG	Stanislaus Operations Group (also known as the Stanislaus
8		Operations Team [SOT])
9	SONCC	Southern Oregon/Northern California Coast
10	SRA	State Recreation Area
11	SRCA	Sacramento River Conservation Area
12	SRCD	Suisun Resource Conservation District
13	SRES	Special Report on Emissions Scenarios
14	SRTTG	Sacramento River Temperature Task Group
15	SRWA	Sacramento River Wildlife Area
16	SSC	Species of Special Concern
17	SSJID	South San Joaquin Irrigation District
18	SSWD	South Sutter Water District
19	SWAP	Statewide Agricultural Production Model
20	SWAMP	State Water Resources Control Board Surface Water
21		Ambient Monitoring Program
22	SWG	Smelt Working Group
23	SWP	State Water Project
24	SWPOCO	State Water Project Operations Control Office
25	SWRCB	State Water Resources Control Board
26	TAC	Toxic Air Contaminant
27	TAF	Thousands of acre-feet
28	TBP	Temporary Barrier Project
29	TCAA	Trichloroacetic Acid
30	TCDD	Temperature Control Device
31	TCDD	Tetrachlorodibenzodioxin
32	TCE	Trichloroethylene
33	TDS	Total Dissolved Solids
34	TFCF	Tracy Fish Collection Facility
35	TMDL	Total Maximum Daily Load
36	TOC	Total Organic Carbon
37	tpy	Tons per year
38	TRRP	Trinity River Restoration Program

## Abbreviations and Acronyms

1	TSS	Total Suspended Sediment
2	UCD	University of California, Davis
3	UCCE	University of California Cooperative Extension
4	USACE	U.S. Army Corps of Engineers
5	USC	United States Code
6	USDA	U.S. Department of Agriculture
7	USEPA	U.S. Environmental Protection Agency
8	USFS	U.S. Forest Service
9	USFWS	U.S. Fish and Wildlife Service
10	USFWS BO	U.S. Fish and Wildlife Service 2008 Biological Opinion
11	USGS	U.S. Geological Survey
12	USGVMWD	Upper San Gabriel Valley Municipal Water District
13	UWMP	Urban Water Management Plan
14	VAMP	Vernalis Adaptive Management Program
15	VIC	Variable Infiltration Capacity
16	VOC	Volatile organic compound
17	VVWRA	Victor Valley Wastewater Reclamation Authority
18	WBMWD	Western Basin Municipal Water District
19	WBS	water balance subregion
20	WDCWA	Woodland-Davis Clean Water Agency
21	WEE	Western Equine Encephalitis
22	Western	Western Area Power Administration
23	WMA	Wildlife Management Area
24	WMD	Western Municipal Water District
25	WNV	West Nile Virus
26	WOMT	Water Operations Management Team
27	WQCP	Water Quality Control Plan for the San Francisco
28		Bay/Sacramento–San Joaquin Delta Estuary
29	WR	Water Rights
30	WRESL	water resources simulation language
31	WRO	Water Rights Order
32	WSD	Water Storage District
33	WSRCD	Western Shasta Resource Conservation District
34	WUA	Weighted Useable Area
35	ww	wet weight
36	WY	Water Year

## Abbreviations and Acronyms

1	YCWA	Yuba County Water Agency
2	YOY	Young-of-the-Year
3	Yuba Accord	Lower Yuba River Accord

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