

Chapter 15**1 Recreation Resources****2 15.1 Introduction**

3 This chapter describes recreational resources in the study area; and potential
4 changes that could occur as a result of implementing the alternatives evaluated in
5 this Environmental Impact Statement (EIS). Implementation of the alternatives
6 could affect recreation resources through potential changes in operation of the
7 Central Valley Project (CVP) and State Water Project (SWP) and ecosystem
8 restoration.

**9 15.2 Regulatory Environment and Compliance
10 Requirements**

11 Potential actions that could be implemented under the alternatives evaluated in
12 this EIS could affect recreational resources at reservoirs and lands served by CVP
13 and SWP water supplies. Actions located on public agency lands; or
14 implemented, funded, or approved by Federal and state agencies would need to be
15 compliant with appropriate Federal and state agency policies and regulations, as
16 summarized in Chapter 4, Approach to Environmental Analyses.

17 15.3 Affected Environment

18 This section describes recreational resources that could be potentially affected by
19 the implementation of the alternatives considered in this EIS. Changes in
20 recreation opportunities due to changes in CVP and SWP operations may occur in
21 the Trinity River, Central Valley, San Francisco Bay Area, Central Coast, and
22 Southern California regions. Recreational fishing in San Francisco Bay and along
23 the Pacific Coast also may be affected by changes in CVP and SWP operations.

24 There are extensive recreational opportunities within this study area. However,
25 the recreational opportunities that could be directly or indirectly affected through
26 implementation of the alternatives analyzed in this EIS are related to water-related
27 recreation activities at CVP and SWP reservoirs and in the rivers downstream of
28 those reservoir, fishing opportunities in the Delta and the Pacific Ocean that are
29 affected by the water flows managed by CVP and SWP operations, and bird
30 watching, wildlife viewing, and hunting activities at wildlife refuges that use CVP
31 water supplies. Therefore, the following description of the affected environment
32 is limited to these recreational aspects. The wildlife refuges identified to receive
33 CVP water supplies are shown on Figure 15.1.

1 **15.3.1 Trinity River Region**

2 The Trinity River Region includes the area along the Trinity River from Trinity
 3 Lake to the confluence with the Klamath River; and along the lower Klamath
 4 River from the confluence with the Trinity River to the Pacific Ocean. Major
 5 recreational opportunities occur at Trinity Lake, Lewiston Reservoir, along the
 6 Trinity River between Lewiston Reservoir and the confluence with the Klamath
 7 River, and along the lower Klamath River.

8 **15.3.1.1 Trinity Lake**

9 Trinity Lake is a CVP facility on the Trinity River that is located approximately
 10 50 miles northwest of Redding, as described in Chapter 5, Surface Water
 11 Resources and Water Supplies. Trinity Lake is part of the Whiskeytown-Shasta-
 12 Trinity National Recreation Area and part of the Shasta-Trinity National Forest.
 13 Recreational facilities and activities at Trinity Lake are administered by the U.S.
 14 Forest Service (USFS). When the water storage in the reservoir is at full capacity
 15 (water elevation at 2370 feet mean sea level (msl), Trinity Lake has a surface area
 16 of 17,222 acres and 147 miles of shoreline (USFS 2014).

17 Boating, windsurfing, and fishing primarily occur in the northern part of the lake
 18 near Trinity Center. Houseboats, motorboats, water skiing primarily occur in the
 19 southern part of the lake. There are six public boat ramps on Trinity Lake as
 20 summarized in Table 15.1.

21 **Table 15.1 Trinity Lake Boat Ramps**

Location	Boat Ramp	Comments	Useable Elevations (feet, msl)
Trinity Lake	Bowerman	–	2,370 to 2,323
Trinity Lake	Clark Spring	–	2,370 to 2,313
Trinity Lake	Fairview	–	2,370 to 2,313
Trinity Lake	Minersville	–	2,305 to 2,170
Trinity Lake	Stuart Fork	–	2,370 to 2,338
Trinity Lake	Trinity Center	–	2,370 to 2,300

22 Source: USFS 2014

23 Three major marinas are located at Trinity Lake, as summarized in Table 15.2.
 24 The USFS can permit up to 1,000 boat slips at the Trinity Lake marinas (USFS
 25 2014). Many commercial houseboats are available for rent at the marinas.
 26 Trinity Lake shoreline includes approximately 32 miles of prime houseboating
 27 areas and 18.5 miles of secondary houseboating areas. The USFS issues permits
 28 for houseboats and privately-owned recreational occupancy vehicles that use the
 29 water overnight. At Trinity Lake, up to 99 permits for privately-owned vessels
 30 and 85 permits for commercially-owned vessels may be issued each year.

1 **Table 15.2 Trinity Lake Marinas and Moorage Facilities**

Location	Marina and Moorage Facility	Number
Trinity Lake	Cedar Stock Resort & Marina	31 Commercial and 220 Private Slips, including 10 Commercial Houseboats
Trinity Lake	KOA Campground	15 Commercial and 110 Private Slips
Trinity Lake	Pinewood Cove Docks	52 Private Slips
Trinity Lake	Trinity Alps Marina	31 Commercial and 63 Private Slips, including 25 Commercial Houseboats
Trinity Lake	Trinity Center Marina	80 Private Slips

2 Source: USFS 2014

3 The Trinity Unit of the Whiskeytown-Shasta-Trinity National Recreation Area
4 includes many campground sites, including campgrounds for group camping
5 opportunities (USFS 2014), as summarized in Table 15.3. There are other
6 campgrounds within the upper elevations of the Trinity Lake watershed that are
7 not directly or indirectly affected by changes in surface water elevations.

8 **Table 15.3 Trinity Lake Major Campgrounds**

Location	Campground	Comments	Number of Campsites
Trinity Lake	Alpine View	–	53
Trinity Lake	Bushytail	–	11
Trinity Lake	Captain's Point	Boat-In Campground	3
Trinity Lake	Clark Springs	–	21
Trinity Lake	Fawn	Group Campground	60
Trinity Lake	Hayward Flat	–	98
Trinity Lake	Jackass Springs	–	10
Trinity Lake	Mariner's Roost	Boat-In Campground	7
Trinity Lake	Minersville	–	14
Trinity Lake	Ridgeville	Boat-In Campground	10
Trinity Lake	Ridgeville Island	Boat-In Campground	3
Trinity Lake	Stoney Creek	Group Campground	10
Trinity Lake	Stoney Point	–	15
Trinity Lake	Tannery Gulch	–	82

9 Source: USFS 2014

1 Trinity Lake recreational areas also include day use areas for picnicking,
 2 swimming, and other recreational opportunities, as summarized in Table 15.4.
 3 The locations for shoreline day use areas are limited due to the steep and rocky
 4 elevations at the shorelines. To develop two swimming beaches at Trinity Lake,
 5 the rocky shorelines were covered with sand and/or decomposed granite at a
 6 specific elevation. Uses of these locations are less desirable when the water
 7 elevations decline.

8 **Table 15.4 Trinity Lake Major Day Use Areas**

Location	Day Use Area	Comments	Number
Trinity Lake	Clark Springs Day Use and Beach	Picnic and Swimming	34 picnic sites
Trinity Lake	North Shore Vista	Vistas and Interpretative Site	–
Trinity Lake	Osprey Info Site	Vistas and Interpretative Site	–
Trinity Lake	Stoney Creek	Picnic and Swimming	4 picnic sites
Trinity Lake	Tanbark Picnic	Picnic and Swimming	8 picnic sites
Trinity Lake	Trail of Trees	Interpretative Trail at Tannery Gulch Campground	0.5 miles
Trinity Lake	Trinity Lakeshore Trail	Trail	4 miles
Trinity Lake	Trinity Vista	Vistas and Interpretative Site	–

9 Source: USFS 2014

10 Trinity Lake fishing opportunities include Smallmouth Bass, Largemouth Bass,
 11 Rainbow Trout, Brown Trout, Chinook Salmon, and Kokanee Salmon (USFS
 12 2014). White Catfish, Brown Bullhead, Green Sunfish, Bluegill, Klamath
 13 Smallscale Sucker, and Pacific Lamprey also are present but are not generally
 14 considered as part of the recreational fishing opportunities. Wildlife viewing
 15 opportunities extend throughout the Trinity Lake area, including viewing of Bald
 16 Eagles, Black-tailed Deer, Black Bear, Gray Squirrel, rabbit, turkey, and
 17 California Quail.

18 **15.3.1.2 Lewiston Reservoir**

19 Lewiston Reservoir is a CVP facility on the Trinity River that is located
 20 immediately downstream of the Trinity Dam, as described in Chapter 5, Surface
 21 Water Resources and Water Supplies. Lewiston Reservoir is part of the
 22 Whiskeytown-Shasta-Trinity National Recreation Area and part of the Shasta-
 23 Trinity National Forest. Recreational facilities and activities are administered by
 24 the USFS. When the water storage in the reservoir is at full capacity (water

1 elevation at 1,874 feet msl), the reservoir has a surface area of 759 acres and
 2 15 miles of shoreline (USFS 2014).
 3 The water elevation is generally stable in Lewiston Reservoir because it is used as
 4 regulating reservoir for releases to downstream uses. Water is diverted from the
 5 lower outlets in Trinity Lake to Lewiston Reservoir to provide cold water to
 6 Trinity River and Whiskeytown Lake. Therefore, recreational opportunities in
 7 Lewiston Reservoir include boating and fishing; however, there are fewer
 8 opportunities for swimming and water skiing. Lewiston Reservoir does not
 9 support houseboats. There is one primary boat ramp and two marinas in Lewiston
 10 Reservoir, as summarized in Tables 15.5 and 15.6.

11 **Table 15.5 Lewiston Reservoir Boat Ramps**

Location	Boat Ramp	Comments	Useable Elevations (feet, msl)
Lewiston Lake	Pine Cove	Open all year	Around 1870

12 Source: USFS 2014

13 **Table 15.6 Lewiston Lake Marinas and Moorage Facilities**

Location	Marina and Moorage Facility	Number
Lewiston Lake	Lakeview Terrace Docks	14 Commercial and 7 Private Slips
Lewiston Lake	Pine Cove Marina	20 Commercial and 34 Private Slips

14 Source: USFS 2014

15 The Whiskeytown-Shasta-Trinity National Recreation Area includes campground
 16 sites near the Lewiston Reservoir shoreline, including campgrounds for group
 17 camping opportunities (USFS 2014), as summarized in Table 15.7. Lewiston
 18 Reservoir recreational areas also include day use areas for picnicking, swimming,
 19 and other recreational opportunities, as summarized in Table 15.8. Because the
 20 water surface elevations are more stable in Lewiston Reservoir than Trinity Lake,
 21 the day use areas have more vegetation along the shoreline.

22 **Table 15.7 Lewiston Lake Major Campgrounds**

Location	Campground	Comments	Number of Campsites
Lewiston Lake	Ackerman	–	51
Lewiston Lake	Cooper Gulch	–	5
Lewiston Lake	Mary Smith	–	17
Lewiston Lake	Tunnel Rock	–	6

23 Source: USFS 2014

1 **Table 15.8 Lewiston Major Lake Day Use Areas**

Location	Day Use Area	Comments	Number
Lewiston Lake	Baker Gulch Trail	Trail	0,2 miles
Lewiston Lake	Lewiston Vista	Vistas and Interpretative Site	–
Lewiston Lake	North Lakeshore Trail	Trail	2 miles
Lewiston Lake	Pine Cove	Picnic	2 picnic sites
Lewiston Lake	South Lakeshore Trail	Trail	1 mile

2 Source: USFS 2014

3 Lewiston Reservoir fishing opportunities include Smallmouth Bass, Rainbow
4 Trout, Brown Trout, Three-spine Stickleback, Golden Shiner, and Kokanee
5 Salmon (USFS 2014). Klamath Smallscale Sucker, and Pacific Lamprey also are
6 present but are not generally considered as part of the recreational fishing
7 opportunities. Wildlife viewing opportunities extend throughout the Lewiston
8 Reservoir area, including viewing of Bald Eagles, Black-tailed Deer, River Otter,
9 ring-tailed cats, raccoon, and California Quail. Waterfowl use Lewiston
10 Reservoir throughout the year with increased populations in the winter.

11 **15.3.1.3 Trinity River from Lewiston Dam to the Klamath River**

12 The Trinity River flows approximately 112 miles from Lewiston Dam to the
13 Klamath River (NCRWQCB et al. 2009) through Trinity, Humboldt, and Del
14 Norte counties.

15 The first mile of the river below the Lewiston Dam is located within the
16 Whiskeytown-Shasta-Trinity National Recreation Area. Portions of the Trinity
17 River downstream of Lewiston Dam and Junction City to the confluence with
18 North Fork Trinity River are under the jurisdiction of the Department of the
19 Interior, Bureau of Land Management (BLM) (USFWS et al. 1999). Between the
20 confluence with the North Fork Trinity River and the confluence of New River,
21 the area along the Trinity River is located within the USFS Shasta-Trinity
22 National Forest. Between the confluence with the New River and the Hoopa
23 Indian Reservation, most of the area along the Trinity River is located within the
24 USFS Six Rivers National Forest. The remaining portions of the Trinity River to
25 the confluence with the Klamath River are located within the Hoopa Indian
26 Reservation.

27 On January 19, 1981, the Secretary of the Interior designated the Trinity River
28 starting 100 yards downstream of the Lewiston Dam to the confluence with the
29 Klamath River as part of the National Wild and Scenic Rivers System. The
30 designation also included portions of the South Fork, North Fork, and New River
31 (BLM et al 2012). However, because the flows in the South Fork, North Fork,
32 and New River are not affected by the alternatives considered in this EIS, these
33 rivers are not evaluated in this EIS.

1 There are approximately 35 developed recreation sites and more than 200 access
 2 points along the Trinity River corridor within a half mile of the river, and
 3 numerous river access sites between Lewiston Dam and Weitchpec (NCRWQCB
 4 et al. 2009; USFWS et al. 1999).

5 Recreation occurs year-round in the Trinity River area. Water-related activities
 6 include boating, kayaking, canoeing, whitewater rafting, inner tubing, fishing,
 7 swimming, wading, gold panning, camping, and picnicking (NCRWQCB et al.
 8 2009). Fishing opportunities include steelhead, Rainbow Trout, Brown Trout, and
 9 Chinook Salmon.

10 **15.3.1.4 Lower Klamath River from Trinity River Confluence to the** 11 **Pacific Ocean**

12 The Klamath River continues for 43.5 miles from the Trinity River confluence to
 13 the Pacific Ocean (NCRWQCB et al. 2009).

14 Downstream of the Trinity River, the Klamath River flows through the Hoopa
 15 Indian Reservation, Yurok Indian Reservation, and Resighini Indian Reservation
 16 as well as lands owned by local agencies and private entities (DOI and DFG
 17 2012). Near the confluence with the Pacific Ocean, the Klamath River flows
 18 through the Redwood National Park. These reaches are primarily within
 19 Humboldt and Del Norte counties.

20 The portion of the Klamath River from the confluence with the Trinity River to
 21 the Pacific Ocean is part of the Klamath River designated by the Secretary of the
 22 Interior to be part of the National Wild and Scenic Rivers System on January 19,
 23 1981. The State of California also designated this reach of Klamath River as wild
 24 and scenic under Public Resources Code sections 5093.54 and 5093.545.

25 Recreation along the Klamath River downstream of the Trinity River is limited
 26 (DOI and DFG 2012). Canoeing, kayaking, and whitewater boating occurs along
 27 this reach. Whitewater rafting generally requires a minimum flow of 1,800 cfs in
 28 this portion of the Klamath River. Four campgrounds, picnic areas, and water
 29 access at public lands are located along the Klamath River near the confluence
 30 with the Pacific Ocean. Fishing opportunities in the lower Klamath River are
 31 primarily related to Chinook Salmon. Del Norte County operates two public boat
 32 ramps along the Klamath River. The Redwood National and State Parks operate
 33 Lagoon Creek near the confluence of the Klamath River and the Pacific Ocean
 34 (RNSP 2013; Del Norte County 2003). There are other trails near the Pacific
 35 Ocean, including the California Coastal Trail which is generally located along the
 36 northern and eastern banks of the Klamath River at the Pacific Ocean (California
 37 Coastal Trail 2014).

38 **15.3.2 Central Valley Region**

39 The Central Valley Region extends from above Shasta Lake to the Tehachapi
 40 Mountains, and includes the Sacramento Valley, San Joaquin Valley, Delta, and
 41 Suisun Marsh.

1 **15.3.2.1 Sacramento Valley**

2 Recreational opportunities in the Sacramento Valley upstream of the Delta that
 3 are influenced by CVP and SWP operations occur at Shasta Lake, Keswick
 4 Reservoir, Whiskeytown Lake, Clear Creek, Sacramento River between Keswick
 5 Dam and the Delta, Lake Oroville and Thermalito Afterbay, Yuba River from
 6 between New Bullards Bar and Feather River, Bear River between Camp Far
 7 West Reservoir and Feather River, Feather River between Thermalito Dam and
 8 the Sacramento River, Folsom Lake and Lake Natoma, American River between
 9 Nimbus Dam and the Sacramento River, and refuges that use CVP water supplies.

10 **15.3.2.1.1 Shasta Lake**

11 Shasta Lake is a CVP facility on the Sacramento River that is located near
 12 Redding, as described in Chapter 5, Surface Water Resources and Water Supplies.
 13 Shasta Lake is part of the Whiskeytown-Shasta-Trinity National Recreation Area
 14 and part of the Shasta-Trinity National Forest. Recreational facilities and
 15 activities at Shasta Lake are administered by the USFS. When the water storage
 16 in the lake is at full capacity (water elevation at 1067 feet msl), Shasta Lake has a
 17 surface area of approximately 30,000 acres and 365 miles of shoreline
 18 (Reclamation 2013a; USFS 2014).

19 Boating, water skiing, other water sports, and fishing occur in many locations in
 20 the lake. Many types of boats are used, including fishing boats, deck boats,
 21 houseboats, cabin cruisers, pontoon boats, personal watercraft, runabouts, and ski
 22 boats (Reclamation 2013a; USFS 2014). There are seven public boat ramps on
 23 Shasta Lake, as summarized in Table 15.9.

24 **Table 15.9 Shasta Lake Boat Ramps**

Location	Boat Ramp	Comments	Useable Elevations (feet, msl)
Shasta Lake	Antlers	–	1,067 to 992
Shasta Lake	Bailey Cove	–	1,067 to 1,017
Shasta Lake	Centimudi	–	1,067 to 857
Shasta Lake	Hirz Bay	–	1,067 to 972
Shasta Lake	Jones Valley	–	1,067 to 857
Shasta Lake	Packers Bay	–	1,067 to 952
Shasta Lake	Sugar Loaf	–	992 to 907

25 Source: USFS 2014

26 A boating safety issue that arises with fluctuations in water level is the associated
 27 fluctuation of the pattern of submerged obstacles. When the water level
 28 decreases, many rocks, shoals, and islands are much closer to the water surface,
 29 and can be easily struck by boats. When the water level rises, debris and
 30 obstacles that were previously easily visible may be dangerously out of sight and
 31 struck by boats (Reclamation 2013a).

1 Nine major marinas are located at Shasta Lake, as summarized in Table 15.10.
 2 The USFS can permit up to 3,000 boat slips at the Shasta Lake marinas (USFS
 3 2014). Many commercial houseboats are available for rent at the marinas. Shasta
 4 Lake shoreline includes approximately 109 miles of prime houseboating areas and
 5 153 miles of secondary houseboating areas. The USFS issues permits for
 6 houseboats and privately-owned recreational occupancy vehicles that use the
 7 water overnight. At Shasta Lake, up to 613 permits for privately-owned vessels
 8 and 450 permits for commercially-owned vessels may be issued each year.

9 **Table 15.10 Shasta Lake Marinas and Moorage Facilities**

Location	Marina and Moorage Facility	Number
Shasta Lake	Antlers Resort and Marina	101 Commercial and 200 Private Slips, including 35 Commercial Houseboats
Shasta Lake	Bridge Bay Resort	140 Commercial and 7,773 Private Slips, including 92 Commercial Houseboats
Shasta Lake	Digger Bay Marina	75 Commercial and 145 Private Slips, including 50 Commercial Houseboats
Shasta Lake	Holiday Harbor	95 Commercial and 330 Private Slips, including 70 Commercial Houseboats
Shasta Lake	Jones Valley Marina	90 Commercial and 99 Private Slips, including 64 Commercial Houseboats
Shasta Lake	Packers Bay Marina	51 Commercial Slips, including 26 Commercial Houseboats
Shasta Lake	Shasta Lake RV Resort	22 Private Slips
Shasta Lake	Shasta Marina	54 Commercial and 139 Private Slips, including 24 Commercial Houseboats
Shasta Lake	Silverthorn Resort Marina	59 Commercial and 113 Private Slips, including 35 Commercial Houseboats
Shasta Lake	Sugarloaf Cottages	16 Private Slips
Shasta Lake	Sugarloaf Marina	41 Commercial and 40 Private Slips, including 21 Commercial Houseboats
Shasta Lake	Tsardi Resort	30 Private Slips

10 Source: USFS 2014

1 The Shasta Unit of the Whiskeytown-Shasta-Trinity National Recreation Area
 2 includes many campground sites, including campgrounds for group camping
 3 opportunities (USFS 2014), as summarized in Table 15.11. There are other
 4 campgrounds within the upper elevations of the Shasta Lake watershed that are
 5 not directly or indirectly affected by changes in surface water elevations.

6 Campers are also affected by declining water elevations because this increases the
 7 distance from the campsites to the shoreline. Drawdown of the reservoir has an
 8 aesthetic effect on users because the land exposed during drawdown is generally
 9 composed of bare earth and rock.

10 **Table 15.11 Shasta Lake Major Campgrounds**

Location	Campground	Comments	Number of Campsites
Shasta Lake	Antlers	–	59
Shasta Lake	Arbuckle Flat	Boat-In Campground	11
Shasta Lake	Beehive	Shoreline Campground	No specified number
Shasta Lake	Bailey Cove	–	7
Shasta Lake	Dekkas Rock	Group Campground	60
Shasta Lake	Ellery Creek	–	19
Shasta Lake	Gooseneck Cove	Boat-In Campground	8
Shasta Lake	Green's Creek	Boat-In Campground	9
Shasta Lake	Gregory Creek	Shoreline Campground	18
Shasta Lake	Hirz Bay	Individual and Group Campground	48 Individual Sites and 200 Group Sites
Shasta Lake	Jones Valley (Upper & Lower)	Includes Shoreline Campground at Inlet	21
Shasta Lake	Lakeshore East	–	26
Shasta Lake	Lower Salt Creek	Shoreline Campground	No specified number
Shasta Lake	Mariners Point	Shoreline Campground	No specified number
Shasta Lake	McCloud Bridge	–	14
Shasta Lake	Moore Creek	Individual and Group Campground	12 Individual Sites and 90 Group Sites
Shasta Lake	Nelson Point	Individual and Group Campground	8 Individual Sites and 60 Group Sites
Shasta Lake	Oak Grove	–	45
Shasta Lake	Pine Point	Individual and Group Campground	14 Individual Sites and 100 Group Sites
Shasta Lake	Ski Island	Boat-In Campground	23

11 Source: USFS 2014

1 Shasta Lake recreational areas also include day use areas for picnicking,
 2 swimming, and other recreational opportunities, as summarized in Table 15.12.
 3 The locations for shoreline day use areas are limited due to the steep and rocky
 4 elevations at the shorelines. Uses of these locations are less desirable when the
 5 water elevations decline.

6 **Table 15.12 Shasta Lake Day Use Areas**

Location	Day Use Area	Comments	Number
Shasta Lake	Bailey Cove	Picnic and Trail	9 picnic sites 3.1 miles
Shasta Lake	Clikapudi	Trail	8 miles with 1 mile advanced trail
Shasta Lake	Dekkas Rock	Picnic	5 picnic sites
Shasta Lake	Dry Fork Creek	Trail	4.7 miles
Shasta Lake	Fisherman's Point	Picnic and Trail	7 picnic sites 0.5 miles
Shasta Lake	Hirz Bay	Trail	1.6 miles
Shasta Lake	McCloud Bridge	Picnic	5 picnic sites
Shasta Lake	Packers Bay	Trail	Four Trails: 0.4 to 2.8 miles
Shasta Lake	Potem Falls	Trail	0.3 miles
Shasta Lake	Samwel Cave Nature Trail	Interpretative Trail	1 mile
Shasta Lake	Sugarloaf	Trail	1 mile

7 Source: USFS 2014

8 Additional recreational opportunities are provided at the Shasta Dam Visitors
 9 Center.

10 Fishing is also popular at Shasta Lake, performed mostly by boat as opposed to
 11 from the shoreline. Anglers can catch warmwater and coldwater fish species
 12 year-round due to the summer stratification of the lake into a warm layer above a
 13 coldwater pool (Reclamation 2013a). Shasta Lake warm water fishing
 14 opportunities include Black Bass, Smallmouth Bass, Largemouth Bass, Spotted
 15 Bass, Black Crappie, Channel Catfish, and Bluegill (USFS 2014). There are
 16 many bass tournaments at Shasta Lake each summer. The cooler water strata
 17 supports fishing for Rainbow Trout and Chinook Salmon.

18 **15.3.2.1.2 Keswick Reservoir**

19 Keswick Reservoir is a CVP afterbay that extends 9 miles along the Sacramento
 20 River from Shasta Dam to Keswick Dam, as described in Chapter 5, Surface
 21 Water Resources and Water Supplies. Recreational facilities and activities at
 22 Keswick Reservoir are administered by BLM, Shasta County, and U.S. Forest
 23 Service for the Department of the Interior, Bureau of Reclamation (Reclamation).
 24 The maximum water storage elevation at the top of the Keswick Dam spillway is

1 587 feet msl (Reclamation 2009). The water level fluctuates frequently in
2 Keswick Reservoir, depending on the operations of Shasta Dam.

3 Water-related activities include boating, fishing, and water sports. The Keswick
4 Boat Launch, operated by BLM, is located on the western shoreline at the south
5 end of the reservoir (BLM 2005).

6 There are several trails along Keswick Reservoir and areas for off highway
7 vehicles (OHVs) with camping allowed at one of the locations (BLM 2005; BLM
8 2011). The Sacramento Rail Trail extends from Moccasin Creek below Shasta
9 Dam to Redding along the western shoreline of Keswick Reservoir and the
10 Sacramento River downstream of Keswick Dam. The Fisherman Trail extends
11 along the shoreline from the lower Sacramento Rail Trail to Keswick Dam. The
12 F.B. Trail extends from the Ribbon Bridge downstream of the Keswick Dam to
13 Walker Mine Road along the eastern side of the Keswick Reservoir. There are
14 several other trails at higher elevations above Keswick Reservoir, including the
15 Hornbeck Tail, Upper and Lower Sacramento Ditch Trails, Flanagan Trail, and
16 Chamise Peak Trail.

17 The Chappie-Shasta OHV Area provides over 200 miles of roads in
18 approximately 52,000 acres (Reclamation 2013a). The area is accessed at two
19 staging areas. The Chappie-Shasta OHV Staging Area and Shasta Campground
20 includes a staging area for day use activities, including picnics, and 22 campsites
21 (BLM 2005). This site is located along the western shoreline of Keswick
22 Reservoir at the trailhead of the Sacramento Rail Trail at Moccasin Creek. The
23 Copley Mountain OHV Staging Area is located along the western shoreline of
24 Keswick Reservoir about midway between Shasta and Keswick dams. This site
25 also provides a staging area for day use activities, including picnics.

26 Fishing opportunities are primarily for German Brown Trout and Rainbow Trout.

27 **15.3.2.1.3 Whiskeytown Lake**

28 Whiskeytown Lake is a CVP facility on Clear Creek that is located approximately
29 8 miles west of Redding on the eastern slope of the Coast Range, as described in
30 Chapter 5, Surface Water Resources and Water Supplies. Whiskeytown Lake is
31 part of the Whiskeytown-Shasta-Trinity National Recreation Area. Recreational
32 facilities and activities administered by the National Park Service (NPS). When
33 the water storage in the reservoir is at full capacity (water elevation at
34 1210 feet msl), Whiskeytown Lake has a surface area of 3,250 acres and 36 miles
35 of shoreline (Reclamation 1997).

36 Boating, water skiing, sailing, kayaking, and canoeing, swimming, and fishing
37 occur in many locations in the lake. Boat launches are available at Oak Bottom,
38 Brandy Creek, and Whiskey Creek and at marinas at Oak Bottom and Brandy
39 Creek (NPS 2012), as summarized in Table 15.13.

1 **Table 15.13 Whiskeytown Lake Boat Ramps**

Location	Boat Ramp	Comments	Useable Elevations (feet, msl)
Whiskeytown Lake	Brandy Creek	–	1210 to 1190
Whiskeytown Lake	Oak Bottom	–	1210 to 1195
Whiskeytown Lake	Oak Bottom Marina	–	1210 to 1198
Whiskeytown Lake	Whiskey Creek	–	1210 to 1195

2 Sources: NPS 2012; Reclamation 1997

3 The lake level is relatively stable and do not reduce the ability for boat launching
 4 until late summer or early fall.

5 The Whiskeytown Unit of the Whiskeytown-Shasta-Trinity National Recreation
 6 Area includes many campground sites, including campgrounds for group camping
 7 opportunities (NPS 2012), as summarized in Table 15.14.

8 **Table 15.14 Whiskeytown Lake Major Campgrounds**

Location	Campground	Comments	Number of Campsites
Whiskeytown Lake	Brandy Creek RV	–	37 RV Sites
Whiskeytown Lake	Brandy Creek	Primitive Campground	2 Sites
Whiskeytown Lake	Coggins Park	Primitive Campground	1 Site
Whiskeytown Lake	Crystal Creek	Primitive Campground near Crystal Creek	2 Sites
Whiskeytown Lake	Dry Creek	Group Campground	100 people
Whiskeytown Lake	Horse Camp	Primitive Campground	2 Sites
Whiskeytown Lake	Oak Bottom Tent and Recreation Vehicle (RV)	–	98 Tent Sites and 22 RV Sites
Whiskeytown Lake	Peltier Bridge	Primitive Campground near Clear Creek	9 Sites
Whiskeytown Lake	Sheep Camp	Primitive Campground	4 Sites

9 Source: NPS 2012

1 Whiskeytown Lake recreational areas also include day use areas for picnicking,
 2 swimming, and other recreational opportunities, as summarized in Table 15.15.
 3 Shoreline day use areas are limited at some locations due to the steep and rocky
 4 elevations at the shorelines.

5 **Table 15.15 Whiskeytown Lake Day Use Areas**

Location	Day Use Area	Comments	Number
Whiskeytown Lake	Boulder Creek Falls	Trail	1 mile with 2.75-mile advanced trail
Whiskeytown Lake	Brandy Creek Beach and Falls	Picnic, Swimming, and Trails	1.6 and 1.5 miles
Whiskeytown Lake	Buck Hollow	Trail	1 mile
Whiskeytown Lake	Camden Water Ditch	Trail	1.1 miles
Whiskeytown Lake	Clear Creek Canal and Vista	Picnic and Trails	2.4 and 4.5 miles
Whiskeytown Lake	Crystal Creek Water Ditch and Falls	Picnic and Trails	0.75 and 0.3 miles
Whiskeytown Lake	Davis Gulch	Trail	3.3 miles
Whiskeytown Lake	East Beach	Swimming	–
Whiskeytown Lake	Guardian Rock	Trail	0.25 miles
Whiskeytown Lake	James K. Carr Trail	Trail	1.7 miles
Whiskeytown Lake	Judge Francis Carr Powerhouse	Picnic	–
Whiskeytown Lake	Kanaka Peak	Trail	3.6 miles
Whiskeytown Lake	Logging Camp	Trail	1 mile
Whiskeytown Lake	Mill Creek	Trail	6.1 miles
Whiskeytown Lake	Mt. Shasta Mine	Trail	3.5 miles
Whiskeytown Lake	Mule Mountain Pass	Trail	4.4 miles
Whiskeytown Lake	Oak Bottom Beach	Picnic and Swimming	–
Whiskeytown Lake	Oak Bottom Ditch	Trail	2.75 miles
Whiskeytown Lake	Papoose Pass	Trail	5.5 miles
Whiskeytown Lake	Peltier	Trail	1.75 miles
Whiskeytown Lake	Rich Gulch	Trail	1.8 miles
Whiskeytown Lake	Salt Creek	Trail	1.8 miles
Whiskeytown Lake	Salt Gulch	Trail	1.6 miles
Whiskeytown Lake	Shasta Divide Nature Trail	Trail	0.4 miles
Whiskeytown Lake	Whiskey Creek	Group Picnic Area and Swimming	–

6 Source: NPS 2012

1 Additional recreational opportunities are provided at the Whiskeytown Visitors
2 Center.

3 Fishing opportunities at Whiskeytown Lake include Brown Trout and Rainbow
4 Trout; Kokanee Salmon; Smallmouth Bass, Largemouth Bass, and Spotted Bass;
5 Bluegill; crappie; and Sacramento Pikeminnow (NPS No Date).

6 **15.3.2.1.4 Clear Creek from Whiskeytown Dam to the Sacramento River**

7 Whiskeytown Lake is operated to release most of the water through the Spring
8 Creek Power Conduit into Keswick Reservoir, as described in Chapter 5, Surface
9 Water Resources and Water Supplies. Flows are also released from Whiskeytown
10 Lake to Clear Creek to be consistent with federal and state requirements. During
11 high flow events, additional flows may be released into Clear Creek.

12 The initial reaches of Clear Creek downstream of the Whiskeytown Dam are
13 located within the Whiskeytown-Shasta-Trinity National Recreation Area. The
14 remaining portions of Clear Creek flow to the Sacramento River through lands
15 owned by BLM and private owners. All of these reaches are located within
16 Shasta County and the most eastern reaches are within the City of Redding.

17 BLM has established the Clear Creek Greenway along a large portion of the lower
18 Clear Creek from within the Whiskeytown-Shasta-Trinity National Recreation
19 Area to the Sacramento River (BLM n.d.). The area also includes the Horsetown-
20 Clear Creek Preserve which is a private-public partnership recreation area.

21 Hiking, picnicking, kayaking, swimming, fishing, and gold panning occur along
22 the lower Clear Creek (SRWP 2010). The Clear Creek Greenway includes ten
23 trails and eight picnic areas (BLM n.d.). Hunting is allowed in the Swasey and
24 Muletown Road areas of the Clear Creek Greenway. Fishing opportunities
25 include steelhead, Chinook Salmon, carp, suckers, Bluegill, bass, and Sacramento
26 Pikeminnow (SRWP 2010).

27 **15.3.2.1.5 Sacramento River from Keswick Dam to the Delta**

28 The Sacramento River from Keswick Dam to the Sacramento-San Joaquin Delta
29 (Delta) is divided into three reaches for discussion in this section: Keswick
30 Reservoir to Red Bluff, Red Bluff to the Feather River, and Feather River
31 confluence to the Delta (near the City of West Sacramento).

32 *Sacramento River from Keswick Dam to Red Bluff*

33 The upper reach of the Sacramento River flows for approximately 60 miles from
34 Keswick Dam to Red Bluff (Reclamation 1997). Water-related recreational
35 activities include boating, picnicking, camping, and wildlife viewing. Boating
36 opportunities include motor-boating, jet-skiing, kayaking, canoeing, and
37 whitewater rafting in some locations (Reclamation 2013a, Reclamation et al.
38 2002). River flows can increase for short-term periods when water is being
39 released from the CVP facilities and during and following storm events in the
40 upper Sacramento River watershed. Flows in the late fall months may decrease to
41 levels that are not favorable for boating. Water temperatures in this reach are
42 generally cold throughout the year.

1 Much of the land along the Sacramento River between Balls Ferry and Red Bluff
2 is owned and managed by BLM (Reclamation 2013a). Public access points are
3 provided by the cities of Redding and Anderson and the BLM. Lake Redding
4 Park, Turtle Bay, and the Anderson River Park are some of the prominent access
5 areas. Boat launching can occur at eight public boat ramps and two smaller
6 launch facilities, including at Turtle Bay, Caldwell Park, and South Bonneyview
7 in the City of Redding; Ball Ferry; Battle Creek confluence with the Sacramento
8 River; Bend Bridge; and Red Bluff River Park in the City of Red Bluff.

9 There are two whitewater river reaches, including between Keswick Dam and the
10 Anderson-Cottonwood Irrigation District Diversion Dam and between Anderson
11 River Park and William B. Ide Adobe State Historic Park.

12 Camping facilities include public campgrounds along the Sacramento River at
13 Lake Red Bluff Recreation Area (Reclamation 2013a).

14 There are trails or trail access and picnicking facilities with access to the river in
15 this reach of the Sacramento River (Reclamation 2013a). The trails include the
16 13-mile Sacramento River Trail between Keswick Dam to Turtle Bay Park in the
17 City of Redding. Many of the picnicking locations are managed by local
18 municipalities, including the cities of Redding, Anderson, and Red Bluff.
19 Coleman National Fish Hatchery, located along Battle Creek near the Sacramento
20 River, provides recreational and educational opportunities.

21 Fishing opportunities along the upper Sacramento River include Chinook Salmon,
22 steelhead, Rainbow Trout, sunfish, and bass (Reclamation 2013a). Fishing can
23 occur from boats along the Sacramento River and at four public fishing access
24 points, including Turtle Bay East, Kapusta Property, Deschutes Road, Reading
25 Island, Diestlehorst Pasture River Access, Jellys Ferry, and Sacramento River
26 Island.

27 The Mouth of Cottonwood Creek Wildlife Area is operated by California
28 Department of Fish and Wildlife (DFW). This area provides viewing
29 opportunities for Swainson's Hawk, Bald Eagle, ringtail cat, River Otter, and
30 other birds and wildlife (Reclamation 2013a). Hunting opportunities on BLM
31 land occur at Inks Creek, Massacre Flat, Perry Rifle, Paynes Creek, Bald Hill and
32 Iron Canyon. Commonly hunted game includes quail, dove, waterfowl, deer, pig,
33 turkey, and bear (Reclamation 2013a).

34 *Sacramento River from Red Bluff to Feather River*

35 The middle reach of the Sacramento River flows approximately 160 miles from
36 Red Bluff to the confluence with the Feather River (Reclamation 1997).

37 Water-dependent activities along the middle reach include boating, swimming,
38 and fishing (Reclamation 2005a). Water-contact activities are popular in this
39 section of the river due to relatively warm water. Public access points are
40 provided along this reach by California Department of Parks and Recreations
41 (State Parks); and Tehama, Glenn, Colusa, and Sutter counties (Reclamation
42 2005a; Reclamation 1997). River access in this reach is primarily provided at
43 private fishing access points, marinas, and resorts.

1 The three major State Parks properties along the middle reach include the
 2 Woodson Bridge State Recreation Area, the Bidwell-Sacramento River State
 3 Park, and the Colusa-Sacramento River State Recreation area (DFG 2004;
 4 Reclamation 2013a). Public access for fishing, hunting, and wildlife viewing also
 5 is provided at the DFW Fremont Weir Wildlife Area (DFW 2014a).

6 Fishing opportunities include Chinook Salmon, steelhead, trout, American Shad,
 7 sturgeon, catfish, and Striped Bass (Reclamation 2005a).

8 Seasonal game includes Ring-necked Pheasants, California Quail, various species
 9 of ducks and geese, Mourning Doves, and Mule Deer (Reclamation 2013a).

10 *Sacramento River from Feather River to the Northern Delta Boundary*

11 The lower reach of the Sacramento River flows for approximately 20 river miles
 12 between the confluence with Feather River and immediately downstream of the
 13 confluence with the American River (USACE 1991). The major portion of this
 14 reach of the Sacramento River flows along private property.

15 Water-related activities in this reach include boating, swimming and beach use,
 16 picnicking, biking, sightseeing, and fishing. Public access is provided by Yolo
 17 County at Elkhorn Regional Park (Yolo County); Sacramento County and the
 18 City of Sacramento at Discovery Park and Miller Park, respectively (Sacramento
 19 County 2012; Reclamation 2005a); and by the City of West Sacramento at
 20 Broderick Boat Ramp (West Sacramento 2000).

21 Fishing opportunities in this area include Chinook Salmon, steelhead, American
 22 Shad, sturgeon, catfish, and Striped Bass (Reclamation 1997, 2005a).

23 **15.3.2.1.6 Sacramento Valley Wildlife Refuges**

24 Wildlife refuges in the Sacramento Valley that rely upon CVP water supplies
 25 include the Sacramento National Wildlife Refuge (NWR) Complex include
 26 Sacramento, Delevan, Colusa, and Sutter NWRs and Gray Lodge Wildlife Area,
 27 as described in Chapter 5, Surface Water Resources and Water Supplies, and
 28 Chapter 10, Terrestrial Biological Resources (Reclamation 2012). Water-related
 29 activities include wildlife viewing, hiking along the refuge wetlands, and
 30 waterfowl hunting. Shoreline fishing opportunities at Gray Lodge Wildlife Area
 31 include bass, sunfish, perch, catfish, and carp (DFW 2014b)

32 **15.3.2.1.7 Feather River Watershed**

33 Antelope Lake, Lake Davis, and Frenchman Lake located in the Upper Feather
 34 River; Lake Oroville and Thermalito Forebay and Afterbay; and the lower Feather
 35 River are located within areas in the Feather River watershed that could be
 36 affected by changes in CVP and/or SWP operations.

37 *Upper Feather River Lakes*

38 The Upper Feather River Lakes, including Antelope Lake, Lake Davis, and
 39 Frenchman Lake, are SWP facilities on the upper Feather River upstream of Lake
 40 Oroville. These lakes are part of the Plumas National Forest (DWR 2013a).

1 Recreational facilities and activities at all three lakes are managed by private
2 concessionaires under contract with the Plumas National Forest.

3 For Antelope Lake, when the water storage in the lake is at full capacity (water
4 elevation at 5,002 feet), the lake has a surface area of 930 acres and 15 miles of
5 shoreline (DWR 2013a; USFS 2011). Water related activities include boating,
6 water skiing, swimming, fishing, camping, and picnicking. There is a boat
7 launching ramp, three fishing access sites, and a picnic area. There are three
8 campgrounds at Antelope Lake, including Boulder Creek, Lone Rock, and Long
9 Point. There are approximately 194 campsites and 4 group campsites at the three
10 campgrounds for use between May through October. Fishing opportunities in
11 Antelope Lake include Rainbow Trout, Brook Trout, crappie, Channel Catfish,
12 and Smallmouth Bass, Largemouth Bass. Hunting opportunities around Antelope
13 Lake include Mule Deer and Black-tailed Deer.

14 For Lake Davis, when the water storage in the lake is at full capacity (water
15 elevation at 5,785 feet), the lake has a surface area of 4,030 acres and 32 miles of
16 shoreline (DWR 2013a; USFS 2006a). Water related activities include boating,
17 fishing, camping, and picnicking. There are boat launching ramps at Lightning
18 and Honker Cove, car-top boat ramp at Mallard Cove, a fishing access site, and a
19 picnic area. There are three campgrounds at Lake Davis, including Grizzly,
20 Grasshopper, and Lightning Tree. There are approximately 180 campsites at the
21 three campgrounds for use between May through October. Fishing opportunities
22 in Lake Davis include Rainbow Trout, German Brown Trout, Eagle Lake trout,
23 Brown Bullhead, and Largemouth Bass. Hunting opportunities around Lake
24 Davis include Mule Deer and Black-tailed Deer.

25 For Frenchman Lake, when the water storage in the lake is at full capacity (water
26 elevation at 5,588 feet), the lake has a surface area of 1,580 acres and 21 miles of
27 shoreline (DWR 2013a; USFS 2006b). Water related activities include boating,
28 water skiing, swimming, fishing, camping, picnicking, and ice fishing. There are
29 two boat launching ramps (Frenchman and Lunker Point), six fishing access sites,
30 and a picnic area. There are five campgrounds at Frenchman Lake, including
31 Chilcoot, Cottonwood Springs, Frenchman, Spring Creek, and Big Cove. There
32 are approximately 209 campsites and 2 group campsites at the five campgrounds
33 for use between May through October. Fishing opportunities in Frenchman Lake
34 include Rainbow Trout, Brown Trout, Eagle Lake trout, and Smallmouth Bass.
35 Hunting opportunities around Frenchman Lake include deer and waterfowl.

36 *Lake Oroville and Thermalito Forebay and Afterbay*

37 Lake Oroville and Thermalito Forebay and Afterbay are SWP facilities on the
38 Feather River, as described in Chapter 5, Surface Water Resources and Water
39 Supplies. The upper North Fork arm of Lake Oroville is part of the Lassen
40 National Forest; and the upper Middle Fork and South Fork arms of Lake Oroville
41 are part of Plumas National Forest. The Middle Fork Feather River (from
42 Beckwourth downstream of Lake Davis to Lake Oroville) was designated as part
43 of Public Law 90-542 (Wild and Scenic Rivers Act) to be part of the National
44 Wild and Scenic Rivers System on October 2, 1968. Recreational facilities and
45 activities at the Lake Oroville Complex (including Lake Oroville and Thermalito

1 Forebay and Afterbay) are managed by State Parks as part of the Lake Oroville
 2 State Recreation Area. When the water storage in the lake is at full capacity
 3 (water elevation at 900 feet msl), Lake Oroville has a surface area of 15,810 acres
 4 and 167 miles of shoreline. Thermalito Forebay has a surface area of 630 acres.
 5 Thermalito Afterbay has a surface area of 4,300 acres and 26 miles of shoreline
 6 when the water elevation is at 136.5 feet msl (DWR 2007a, 2007c, 2013b).

7 Water-related activities include boating, whitewater boating, camping, picnicking,
 8 and fishing (DWR 2007a). Boating includes kayaking, canoeing, and fishing
 9 boats. Whitewater boating occurs on the Big Bend area of the North Fork Feather
 10 River when Lake Oroville elevations are sufficiently low to expose several miles
 11 of river. This portion of the North Fork Feather River forms the Upper North
 12 Fork arm of Lake Oroville. Generally, this area is exposed in the late fall months.
 13 Another whitewater area is located in the Bald Rock Canyon on the Middle Fork
 14 Feather River. This whitewater area is located upstream of the Middle Fork arm
 15 of Lake Oroville.

16 There are 11 boat ramps on Lake Oroville, as summarized in Table 15.16. Two of
 17 the boat ramps are located at marinas (DWR 2007a).

18 **Table 15.16 Lake Oroville, Thermalito Forebay, and Thermalito Afterbay Boat**
 19 **Ramps**

Location	Boat Ramp	Comments	Useable Elevations (feet, msl)
Lake Oroville	Bidwell Canyon	Day Use Area Marina with 280 berths and 400 mooring anchors	900 to 700
Lake Oroville	Dark Canyon	Car-Top Launching	900 to 765
Lake Oroville	Enterprise		900 to 835
Lake Oroville	Foreman Creek	Car-Top Launching	900 to approximately 800
Lake Oroville	Lime Saddle	Day Use Area Marina, including houseboat rentals	900 to 702
Lake Oroville	Loafer Creek	Boat-In Campground	900 to 775
Lake Oroville	Monument Hill	Day Use Area	900 to approximately 700
Lake Oroville	Nelson Bar	Car-Top Launching	900 to 825
Lake Oroville	Spillway	Day Use Area	900 to 695
Lake Oroville	Stringtown Creek	Car-Top Launching	900 to 866
Lake Oroville	Vinton Gulch	Car-Top Launching	900 to 825

Location	Boat Ramp	Comments	Useable Elevations (feet, msl)
Thermalito Forebay	North Thermalito Forebay	Day Use Area Also used by California State University, Chico	Water elevation does not vary substantially
Thermalito Forebay	South Thermalito Forebay	Day Use Area	Water elevation does not vary substantially
Thermalito Afterbay	Larkin Road	Car-Top Launching	Water elevation does not vary substantially
Thermalito Afterbay	Oroville Wildlife Area		Water elevation does not vary substantially
Thermalito Afterbay	Thermalito Afterbay Outlet		Water elevation does not vary substantially
Thermalito Afterbay	Wilbur Road		Water elevation does not vary substantially

1 Sources: DWR 2006, 2007a

2 There are 16 campgrounds at Oroville Lake and Thermalito complex (DWR
3 2007a), as summarized in Table 15.17. Campers are affected by declining water
4 elevations because this increases the distance from the campsites to the shoreline,
5 and makes it difficult to access shoreline campgrounds at Bidwell Canyon, Lime
6 Saddle, and Loafer Creek when water elevations are lower than 850 feet msl.

7 **Table 15.17 Lake Oroville, Thermalito Forebay, and Thermalito Afterbay Major**
8 **Campgrounds**

Location	Campground	Comments	Number of Campsites
Lake Oroville	Bidwell Canyon	Campground	75
Lake Oroville	Bloomer Cove	Boat-In Campground	5
Lake Oroville	Bloomer Group	Boat-In Group Campground	75
Lake Oroville	Bloomer Knoll	Boat-In Campground	6
Lake Oroville	Bloomer Point	Boat-In Campground	25
Lake Oroville	Craig Saddle	Boat-In Campground	18
Lake Oroville	Floating Campsites	Boat-In Campground	10 Different Locations with approximately 15 sites per location
Lake Oroville	Foreman Creek	Boat-In Campground	26
Lake Oroville	Goat Ranch	Boat-In Campground	5
Lake Oroville	Lime Saddle	Campground and Group Campground	45

Location	Campground	Comments	Number of Campsites
Lake Oroville	Loafer Creek	Campground and Group Campground Horse Campground	137 6 15
Thermalito Forebay	North Thermalito Forebay "En Route"	Recreational Vehicle Campground	15
Thermalito Afterbay	Oroville Wildlife Area	Primitive Campground	Several

1 Sources: DWR 2006, 2007a

2 Lake Oroville recreational areas also include day use areas for picnicking,
 3 swimming, and other recreational opportunities, as summarized in Table 15.18.
 4 The locations for shoreline day use areas are limited due to the steep and rocky
 5 elevations at the shorelines. Uses of these locations are less desirable when the
 6 water elevations decline. It is difficult to access shoreline campgrounds at
 7 Bidwell Canyon and Loafer Creek when water elevations are lower than
 8 850 feet msl.

9 **Table 15.18 Lake Oroville, Thermalito Forebay, and Thermalito Afterbay Day**
 10 **Use Areas**

Location	Day Use Area	Comments	Number
Lake Oroville	Bidwell Canyon With Saddle Dam trailhead	Trail and picnic	4.9 mile trail (hiking and bicycling) 21 picnic sites
Lake Oroville	Chaparral Trail	Interpretative Trail	0.2 miles
Lake Oroville	Dan Beebe Trail With Saddle Dam, Lakeland Boulevard, Oro Dam Boulevard, and visitor center trailheads	Trail	14.3 mile trail (equestrian and hiking)
Lake Oroville	Lake Oroville Visitors Center	Visitors Center and picnic	18 picnic sites
Lake Oroville	Lime Saddle	Picnic	13 picnic sites
Lake Oroville	Loafer Creek	Trail, swimming, and picnic	3.2 mile trail (equestrian and hiking) 1.7 mile trail (hiking and bicycling) 30 picnic sites
Lake Oroville	Model Aircraft Flying Facility	Aircraft staging and picnic	6 picnic sites

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Location	Day Use Area	Comments	Number
Lake Oroville	Oroville Dam Overlook and Spillway Day Use Area	Trail, picnic, and shoreline fishing	1 mile along Oroville Dam crest 8 picnic sites
Lake Oroville	Potter's Ravine	Trail	5.5 miles
Lake Oroville	Roy Rogers Trail	Trail	4 miles (equestrian and hiking)
Lake Oroville	Sewim Bo Trail	Trail and picnic	0.5 miles (equestrian and hiking) 1 picnic site
Lake Oroville	Wyk Island Trail	Trail	0.2 miles
Feather River downstream of Oroville Dam	Feather River Fish Hatchery	Hatchery and picnic	1 picnic site
Oroville Dam Crest, Diversion Pool, Thermalito Forebay, and Thermalito Afterbay	Brad Freeman Trail Diversion Pool access road, East Hamilton Road, Powerhouse Road, Toland Road, and Tres Vias Road trailheads	Trail Loop	41 miles
Thermalito Forebay	North Thermalito Forebay	Picnic, swimming, and shoreline fishing	117 picnic sites
Thermalito Forebay	South Thermalito Forebay	Picnic, swimming, and shoreline fishing	10 picnic sites
Thermalito Afterbay	Monument Hill	Picnic, swimming, and shoreline fishing	10 picnic sites
Oroville Wildlife Area	Rabe Road Shooting Range	Range and target shooting and picnic	7 picnic sites
Oroville Wildlife Area	Clay Pit State Vehicular Recreation Area	Off-highway vehicle riding	–
Thermalito Afterbay	Thermalito Afterbay Outlet and Oroville Wildlife Area	Trail, picnic, shoreline fishing, and hunting	Several trails and day use areas

1 Sources: DWR 2006, 2007a

2 Fishing is popular at the Lake Oroville complex and is performed by boat and
 3 from the shoreline (DWR 2007a). Fishing opportunities in Lake Oroville include
 4 Smallmouth Bass, Largemouth Bass, Spotted Bass, red-eye bass, Black Crappie,

1 Bluegill, Green Sunfish, Channel Catfish, and White Catfish, Coho Salmon,
 2 Rainbow Trout, and Brown Trout. In Thermalito Forebay, fish species include
 3 Brook Trout, Brown Trout, Rainbow Trout, and Chinook Salmon. In Thermalito
 4 Afterbay, fishing opportunities include Smallmouth Bass, Largemouth Bass, trout,
 5 Channel Catfish, White Catfish, and carp. Downstream in the Feather River,
 6 fishing opportunities include steelhead, Chinook Salmon, American Shad,
 7 Smallmouth Bass, Largemouth Bass, and White Sturgeon.

8 Hunting opportunities occur around Thermalito Afterbay and/or Oroville Wildlife
 9 Area for turkey (in the spring), dove, quail, waterfowl, pheasant, deer, squirrel,
 10 and rabbit.

11 *Feather River from Thermalito Afterbay/Oroville Wildlife Area to Sacramento*
 12 *River*

13 The Feather River flows from the Thermalito Dam to approximately 40 miles
 14 downstream to the confluence with the Sacramento River (Reclamation 1997).
 15 The Feather River Wildlife Area, managed by DFW, is located along the Feather
 16 River near the confluence with the Bear River. The Feather River Wildlife Area
 17 includes the Abbott Lake, Star Bend, O'Connor Lakes, Lake of the Woods, and
 18 Nelson Slough units; and Bobelaine Audubon Ecological Reserve (DFG 2008a).
 19 The southern boundary of the wildlife area is located adjacent to the Sutter
 20 Bypass. In Sutter County, water-related recreation opportunities along the
 21 Feather River also include public access at Donahue Road Park, Tisdale Boat
 22 Ramp, Boyd's Pump boat launch, Feather River parkway, Yuba City Boat Ramp,
 23 Riverfront Park in Marysville, and Live Oak Park and Recreation Area (Sutter
 24 County 2010). There are several private facilities that offer camping, boating, and
 25 river access.

26 **15.3.2.1.8 Yuba River Watershed**

27 Portions of the Yuba River watershed along the North Yuba River between New
 28 Bullards Bar Reservoir and Englebright Lake and along the Lower Yuba River
 29 between Englebright Lake and the Feather River could be affected by operation of
 30 the Lower Yuba River Water Accord (DWR et al. 2007), as described in
 31 Chapter 5, Surface Water Resources and Water Supplies. New Bullards Bar Dam
 32 and Reservoir are owned and operated by the Yuba County Water Agency to
 33 provide flood control, water storage, and hydroelectric generation. The Harry L.
 34 Englebright Dam and Reservoir were constructed by the California Debris
 35 Commission downstream of New Bullards Bar Reservoir to trap and store
 36 sediment from historical hydraulic mining sites in the upper watershed, and
 37 provide recreation and hydroelectric generation opportunities (USACE 2013).
 38 Following decommissioning of the California Debris Commission in 1986,
 39 administration of Englebright Dam and Reservoir (Lake) was assumed by the
 40 U.S. Army Corps of Engineers.

41 Portions of the watershed along the Middle Yuba River between New Bullards
 42 Bar Reservoir and Englebright Reservoir are within the Plumas and Tahoe
 43 national forests. There are also lands owned and managed by the Bureau of Land
 44 Management and U.S. Army Corps of Engineers along this reach of the river.

1 This reach also includes the confluence with the South Yuba River. Portions of
2 the Lower South Yuba River are designated as a California Wild and Scenic River
3 (USFS et al. No Date). Portions of the South Yuba River State Park located near
4 the confluence along the South Yuba River and Yuba River provide recreational
5 opportunities for swimming, fishing, bird watching, and gold panning (State
6 Parks 2009).

7 *New Bullards Bar Reservoir*

8 The New Bullards Bar Reservoir has a storage capacity of 966,103 acre-feet when
9 the water elevation is at 1,956 feet. When full, the lake has a surface area of
10 4,790 acres and 71.9 miles of shoreline (YCWA 2012). Recreational facilities
11 and activities are the responsibility of Yuba County Water Agency. Water related
12 activities include boating, fishing, camping from May through September, and
13 picnicking (DWR et al. 2007). There are several campgrounds adjacent to the
14 lake, including Schoolhouse and Dark Day campgrounds along the shoreline and
15 Madrone Cove and Garden Point that are only accessed by boat. Boat access is
16 provided at Emerald Cove Resort and Marina, Cottage Creek, and Dark Day. The
17 Cottage Creek and Dark Day boat ramps are not useable when the lake elevation
18 declines below 1,822 and 1,798 feet, respectively. Fishing opportunities include
19 Rainbow Trout, Brown Trout, Kokanee Salmon, Bluegill, crappie, Bullhead,
20 Smallmouth Bass, and Largemouth Bass.

21 *Englebright Reservoir*

22 The Englebright Reservoir has a storage capacity of approximately 70,000 acre-
23 feet when the water elevation is at 527 feet (USACE 2012, 2013, 2014). When
24 full, the lake has a surface area of 815 acres and 24 miles of shoreline.
25 Recreational facilities and activities are the responsibility of U.S. Army Corps of
26 Engineers. Water related activities include boating, water-skiing, fishing, boat-
27 access camping, and picnicking. There are 96 boat-access only camping sites.
28 There are two boat ramps to provide access to the lower part of the lake. The
29 upper portion of the lake is characterized by narrow canyons and sharp bends
30 which limit boat access. Fishing opportunities include Rainbow Trout, Brown
31 Trout, Kokanee Salmon, sunfish, catfish, Smallmouth Bass, and
32 Largemouth Bass.

33 *Lower Yuba River*

34 Hiking and boating opportunities occur along the 24 miles of the Lower Yuba
35 River between Englebright Reservoir and the Feather River (DWR et al. 2007).
36 Public river access is provided at several locations to support fishing, picnicking,
37 rafting, kayaking, tubing, and swimming. Fishing opportunities include American
38 Shad, Chinook Salmon, steelhead, Smallmouth Bass, and Striped Bass.

39 **15.3.2.1.9 American River Watershed**

40 Folsom Lake and Lake Natoma on the American River and the lower American
41 River are located within areas in the American River watershed that could be
42 affected by changes in CVP and/or SWP operations.

1 *Folsom Lake and Lake Natoma*
 2 Folsom Lake is a CVP facility on the American River, as described in Chapter 5,
 3 Surface Water Resources and Water Supplies. The El Dorado National Forest is
 4 located in the upper American River watershed upstream of Folsom Lake. The
 5 State of California designated the North Fork American River from the source to
 6 Iowa Hill Bridge upstream of Folsom Lake as wild and scenic. Recreational
 7 facilities and activities in the Folsom Lake area are within the Folsom Lake State
 8 Recreation Area or the Folsom Powerhouse State Historic Park that are managed
 9 by State Parks. Recreational activities upstream of Folsom Lake occur on or
 10 adjacent to many lands owned by the Bureau of Land Management, State Parks,
 11 and El Dorado County. When the water storage in the lake is at full capacity
 12 (466 feet msl), Folsom Lake has a surface area of 11,450 acres and 75 miles of
 13 shoreline (State Parks and Reclamation 2003, 2007).

14 The upper extent of Lake Natoma is located about 1 mile downstream of Folsom
 15 Dam. Lake Natoma continues from the Rainbow Bridge to Nimbus Dam, about a
 16 4-mile distance (State Parks and Reclamation 2003, 2007). Recreational facilities
 17 and activities at the Lake Natoma area are part of the Folsom Lake State
 18 Recreation Area and managed by State Parks. When the water storage in the
 19 reservoir is at full capacity (132 feet msl), Lake Natoma has a surface area of
 20 540 acres and 14 miles of shoreline.

21 Water-related activities at Folsom Lake include boating, jet skiing, water skiing,
 22 wind surfing, rafting, sailing, canoeing, kayaking, swimming, and fishing
 23 (Reclamation 2005b; State Parks and Recreation 2003, 2007). White water
 24 rafting occurs along the South Fork American River upstream of Folsom Lake
 25 and at Skunk Hollow and Salmon Falls.

26 Water-related activities at Lake Natoma generally only includes paddling, rowing,
 27 and fishing due to a 5 miles/hour speed limit for motorized watercraft. California
 28 State University Sacramento operates an aquatic center at Lake Natoma
 29 (Reclamation et al. 2006).

30 Folsom Lake Marina at Brown’s Ravine is the only marina at Folsom Lake.
 31 There are six boat launch facilities at Folsom Lake and three boat launch facilities
 32 at Lake Natoma, as summarized in Table 15.19.

33 **Table 15.19 Folsom Lake and Lake Natoma Boat Ramps**

Location	Boat Ramp	Comments	Useable Elevations (feet, msl)
Folsom Lake	Beal’s Point	Day Use Area Informal Boat Ramp	465 to 420
Folsom Lake	Brown’s Ravine	Day Use Area Folsom Lake Marina with 685 wet slips and 175 dry storage slips	466 to 395
Folsom Lake	Folsom Point	–	466 to 406

Location	Boat Ramp	Comments	Useable Elevations (feet, msl)
Folsom Lake	Granite Bay	Day Use Area Largest Boat Launch Facility at Folsom Lake	466 to 360
Folsom Lake	Hobie Cove	–	426 to 375
Folsom Lake	Peninsula	Day Use Area	466 to 410
Folsom Lake	Rattlesnake Bar	–	466 to 425
Lake Natoma	Negro Bar	–	121 to 115
Lake Natoma	Nimbus Flat	Main Boat Ramp Informal Boat Ramp	128 to 115 128 to 120
Lake Natoma	Willow Creek	Informal Boat Ramp	125 to 115

1 Sources: Reclamation et al. 2006; State Parks and Reclamation 2003, 2007

2 Campgrounds are located at Folsom Lake and Lake Natoma, as summarized in
 3 Table 15.20. Campers are also affected by declining water elevations because this
 4 increases the distance from the campsites to the shoreline. Drawdown of the
 5 reservoir has an aesthetic effect on users because the land exposed during
 6 drawdown is generally composed of bare earth and rock.

7 **Table 15.20 Folsom Lake and Lake Natoma Major Campgrounds**

Location	Campground	Comments	Number of Campsites
Folsom Lake	Beal's Point	–	49 Camp Sites 20 Recreation Vehicles
Folsom Lake	Peninsula	Campground Boat-In Campground	104 Camp Sites
Lake Natoma	Negro Bar	Group Campground	3 Major Camp Sites

8 Note: State Parks and Reclamation 2003, 2007; Reclamation et al. 2006

9 Folsom Lake and Lake Natoma recreational areas also include day use areas for
 10 picnicking, swimming, and other recreational opportunities, as summarized in
 11 Table 15.21. The locations for shoreline day use areas are limited due to the steep
 12 and rocky elevations at the shorelines. Uses of these locations are less desirable
 13 when the water elevations decline. The Jedediah Smith Memorial Trail begins at
 14 Beal's Point and extends along Lake Natoma to the confluence of the American
 15 River and Sacramento River downstream of Nimbus Dam. The Pioneer Express
 16 Trail which extends from the Auburn State Recreation Area to Beal's Point is part
 17 of the Western States Pioneer Express Trail (a National Recreation Trail).

1 **Table 15.21 Folsom Lake and Lake Natoma Day Use Areas**

Location	Day Use Area	Comments	Number
Folsom Lake	Beal's Point	Picnic and Swimming Trailhead for Jedediah Smith Memorial Trail	53 picnic sites in Day Use area 69 at campground
Folsom Lake	Brown's Ravine Trail	Trail (to Old Salmon Falls)	12 miles
Folsom Lake	Darrington Trail	Trail	9 miles
Folsom Lake	Doton's Point ADA Trail	Trail	1 mile
Folsom Lake	Folsom Point	Picnic and water skiing Trail (to Brown's Ravine Trail)	50 picnic sites 4 miles
Folsom Lake	Folsom Powerhouse	Historic Site and Museum Trail	10 picnic sites 1 mile
Folsom Lake	Folsom Reservoir River Access Areas	Whitewater rafting (South Fork)	40 commercial rafting outfitters with 67 permits No permits for private boats
Folsom Lake	Granite Bay	Trail Picnic, Swimming, fishing, equestrian, and hiking	Several trails: 1 to 5 miles 100 picnic sites
Folsom Lake	Los Lagos Trail	Trail	1.5 miles
Folsom Lake	Old Salmon Falls	Swimming, equestrian, and hiking Trailhead for Brown's Ravine and Sweetwater trails	–
Folsom Lake	Peninsula	Trail Picnic	1 mile 6 picnic sites in Day Use area 104 at campground
Folsom Lake	Pioneer Express Trail	Trail	21 miles
Folsom Lake	Rattlesnake Bar	Equestrian	–
Folsom Lake	Skunk Hollow and Salmon Falls	Whitewater rafting (South Fork)	–

Location	Day Use Area	Comments	Number
Folsom Lake	Sweetwater Creek	Trailhead for Sweetwater Trail	–
Folsom Lake	Sweetwater Trail	Trail	2 miles
Lake Natoma	Lake Natoma Trails	Trail	Several trails: 1 to 10 miles
Lake Natoma	Lake Overlook	Trailhead for Lake Natoma Trail	–
Lake Natoma	Negro Bar	Picnic, fishing, and equestrian Trailhead for Lake Natoma Trail	32 picnic sites in Day Use area 17 at campground
Lake Natoma	Nimbus Fish Hatchery	Hatchery	–
Lake Natoma	Nimbus Flat	California State University, Sacramento Aquatic Center Trailhead for Lake Natoma Trail	37 picnic sites
Lake Natoma	Willow Creek	Trailhead for Lake Natoma Trail	4 picnic sites

1 Sources: Reclamation et al. 2006; State Parks and Reclamation 2003, 2007

2 Fishing is also popular at Folsom Lake and Lake Natoma from boats and the
3 shoreline. Anglers can catch warmwater and coldwater fish species due to the
4 summer stratification of the lake into a warm layer above a coldwater pool
5 especially in Folsom Lake (State Parks and Reclamation 2007). Warm water
6 fishing opportunities include Smallmouth Bass, Largemouth Bass, Spotted Bass,
7 and black and White Crappie. The cooler water strata support fishing for
8 Rainbow Trout, Brown Trout, and Chinook Salmon.

9 *American River from Nimbus Dam to the Confluence with Sacramento River*

10 The American River flows 14 miles between Nimbus Dam and the confluence
11 with the Sacramento River was designated by the Secretary of the Interior to be
12 part of the National Wild and Scenic Rivers System on January 19, 1981. The
13 State of California also designated the Lower American River as wild and scenic
14 under Public Resources Code sections 5093.54 and 5093.545.

15 The Jedediah Smith Memorial Trail (also known as the American River Bike
16 Trail) continues along the American River from Beal’s Point at Folsom Lake,
17 along Folsom Lake and Lake Natoma, and along the Lower American River
18 through Discovery Park to the confluence with the Sacramento River
19 (Reclamation 2005b).

1 The American River Parkway is a 26-mile green space designated and managed
 2 by Sacramento County Parks and Recreation along the Lower American River
 3 from Nimbus Dam to the confluence with the Sacramento River at Discovery
 4 Park. This parkway provides extensive recreational opportunities, including
 5 boating rafting, kayaking, canoeing, swimming, and fishing (Reclamation 2005b;
 6 Sacramento County 2008). Pedestrian access is provided at 87 locations along the
 7 parkway. Bicycle access and equestrian access are provided at 65 and 37
 8 locations, respectively. Boat launch ramps are provided at 7 locations and Car-
 9 top Boat Launch opportunities are provided at 17 locations. Picnic locations are
 10 located at numerous locations along the American River. Fishing opportunities
 11 along the Lower American River include Chinook Salmon, steelhead, trout,
 12 Striped Bass, American Shad, Largemouth Bass, Bluegill, crappie, sunfish, and
 13 catfish (Sacramento County 2008).

14 *Sacramento Municipal Utility District – Rancho Seco Park and Lake*

15 Rancho Seco Park and Lake, operated by Sacramento Municipal Utility District,
 16 is used to store CVP water (Reclamation 2005b). The lake has a surface area of
 17 160 acres. Water-related activities include boating, camping, picnicking, bird
 18 watching and fishing. Facilities available for these activities are two boat ramps
 19 and a fish cleaning facility. Game fish species found at the lake include catfish,
 20 Bluegill, crappie, and trout. Birds that use the area include ducks, geese, hawks,
 21 Bald Eagles, blue heron, and migratory birds (SMUD 2013).

22 **15.3.2.2 San Joaquin Valley**

23 Recreational opportunities in the San Joaquin Valley upstream of the Delta that
 24 are influenced by CVP and SWP operations occur at Millerton Lake, San Joaquin
 25 River between Friant Dam and the Delta, New Melones Reservoir, Stanislaus
 26 River between Tulloch Dam and San Joaquin River, San Luis Reservoir complex,
 27 recreation areas along Delta Mendota Canal and California Aqueduct, and refuges
 28 that use CVP water supplies.

29 **15.3.2.2.1 Millerton Lake**

30 Millerton Lake is a CVP facility on the San Joaquin River, as described in
 31 Chapter 5, Surface Water Resources and Water Supplies. Millerton Lake is part
 32 of the Millerton State Recreation Area. Recreational facilities and activities at
 33 Millerton Lake are administered by State Parks. When the water storage in the
 34 lake is at full capacity (water elevation at 580.6 feet msl), Millerton Lake has a
 35 surface area of approximately 4,900 acres and 44 miles of shoreline (Reclamation
 36 and DWR 2011).

37 Boating, sailing, water skiing, jetskiing, swimming, tournament and recreational
 38 fishing, camping, and picnicking (Reclamation and DWR 2011; Reclamation and
 39 State Parks 2010). Whitewater rafting opportunities occur upstream of Millerton
 40 Lake. There are six public boat ramps on Millerton Lake, as summarized in
 41 Table 15.22.

1 **Table 15.22 Millerton Lake Boat Ramps**

Location	Boat Ramp	Comments	Useable Elevations (feet, msl)
Millerton Lake	Crow's Nest	On South Shore	580 to 487
Millerton Lake	Grange Cove	On South Shore	Several Boat Ramps: 580 to 500
Millerton Lake	McKenzie Point	On South Shore	580 to 472
Millerton Lake	North Shore	On North Shore	580 to 470
Millerton Lake	South Bay	On South Shore	580 to 500

2 Sources: Reclamation and DWR 2011; Reclamation and State Parks 2010

3 The marina at Millerton Lake is located at Winchell Cove on the South Shore
4 (Reclamation and State Parks 2010). The marina includes 500 boat slips. There
5 are also eight boat slips at Crow's Nest.

6 Campgrounds are located along the Millerton Lake North Shore, as summarized
7 in Table 15.23. Many of these campsites are located along the shoreline. These
8 campsites are affected by declining water elevations because this increases the
9 distance from the campsites to the shoreline.

10 **Table 15.23 Millerton Lake Major Campgrounds**

Location	Campground	Comments	Number of Campsites
Millerton Lake	Dumna Strand	–	10
Millerton Lake	Fort Miller	Shoreline Campground	36
Millerton Lake	Group Campsites	Group Campground Amphitheater	Two sites with total of 120 sites
Millerton Lake	Meadows	Campsites Equestrian Campsites	59 4 corrals and campsites
Millerton Lake	Mono	–	16
Millerton Lake	North Fine Gold Campground	Boat-In Campground	15
Millerton Lake	Rocky Point	–	21
Millerton Lake	Temperance Flat Boat	Boat-In Campground	25
Millerton Lake	Valley Oak	–	6

11 Source: Reclamation and State Parks 2010

12 Millerton Lake recreational areas also include day use areas for picnicking,
13 swimming, and other recreational opportunities, as summarized in Table 15.24
14 (Reclamation and State Parks 2010). The locations for shoreline day use areas are
15 less desirable when the water elevations decline.

1 **Table 15.24 Millerton Lake Day Use Areas**

Location	Day Use Area	Comments	Number
Millerton Lake	Blue Oak	Picnic and Trail along the South Shore	3 sites 4 miles
Millerton Lake	Buzzard’s Roost Trail	Picnic and Trail	2 sites 0.5 miles
Millerton Lake	Crow’s Nest	Picnic	13 sites
Millerton Lake	Eagle’s Nest	Picnic and Trailhead	2 sites
Millerton Lake	Fort Miller	Trail	0.25 miles
Millerton Lake	Grange Grove	Picnic	74 sites
Millerton Lake	La Playa	Picnic and Swimming	95 sites
Millerton Lake	McKenzie Point	Picnic	–
Millerton Lake	Meadows	Picnic	10 sites
Millerton Lake	Millerton Courthouse	Historic Site and Picnic	3 sites
Millerton Lake	San Joaquin River Trail	Portions along the Millerton Lake shoreline	14 miles
Millerton Lake	South Bay	Picnic	9 sites
Millerton Lake	South Fine Gold	Picnic and Trail	10 sites 11 miles

2 Sources: Reclamation and State Parks 2010; State Parks 2008

3 Fishing is also popular at Millerton Lake from boats and shoreline. Fishing
 4 opportunities include Striped Bass, Black Bass, Largemouth Bass, Green Sunfish,
 5 and American Shad (Reclamation and State Parks 2010).

6 **15.3.2.2.2 San Joaquin River from Friant Dam to the Delta**

7 The San Joaquin River flows 100 miles from Friant Dam to the Delta.
 8 Downstream of Friant Dam, the San Joaquin River flows 23 miles through lands
 9 within the San Joaquin River Parkway which includes parks, trails, and ecological
 10 reserve areas between Friant Dam and State Route 145 managed by the San
 11 Joaquin River Parkway and Conservation Trust (Reclamation and DWR 2011).

12 Water-related recreational activities include boating, canoeing, kayaking,
 13 whitewater rafting, camping, picnicking, fishing, and hunting (Reclamation and
 14 DWR 2011). Access and facilities for these activities are available at several
 15 locations along and adjacent to the San Joaquin River.

16 Between Friant Dam and the confluence with the Merced River, whitewater
 17 rafting occurs between Friant Dam to Skaggs Bridge Park at State Route 145.
 18 Public access locations are generally located within the San Joaquin River

1 Parkway. Seven boat launching locations along the San Joaquin River Parkway
2 that are managed by the San Joaquin River Parkway and Conservation Trust
3 and/or DFW, Fresno County, or private operators. Lost Lake Park, managed by
4 the San Joaquin River Parkway and Conservation Trust and DFW, provides a
5 non-powered car-top boat launch. Sycamore Island Park, managed by San
6 Joaquin River Parkway and Conservation Trust offers a boat ramp for small boats.
7 River access also is available at Skaggs Bridge Park, managed by Fresno County.
8 Picnicking is provided at most of the public access locations and at several other
9 locations within the parkway. Camping is provided at Scout Island and Lost Lake
10 Park managed by Fresno County and the private Fort Washington Beach. Trails
11 include the 5-mile long Lewis S. Eaton Trail.

12 Downstream of State Route 145, major recreational areas include the 85-acre
13 Mendota Pool in Mendota; Dunkle and Maldonado parks in the City of Firebaugh;
14 and Las Palmas Fishing Access and Laird Park in Stanislaus County. Public
15 access is provided at all of these sites. A boat ramp is located upstream of
16 Mendota Dam.

17 The majority of these areas permit fishing. Fishing opportunities in the San
18 Joaquin River include sunfish, crappie, Bluegill, Striped Bass, Largemouth Bass,
19 and catfish (Reclamation and DWR 2011).

20 **15.3.2.2.3 San Joaquin Valley Refuges**

21 Wildlife refuges in the San Joaquin Valley that rely upon CVP water supplies
22 include the San Luis NWR (including the San Luis Unit, West Bear Creek Unit,
23 East Bear Creek Unit, Freitas Unit, and Kesterson Unit); Merced NWR; Los
24 Banos Wildlife Area; Volta Wildlife Area; Mendota Wildlife Area; North
25 Grasslands Wildlife Area (including China Island Unit and Salt Slough Unit); and
26 Grasslands Resource Conservation District, as described in Chapter 5, Surface
27 Water Resources and Water Supplies, and Chapter 10, Terrestrial Biological
28 Resources (Reclamation 2012). Water-related activities include wildlife viewing,
29 and hunting. Hunting opportunities include waterfowl, shorebirds, and pheasants
30 (Reclamation and DWR 2011).

31 Several wildlife areas along the San Joaquin River could be affected by CVP
32 operations of Millerton Lake, including the West Hilmar Wildlife Area
33 downstream of the confluence with the Merced River and the San Joaquin River
34 NWR located between the Tuolumne and Stanislaus rivers (Reclamation and
35 DWR 2011). West Hilmar Wildlife Area includes 340 acres of wildlife area
36 accessible by boat. The San Joaquin River NWR includes over 7,000 acres of
37 riparian woodlands, wetlands, and grasslands for native wildlife with limited
38 access at Pelican Trail.

39 In the southern San Joaquin Valley, the Kern and Pixley NWRs provide wildlife
40 viewing opportunities.

1 **15.3.2.2.4 Stanislaus River Watershed**

2 New Melones Reservoir and Tulloch Reservoir on the Stanislaus River and the
 3 lower Stanislaus River are located within areas in the Stanislaus River watershed
 4 that could be affected by changes in CVP operations.

5 *New Melones Reservoir*

6 New Melones Reservoir is a CVP facility on the Stanislaus River, as described in
 7 Chapter 5, Surface Water Resources and Water Supplies. Recreation activities
 8 and facilities at New Melones Reservoir area are managed by Reclamation.

9 When the water storage in the reservoir is at full capacity, New Melones
 10 Reservoir has a surface area of approximately 12,500 acres and 105 miles of
 11 shoreline at a surface elevation of 1,088 feet msl (Reclamation 1997, 2010a).

12 Water-related activities include boating, waterskiing, camping, picnicking,
 13 wildlife viewing, spelunking, rock climbing, gold panning, and fishing
 14 (Reclamation 2010a). Float planes can land within the North, Middle, and South
 15 Bays of the reservoir. A model airplane club operates an airstrip near New
 16 Melones Dam. Cave exploration occurs in the Stanislaus River Canyon. Rock
 17 climbing occurs on Table Mountain. In years when the reservoir elevation is low,
 18 whitewater rafters launch at the Old Camp Nine Bridge.

19 There are five boat ramps at New Melones Reservoir, as summarized in
 20 Table 15.25.

21 **Table 15.25 New Melones Reservoir Boat Ramps**

Location	Boat Ramp	Comments	Useable Elevations (feet, msl)
New Melones Reservoir	Angels Creek	–	1,088 to 975
New Melones Reservoir	Glory Hole	Location of New Melones Lake Marina	Several Boat Ramps: 1,088 to 860
New Melones Reservoir	Mark Twain	Unimproved Ramp	1,088 to 760
New Melones Reservoir	Parrotts Ferry	Unimproved Ramp	Several Boat Ramps: 1,088 to 900

22 Source: Reclamation 2010a

23 The New Melones Marina is the only location with mooring facilities and
 24 houseboat rentals (Reclamation 2010a). Up to 50 private houseboats on mooring
 25 balls, 38 private houseboats in slips, and 20 rental houseboats may be maintained
 26 on the reservoir.

27 Campgrounds are located at Glory Hole and Tutletown, as summarized in
 28 Table 15.26 (Reclamation 2010a). Some of the campsites are located along the
 29 shoreline. These campsites are affected by declining water elevations because
 30 this increases the distance from the campsites to the shoreline.

1 **Table 15.26 New Melones Reservoir Major Campgrounds**

Location	Campground	Comments	Number of Campsites
New Melones Reservoir	Glory Hole	Two campgrounds	144
New Melones Reservoir	Tuttletown	Three campgrounds Two Group campgrounds	161 16

2 Source: Reclamation 2010a

3 New Melones Reservoir recreational areas also include day use areas for
 4 picnicking, swimming, and other recreational opportunities, as summarized in
 5 Table 15.27 (Reclamation 2010a). The locations for shoreline day use areas are
 6 less desirable when the water elevations decline.

7 **Table 15.27 New Melones Reservoir Day Use Areas**

Location	Day Use Area	Comments	Number
New Melones Reservoir	Glory Hole	Picnic and Trails	61 sites Several trails: 0.25 to 2.5 miles
New Melones Reservoir	Mark Twain	Picnic and Norwegian Gulch Trail	0.5 miles
New Melones Reservoir	Natural Bridges	Trail	0.7 miles
New Melones Reservoir	Shoreline	Swimming and Recreational Gold Panning	–
New Melones Reservoir	Table Mountain	Trail	Several trails: 1.5 to 4.0 miles
New Melones Reservoir	New Melones Lake Visitor	Visitor Center	–
New Melones Reservoir	Tuttletown	Picnic and Trail	52 sites Several trails: 0.4 to 1.7 miles

8 Sources: Reclamation 2010a, 2010b, 2014

9 *Tulloch Reservoir*

10 Tulloch Reservoir is a reservoir owned and operated by the Oakdale and South
 11 San Joaquin Irrigation Districts on the Stanislaus River downstream of New
 12 Melones Reservoir, as described in Chapter 5, Surface Water Resources and
 13 Water Supplies. When the water storage in the reservoir is at full capacity (water
 14 elevation at 510 feet msl), the reservoir has a surface area of 1,260 acres and
 15 55 miles of shoreline (CBC 2013; Tri-Dam Project 2002).

1 Water-related activities include boating, sailing, windsurfing, jet and water skiing,
 2 camping, picnicking, and fishing. Most of the shoreline is privately owned with
 3 shoreline access and more than 400 private docks for residents (Tri-Dam Project
 4 2012). Public access is provided at a DFW marina and campground with a boat
 5 ramp at South Shore.

6 *Stanislaus River from Tulloch Dam to the San Joaquin River*

7 Downstream of Tulloch Dam, the Stanislaus River flows to Goodwin Dam, and
 8 then continues approximately 40 miles to the confluence with the San Joaquin
 9 River. Water-related activities along the lower portion of the Stanislaus River
 10 include whitewater rafting, camping, picnicking, swimming, and fishing.
 11 Whitewater rafting begins at Goodwin Dam and continues almost 4 miles to
 12 Knights Ferry (Reclamation 1997). Downstream of Knights Ferry, there are
 13 seven parks, including Caswell Memorial State Park, a 258-acre park managed by
 14 State Parks (Stanislaus County 1987; State Parks 2006a). Fishing opportunities
 15 on the lower Stanislaus River include bass, catfish, and crappie.

16 **15.3.2.2.5 San Luis Reservoir State Recreation Area**

17 The San Luis Reservoir complex includes CVP and SWP offstream storage
 18 facilities located south of the Delta, as described in Chapter 5, Surface Water
 19 Resources and Water Supplies. The San Luis Reservoir complex includes San
 20 Luis Reservoir, O'Neill Forebay, and Los Banos Creek Reservoir. The San Luis
 21 Reservoir complex is located within the San Luis Reservoir State Recreation
 22 Area, and the recreational facilities are operated by State Parks (State Parks
 23 2003). Los Banos Creek Reservoir is a flood detention basin to protect the
 24 community of Los Banos and San Luis Canal/California Aqueduct. This reservoir
 25 and a similar flood management reservoir that is not within the San Luis
 26 Reservoir State Recreation Area (Little Panoche Creek Reservoir) are not affected
 27 by CVP and SWP operations. Therefore, Los Banos Creek Reservoir and Little
 28 Panoche Creek Reservoir are not considered in detail in this EIS.

29 When the water storage in the San Luis Reservoir is at full capacity (water
 30 elevation at 540 feet msl), the reservoir has a surface area of 12,700 acres and
 31 65 miles of shoreline (Reclamation and State Parks 2013; State Parks 2010).

32 The O'Neill Forebay is east of the San Luis Reservoir downstream of the San
 33 Luis Dam. When the water storage in the forebay is at full capacity (water
 34 elevation of 230 feet msl), the reservoir has a surface area of 2,210 acres and
 35 14 miles of shoreline (Reclamation and State Parks 2013; State Parks 2010).

36 Water-related activities include boating, camping, picnicking, wildlife and scenic
 37 viewing, fishing, and hunting occur throughout the San Luis Reservoir State
 38 Recreation Area (Reclamation 2005c; State Parks 2010; Reclamation and State
 39 Parks 2013). Boat ramps are located at all three reservoirs, as summarized below.

- 40 • San Luis Reservoir: Boat ramps at Basalt Area and Dinosaur Point
 41 (operational to 340 feet and 360 feet msl, respectively).

1 • O'Neill Forebay: Boat ramps at Group Campground and Medeiros
2 Campground.

3 • Los Banos Creek Reservoir: Boat ramp at Los Banos Creek Campground.

4 Camping occurs at Basalt Area at San Luis Reservoir (79 sites), O'Neill Forebay
5 (50 sites), San Luis Creek Area (53 sites and two group campsites with 90 sites),
6 and Los Banos Creek Area (14 sites) (Reclamation and State Parks 2013). Picnic
7 sites, swimming, and/or trails occur at Basalt Area, Medeiros Area, and Los
8 Banos Creek Area (Reclamation 2005c; State Parks 2010; Reclamation and State
9 Parks 2013).

10 Fishing opportunities include Striped Bass, American Shad, and catfish
11 (Reclamation and State Parks 2013). Hunting opportunities occur at San Luis
12 Reservoir for waterfowl, deer, and wild pig (Reclamation 2005c; Reclamation and
13 State Parks 2013).

14 **15.3.2.2.6 Delta Mendota Canal**

15 Delta Mendota Canal is a CVP facility, as described in Chapter 5, Surface Water
16 Resources and Water Supplies. The Delta-Mendota Canal includes two fishing
17 sites: one in Stanislaus County and the other in Fresno County (Reclamation
18 2005c). Fishing opportunities include Striped Bass and catfish (Reclamation
19 1997).

20 **15.3.2.2.7 California Aqueduct/San Luis Canal**

21 The California Aqueduct is a SWP facility, as described in Chapter 5, Surface
22 Water Resources and Water Supplies. A portion of the canal is also co-located
23 with the CVP San Luis Canal. Fishing is permitted at 12 sites along the
24 California Aqueduct between Bethany Reservoir and Perris Lake in Southern
25 California. Fishing opportunities include Striped Bass, Largemouth Bass, catfish,
26 crappie, Green Sunfish, Bluegill, and starry flounder (Reclamation 1997).

27 **15.3.2.3 Delta**

28 The Delta is located at the terminus of the Sacramento River and the San Joaquin
29 River. Water-related activities in the Delta include boating, sailing, water skiing,
30 canoeing, kayaking, picnicking, fishing, and hunting. Recreational opportunities
31 exist in many areas of the Delta; however, the analysis in this EIS is related to
32 areas that could be affected by changes in CVP and/or SWP water supply
33 operations and restoration in the Yolo Bypass. The following discussion
34 describes recreation throughout the Delta followed by more specific discussions
35 of recreation within the Yolo Bypass and Cache Slough.

36 **15.3.2.3.1 Delta Recreational Opportunities**

37 The primary recreational activities in the Delta are related to boating and fishing
38 (DPC 2012). Public recreation facilities are limited within the Delta. Most
39 recreational opportunities are provided by private enterprises, including marinas,
40 restaurants, hunting venues, and wineries and farm visits. Public access is
41 provided at DFW and U.S. Fish and Wildlife Service (USFWS) sites.

1 The most recent survey of boating opportunities in the Delta was completed in
 2 2002 by the California Department of Boating and Waterways (DBW 2014; DPC
 3 2012). The survey indicated that of the 95 marinas surveyed, three were
 4 publically-owned and 92 were privately-owned (including 87 that were open to
 5 the public and five that were for members). The survey indicated that within the
 6 Delta there were over 11,600 boat slips, 55 boat launches, 2,182 campsites, and
 7 324 picnic sites.

8 Public access sites for boating and wildlife and scenic viewing in the Delta
 9 include:

- 10 • USFWS: Stone Lakes NWR, Antioch Dunes NWR.
- 11 • DFW: Calhoun Cut Ecological Reserve, Decker Island Wildlife Area, Lower
 12 Sherman Island Wildlife Area, Miner Slough Wildlife Area, Rhode Island
 13 Wildlife Area, White Slough Wildlife Area, Woodbridge Ecological Reserve,
 14 Fremont Weir Wildlife Area, Sacramento Bypass Wildlife Area, and Yolo
 15 Bypass Wildlife Area.
- 16 • State Parks: Brannan Island-Franks Tract State Recreation Areas, Delta
 17 Meadows State Recreation Area.
- 18 • Department of Water Resources: Clifton Court Forebay.
- 19 • The Nature Conservancy/DFW: Cosumnes River Preserve.
- 20 • Solano Land Trust: Jepson Prairie Preserve.
- 21 • East Bay Regional Park District: Big Break Regional Shoreline,
 22 Antioch/Oakley Regional Shoreline, Browns Island Regional Preserve, Bay
 23 Point Regional Shoreline, Martinez Regional Shoreline, Carquinez Strait
 24 Regional Shoreline-Crockett Hills Regional Park, and Contra Costa Canal
 25 Trail.
- 26 • Municipal Marinas, Boat Launching, and Fishing Access Facilities: City of
 27 Antioch Marina and Municipal Boat Ramp; City of Pittsburg Riverview Park;
 28 Sacramento County Cliffhouse, Georgiana Slough Fishing Access, Hogback
 29 Island Access, and Sherman Island Public Access Facility; City of Sacramento
 30 Garcia Bend Park; several public and private marinas in Sacramento County;
 31 12 public and private marinas with over 900 boat slips and boat access within
 32 the City of Stockton; San Joaquin County Dos Reis Regional Park, Mossdale
 33 Crossing Regional Park, and Westgate Landing Regional Park; and Yolo
 34 County Clarksburg River Access.

35 Several of these sites include launch sites for boats, canoes, and kayaks and
 36 numerous trails (DPC 2012; DSC 2011; DFG 2008b, 2008d, 2009; EBRPD
 37 2013a; Antioch 2003; Pittsburg 2001; Sacramento County 2014; Sacramento
 38 2005; Stockton 2007; Yolo County 2009).

39 One of the larger bodies of water in the Delta is the SWP Clifton Court Forebay.
 40 Fishing is the only recreational opportunity that occurs within the Clifton Court
 41 Forebay; and the opportunities are limited (DWR 2013c). Public access is

1 restricted near the radial gate along West Canal. However, boat access occurs at a
2 boat dock along West Canal to the east of the radial gate and by a trail from
3 Clifton Court Road.

4 Fishing opportunities in the Delta generally include Striped Bass, Smallmouth
5 Bass, Largemouth Bass, Spotted Bass, American Shad, Black Crappie, Chinook
6 Salmon, steelhead, catfish, sunfish, Tule Perch, Warmouth, and White Sturgeon
7 (DPC 2006).

8 Hunting opportunities for waterfowl, shorebirds, doves, and pheasants occur in
9 many areas of the Delta on privately-owned land. Hunting also occurs at several
10 publically-owned sites within the Delta, including:

- 11 • USFWS: Stone Lakes NWR.
- 12 • DFW: Decker Island Wildlife Area, Lower Sherman Island Wildlife Area,
13 Miner Slough Wildlife Area, Rhode Island Wildlife Area, White Slough
14 Wildlife Area, Yolo Bypass Wildlife Area; and on some lands owned by
15 DWR (including Sherman and Twitchell islands and Clifton Court Forebay).

16 The Delta Protection Commission identified several physical constraints to Delta
17 recreational opportunities that could be affected by CVP and SWP operations,
18 including changes in water quality and operation of the CVP or SWP water
19 facilities (Delta Cross Channel, South Delta Temporary Barriers, and Montezuma
20 Slough Salinity Gates) (DPC 2012).

21 **15.3.2.3.2 Yolo Bypass and Cache Slough Recreational Opportunities**

22 The primary recreational activities in the Yolo Bypass and Cache Slough areas are
23 related to wildlife viewing and hunting. Many recreational hunting opportunities
24 occur on private lands, including private hunting clubs. Areas within Yolo
25 Bypass and Cache Slough that provide public access for wildlife viewing or
26 hunting within the Yolo Bypass and Cache Slough area, include:

- 27 • Fremont Weir Wildlife Area (DFW 2014a).
 - 28 – Wildlife viewing and fishing.
 - 29 – Hunting for pheasant, waterfowl, Mourning Dove, deer, quail, rabbit, and
30 turkey.
- 31 • Sacramento Bypass Wildlife Area (DFW 2014c).
 - 32 – Wildlife viewing and fishing, including for White Sturgeon, White
33 Catfish, and Black Crappie in the Tule Canal; and Largemouth Bass,
34 Bluegill, and White Catfish in the borrow pits.
 - 35 – Hunting for pheasant and Mourning Dove.
- 36 • Yolo Bypass Wildlife Area (DFG 2008c, 2010).
 - 37 – Wildlife viewing and hiking.
 - 38 – Fishing for sturgeon, Striped Bass, Black Bass, and catfish.

- 1 – Hunting for waterfowl, coots, Moorhens, Snipe, pheasants, and Mourning
- 2 Doves.
- 3 – Educational and interpretative programs.
- 4 • Calhoun Cut Ecological Reserve (DFG 2008d).
- 5 – Waterfowl hunting and fishing from a boat.

6 There are other publically-owned lands within the Yolo Bypass and Cache Slough
7 that provide habitat or will be restored to provide habitat. However, these lands
8 are generally not available for public access to protect fragile ecosystems.

9 **15.3.2.4 Suisun Marsh**

10 Suisun Marsh is 106,511 acres of wetlands located between the Delta and the
11 San Francisco Bay. Water-related activities at Suisun Marsh include waterfowl
12 hunting, boating, kayaking, hiking, wildlife viewing, fishing, and hunting
13 (Reclamation et al. 2011). Water-related recreation occurs within the two major
14 channels, Montezuma and Suisun sloughs; and several moderately sized channels,
15 Cordelia, Denverton, Nurse, and Hill sloughs.

16 The DFW manages several areas within the Suisun Marsh for public access, as
17 described in Chapter 10, Terrestrial Biological Resources. These areas include
18 (Reclamation et al. 2011):

- 19 • Grizzly Island Wildlife Area
 - 20 – Wildlife viewing, hiking, and fishing (February through July, and late
 - 21 September).
 - 22 – Hunting (August through mid-September, and October through January).
- 23 • Hill Slough Wildlife Area
 - 24 – Wildlife viewing and fishing.
- 25 • Peytonia Slough Ecological Preserve
 - 26 – Kayaking.
 - 27 – Wildlife viewing and fishing.
- 28 • Belden’s Landing Water Access Facility
 - 29 – Boat launch ramp and fishing pier.

30 Suisun City Marina and Solano Yacht Club, Suisun City Boat Launch, and
31 McAvoy Yacht Harbor and Club also provide boat launch ramp facilities
32 (Reclamation et al. 2011). Pier fishing opportunities are provided at Suisun City
33 Boat Launch.

34 The Solano Land Trust’s Rush Ranch also provides opportunities for hiking and
35 picnicking in the wetlands and upland areas near Potrero Hills (Reclamation et al.
36 2010).

1 Fishing opportunities within Suisun Marsh include Striped Bass, White Sturgeon,
2 catfish, and carp (Reclamation et al. 2011). Occasionally, Chinook Salmon,
3 steelhead, and Largemouth Bass are caught in Suisun Marsh near Grizzly Island.
4 Duck hunting generates the most frequent recreational visits in Suisun Marsh
5 (Reclamation et al. 2011). About 37,500 acres of Suisun Marsh are owned and
6 operated by private duck clubs. DFW manages about 15,300 acres of public lands
7 in Grizzly Island Wildlife Area for hunting of waterfowl, Snipe, coots, Moorhens,
8 Mourning Doves, pheasants, rabbits, and Tule Elk.
9 There are other publically-owned lands within Suisun Marsh that provide habitat
10 or will be restored to provide habitat. However, these lands are generally not
11 available for public access to protect fragile ecosystems.

12 **15.3.3 San Francisco Bay Area Region**

13 The San Francisco Bay Area Region includes portions of Contra Costa, Alameda,
14 Santa Clara, San Benito, and Napa counties that are within the CVP and SWP
15 service areas. This section describes reservoirs in the San Francisco Bay Area
16 Region that could be affected by CVP and SWP operations, including the CVP
17 Contra Loma and San Justo reservoirs; the SWP Bethany Reservoir and Lake Del
18 Valle; the Contra Costa Water District Los Vaqueros Reservoir; and the East Bay
19 Municipal Utility District Upper San Leandro, San Pablo, Briones, and Lafayette
20 reservoirs and Lake Chabot. CVP and SWP are generally not stored in reservoirs
21 within Santa Clara County (SCVWD 2010).

22 **15.3.3.1 Contra Loma Reservoir**

23 The Contra Loma Reservoir is a CVP facility in Contra Costa County that
24 provides offstream storage along the Contra Costa Canal, as described in
25 Chapter 5, Surface Water Resources and Water Supplies. The recreation facilities
26 are managed by East Bay Regional Park District. The 80 acre reservoir is part of
27 661-acre Contra Loma Regional Park and Antioch Community Park (Reclamation
28 2014a). Water-related activities include boating, wind surfing, kayaking,
29 picnicking, and fishing. No bodily contact is to occur in Contra Loma Reservoir;
30 therefore, a large swimming pool was constructed for the visitors by the East Bay
31 Regional Park District. There is one boat launch at the reservoir. Contra Loma
32 Reservoir accommodates fishing all year-round. Fishing opportunities include
33 catfish, Black Bass, Striped Bass, Largemouth Bass, Bluegill, crappie, trout, and
34 Redear Sunfish (EBRPD 2013c).

35 **15.3.3.2 San Justo Reservoir**

36 The San Justo Reservoir is a CVP facility in San Benito County that provides
37 offstream storage as part of the San Felipe Division, as described in Chapter 5,
38 Surface Water Resources and Water Supplies. San Justo Reservoir recreation
39 facilities have been closed to the public since 2009 due to an infestation by the
40 zebra mussel. Previously, the recreation facilities were managed by San Benito
41 County Water District (SBCWD 2014).

1 **15.3.3.3 Bethany Reservoir**

2 Bethany Reservoir is a SWP facility located between the California Aqueduct and
3 South Bay Aqueduct in Alameda County, as described in Chapter 5, Surface
4 Water Resources and Water Supplies. The recreation facilities are part of the
5 Bethany Reservoir State Recreation Area and are managed by State Parks. When
6 the water storage in the reservoir is at full capacity (water elevation at
7 243 feet msl), Bethany Reservoir has 161 acres of surface area and 6 miles of
8 shoreline (DWR 2001). Water-related activities include boating, windsurfing,
9 picnicking, and fishing. There is one boat launch at the reservoir (State Parks
10 2013a). Fishing opportunities include Striped Bass, Smallmouth Bass,
11 Largemouth Bass, Spotted Bass, White Bass, catfish, crappie, and trout.

12 **15.3.3.4 Lake Del Valle**

13 Lake Del Valle is a SWP facility located along the South Bay Aqueduct in
14 Alameda County, as described in Chapter 5, Surface Water Resources and Water
15 Supplies. The recreation facilities are managed by East Bay Regional Park
16 District as part of the Del Valle Regional Park. When the water storage in the
17 reservoir is at full capacity (water elevation at 703 feet msl), Lake Del Valle has
18 708 acres of surface area and 16 miles of shoreline (DWR 2001). Water-related
19 activities include boating, windsurfing, camping, swimming, and fishing (DWR
20 2001). There is a boat launch at the lake (EBRPD 2014). Boating hazards can
21 occur along the variable shoreline when the surface water elevation declines to
22 678 feet msl. There are seven group campsites for up to 475 and a family
23 campground (DWR 2001; EBRPD 2014). Fishing opportunities include trout,
24 catfish, Largemouth Bass, and Smallmouth Bass, Striped Bass, and Panfish
25 (EBRPD 2014).

26 **15.3.3.5 Los Vaqueros Reservoir**

27 Los Vaqueros Reservoir is a Contra Costa Water District offstream storage
28 facility in Contra Costa County, as described in Chapter 5, Surface Water
29 Resources and Water Supplies. Recreation facilities are managed by Contra
30 Costa Water District. Water-related activities include boating using rented
31 electrical boats, and fishing (CCWD 2014). The Los Vaqueros recreation
32 facilities include a marina, four fishing piers, 55 miles of trails, several individual
33 and group picnic areas, and an interpretative center. Fishing opportunities include
34 Rainbow Trout, Brown Bullhead, White Catfish, Channel Catfish, sunfish, White
35 Crappie, Largemouth Bass, Striped Bass, Chinook Salmon, Kokanee Salmon,
36 Green Sunfish, and Sacramento Perch (EBRPD 2014).

37 **15.3.3.6 San Pablo Reservoir, Lafayette Reservoir, Lake Chabot, and East
38 Bay Municipal Utility District Trails**

39 The East Bay Municipal Utility District reservoirs in Alameda and Contra Costa
40 County are used to store water within and near the East Bay Municipal Utility
41 District service area. Water stored in these reservoirs includes water from local
42 watersheds, the Mokelumne River watershed, and CVP water supplies, as
43 described in Chapter 5, Surface Water Resources and Water Supplies. Recreation
44 is allowed within the waters of San Pablo and Lafayette reservoirs and Lake

1 Chabot (EBMUD 2011). Recreation is not allowed within the waters of Upper
2 San Leandro and Briones reservoir. East Bay Municipal Utility District maintains
3 trails within the watersheds of the reservoirs.

4 Recreation facilities at San Pablo Reservoir are managed by East Bay Municipal
5 Utility District. Water-related activities at San Pablo Reservoir include boating,
6 picnicking, and fishing (EBMUD 2014a). There is a boat launch at the reservoir.
7 There are individual sites and nine group picnic areas that can accommodate up to
8 100 people at each site. Hiking can occur in the San Pablo Reservoir watershed
9 on 8.7 miles of trails which connect to about 13 miles of trails in the Briones
10 Reservoir watershed (EBMUD 2007a). The surface water of the reservoirs can be
11 viewed from many locations along these trails. Fishing opportunities at San Pablo
12 Reservoir include Rainbow Trout, catfish, Black Bass, Bluegill, and crappie
13 (EBMUD 2014a).

14 Recreation facilities at Lafayette Reservoir are managed by East Bay Municipal
15 Utility District. Water-related activities at Lafayette Reservoir include boating,
16 picnicking, and fishing (EBMUD 2014b). There is a private car-top boat launch
17 at the reservoir. There are 125 picnic sites around the reservoir. Hiking can occur
18 in the Lafayette Reservoir watershed on 7.4 miles of trails. Fishing opportunities
19 at Lafayette Reservoir include Rainbow Trout, catfish, Black Bass, and sunfish.

20 There are no water-related activities within or adjacent to Upper San Leandro
21 Reservoir. However, East Bay Municipal Utility District maintains over 26 miles
22 of trails within the Upper San Leandro Reservoir watershed. The surface water of
23 the reservoirs can be viewed from many locations along these trails (EBMUD
24 2007b).

25 Recreation facilities at Lake Chabot are managed by East Bay Regional Park
26 District as part of the Lake Chabot Regional Park (EBRPD 2011). Water-related
27 activities at Lake Chabot include boating, camping, picnicking, and fishing.
28 There is a boat launch at the reservoir and boat rides are offered on the *Chabot*
29 *Queen*. Individual campsites and group campsites are located near the southern
30 portion of the park. Picnic sites are located near the Lake Chabot Marina. Hiking
31 can occur along the shoreline on over 9 miles of trails which connect to more than
32 17 miles of other trails in the watershed (EBRPD 2011, 2013d). Other
33 recreational activities, including equestrian trails and a marksmanship range, are
34 located in the upper Lake Chabot watershed. Fishing opportunities at Lake
35 Chabot include Rainbow Trout, catfish, Black Bass, crappie, Bluegill, and carp.

36 **15.3.4 Central Coast Region**

37 The Central Coast Region includes portions of San Luis Obispo and Santa
38 Barbara counties served by the SWP. The SWP water supplies generally are
39 conveyed to Central Coast municipal, industrial, and agricultural water users in
40 pipelines and closed reservoirs. Water is delivered to southern Santa Barbara
41 County communities through Cachuma Lake. Therefore, in the Central Coast
42 Region, the only recreational opportunities that may be affected by changes in
43 SWP operations would be Cachuma Lake in Santa Barbara County (CCWA
44 2014).

1 **15.3.4.1 Cachuma Lake**

2 Cachuma Lake is a facility owned and operated by Reclamation in Santa Barbara
3 County, as described in Chapter 5, Surface Water Resources and Water Supplies.
4 Recreation facilities are managed by Santa Barbara County Parks Department.
5 Water-related activities include boating, and fishing within the lake and along the
6 lake shoreline (Reclamation 2010c). Cachuma Lake recreation facilities include a
7 marina with 87 rental boats and a public boat launch, 94 private boat slips,
8 520 campsites, equestrian campsites, family center, amphitheater, and trails that
9 range from 0.25 to 9 miles in length. Fishing opportunities include trout, catfish,
10 crappie, bass, Redear Perch, and Bluegill.

11 **15.3.5 Southern California Region**

12 The Southern California Region includes portions of Ventura, Los Angeles,
13 Orange, San Diego, Riverside, and San Bernardino counties served by the SWP.
14 The SWP water supplies generally are conveyed to Southern California
15 municipal, industrial, and agricultural water users in canals and pipelines. There
16 are six SWP reservoirs along the main canal, West Branch, and East Branch of the
17 California Aqueduct and many other reservoirs owned and operated by regional
18 and local agencies. The Metropolitan Water District of Southern California's
19 Diamond Valley Lake and Lake Skinner primarily store water from the SWP.
20 Other reservoirs that store SWP water, include United Water Conservation
21 District's Lake Piru; City of Escondido's Dixon Lake; City of San Diego's San
22 Vicente, El Capitan, Lower Otay, Hodges, and Murray reservoirs; Helix Water
23 District's Lake Jennings; and Sweetwater Authority's Sweetwater Reservoir.

24 This section does not include reservoirs that do not provide recreational
25 opportunities, such as Vail Lake in Riverside County or Olivenhain Reservoir in
26 San Diego County, or reservoirs that do not store SWP water supplies, such as
27 Lake Mathews in Riverside County which is used to store Colorado River water
28 (RCWD 2011; SDCWA 2015; Riverside County 2000).

29 **15.3.5.1 Quail Lake**

30 Quail Lake is a SWP facility in Los Angeles County, as described in Chapter 5,
31 Surface Water Resources and Water Supplies. Recreation facilities are managed
32 by DWR (DWR 2014a). Water-related activities include fishing within the lake
33 and along the shoreline. Fishing opportunities include Channel Catfish, Striped
34 Bass, Blackfish, Tule Perch, Threadfin Shad, and Hitch.

35 **15.3.5.2 Pyramid Lake**

36 Pyramid Lake is a SWP facility located in Los Angeles County and upstream of
37 Castaic Lake on the West Branch of the California Aqueduct, as described in
38 Chapter 5, Surface Water Resources and Water Supplies. Recreation facilities are
39 managed by the U.S. Forest Service (DWR 2000, 2014b). Water-related activities
40 include boating, camping, water skiing, swimming, and fishing. Boat launch
41 facilities are available at Vaqueros Beach and Emigrant Landing. A marina and
42 picnic sites are available at Emigrant Landing. Four picnic and viewing sites are
43 accessible only by boat. Family and group camping are available at two sites.

1 Fishing opportunities include largemouth, smallmouth, and Striped Bass; catfish,
2 blue gill; crappie; and trout. Reservoir elevations can vary substantially on a daily
3 basis because the lake provides short-term storage for the downstream Castaic
4 Powerplant.

5 **15.3.5.3 Castaic Lake**

6 Castaic Lake is a SWP facility located in Los Angeles County at the terminal end
7 of the West Branch of the California Aqueduct, as described in Chapter 5, Surface
8 Water Resources and Water Supplies. Recreation facilities are managed by the
9 Los Angeles County Department of Parks (DWR 2007b). Water-related activities
10 include boating, water skiing, jet skiing, wakeboarding, camping, picnicking,
11 swimming at the lagoon/afterbay, and fishing. Fishing opportunities include
12 trout, Largemouth Bass, Striped Bass, catfish, and crappie (DWR 2014c).

13 **15.3.5.4 Silverwood Lake**

14 Silverwood Lake is a SWP facility located in San Bernardino County along the
15 East Branch of the California Aqueduct, as described in Chapter 5, Surface Water
16 Resources and Water Supplies. Recreation facilities are managed by State Parks
17 as part of the Silverwood Lake State Recreational Area (State Parks 2006b).
18 Water-related activities include boating, water skiing, camping, picnicking,
19 swimming, and fishing. Facilities available for boating include a boat ramp,
20 marina, and waterskiing area. Camping facilities include 136 family sites, seven
21 walk-in sites, and several group sites for up to 120 people. The park includes two
22 swimming beaches and 13 miles of trails. Fishing opportunities include
23 Largemouth Bass, Striped Bass, Bluegill, crappie, and catfish.

24 **15.3.5.5 Crafton Hills Reservoir**

25 Crafton Hills Reservoir is a SWP facility located in the City of Yucaipa within
26 San Bernardino County, as described in Chapter 5, Surface Water Resources and
27 Water Supplies. Recreation facilities are managed by DWR (DWR 2009).
28 Recreation activities in vicinity of the reservoir are associated with hiking trails in
29 the open space within the Crafton Hills watershed. The surface water of the
30 reservoirs can be viewed from many locations along these trails.

31 **15.3.5.6 Lake Perris**

32 Lake Perris is a SWP facility located in Riverside County at the terminal end of
33 the East Branch of the California Aqueduct, as described in Chapter 5, Surface
34 Water Resources and Water Supplies. Recreation facilities are managed by State
35 Parks as part of the Lake Perris State Recreational Area (State Parks 2013b; DWR
36 2010). Water-related activities include boating, camping, swimming, picnicking,
37 and fishing. Boating facilities include a marina and three boat launch ramps.
38 Other recreational facilities include two swimming beaches, family campground,
39 seven equestrian camp sites, boat-in picnic sites on Alessandro Island, and the
40 Ya'i Hek'i Regional Indian Museum. Fishing opportunities include Largemouth
41 Bass, catfish, crappie, carp, Bluegill, and Redear Sunfish.

1 **15.3.5.7 Diamond Valley Lake**

2 Diamond Valley Lake is an offstream storage facility located in Riverside County
3 owned and operated by Metropolitan Water District of Southern California, as
4 described in Chapter 5, Surface Water Resources and Water Supplies (MWD
5 2013). The lake is used to store SWP water. Water-related activities include
6 boating, and fishing. Boating facilities include a marina with boat rentals. Other
7 recreational facilities include a visitor center, Western Science Center, and the
8 Valley-Wide Recreation and Park District Regional Aquatic Center and
9 Community Park. Fishing opportunities include Black Bass, Bluegill, redear
10 sunfish, Rainbow Trout, blue catfish, and Channel Catfish (DVM 2014).

11 **15.3.5.8 Lake Skinner**

12 Lake Skinner is an offstream storage facility located in Riverside County owned
13 and operated by Metropolitan Water District of Southern California, as described
14 in Chapter 5, Surface Water Resources and Water Supplies. Recreation facilities
15 are managed by Riverside County Parks (Riverside County 2014). The lake is
16 used to store SWP water. Water-related activities include boating, camping, and
17 fishing. Other recreational facilities include an amphitheater and Splash Pad.
18 Fishing opportunities include Striped Bass, Largemouth Bass, Bluegill, Rainbow
19 Trout, catfish, and carp.

20 **15.3.5.9 Lake Piru**

21 Lake Piru is located on Piru Creek, a tributary of the Santa Clara River, in
22 Ventura County (UWCD 2014). The lake is owned and operated by United Water
23 Conservation District, as described in Chapter 5, Surface Water Resources and
24 Water Supplies. Lake Piru is located within Los Padres National Forest (PMC
25 2014). The lake is used to store SWP water.

26 Recreation facilities are managed by a private concessionaire for the district
27 (UWCD 2014; PMC 2014). Water-related activities include boating, camping,
28 and picnicking. The marina includes a boat launch and private boat slips. There
29 are over 220 campsites, including several group campsites.

30 **15.3.5.10 Dixon Lake**

31 Dixon Lake is located in the hills above the City of Escondido in San Diego
32 County (Escondido 2014a). The lake is owned and operated by the City of
33 Escondido, as described in Chapter 5, Surface Water Resources and Water
34 Supplies. The lake is used to store SWP water.

35 Recreation facilities are managed by the City of Escondido (Escondido 2014b).
36 Water-related activities include camping, picnicking, and fishing. Boats are
37 allowed on the lake for fishing. There are 45 campsites and 22 picnic sites
38 (Escondido 2014 n.d.; Escondido 2014c). Fishing opportunities include trout,
39 bass, Bluegill, carp, catfish, and crappie.

1 **15.3.5.11 San Vicente, El Capitan, Lower Otay, Hodges, and Murray**
2 **Reservoirs**

3 San Vicente Reservoir, El Capitan, Lower Otay, Hodges, and Murray reservoirs
4 are located in San Diego County (San Diego 2011). The reservoirs are owned and
5 operated by the City of San Diego, as described in Chapter 5, Surface Water
6 Resources and Water Supplies. The reservoirs are used to store SWP water.

7 Recreation facilities are managed by the City of San Diego (San Diego 2014a,
8 2015a, 2015b). Water-related activities at the reservoirs include boating,
9 picnicking, and fishing (San Diego 2014b, 2015a, 2015b). There are 16 picnic
10 sites at Lower Otay Reservoir. Fishing opportunities at Lower Otay Reservoir
11 include Largemouth Bass, Bluegill, black and White Crappie, Channel Catfish,
12 blue catfish, White Catfish, and bullhead. Recreational activities at San Vicente
13 Reservoir are temporarily closed during construction to raise the dam (San Diego
14 2014c). Fishing opportunities at El Capitan Reservoir include Largemouth Bass,
15 Bluegill, crappie, Channel Catfish, Blue Catfish, Green Sunfish, and carp (San
16 Diego 2014d). Hodges Reservoir provides recreational opportunities including
17 boating, boardsailing, and fishing for bass, catfish, crappie, Bluegill, Bullhead,
18 and carp (San Diego 2015a). Murray Reservoir provides recreational
19 opportunities for boating, floating, swimming, and fishing for Largemouth Bass,
20 Bluegill, Channel Catfish, Black Crappie, and trout (San Diego 2015b).

21 **15.3.5.12 Lake Jennings**

22 Lake Jennings is located in San Diego County (HWD 2014). The lake is owned
23 and operated by Helix Water District, as described in Chapter 5, Surface Water
24 Resources and Water Supplies. The lake is used to store SWP water.

25 Recreation facilities are managed by Helix Water District (HWD 2014). Water-
26 related activities include boating, camping, picnicking, and fishing. There are
27 96 campsites. There are a variety of picnic sites at Lake Jennings including:
28 Cloister Cover, Siesta Point, Hermit Cove, and Eagle Point. Bird watchers at
29 Lake Jennings can see Loons, Grebes, Cormorants, Herons, Swans, Geese,
30 Eagles, Hawks, Thrushes, Warblers, and many others. Hikers at Lake Jennings
31 have access to a variety of different trails near the lake including a 5.5 mile loop
32 around the lake. Fishing opportunities include trout, bass, and catfish.

33 **15.3.5.13 Sweetwater Reservoir**

34 Sweetwater Reservoir is located in San Diego County (Sweetwater Authority
35 2014). The lake is owned and operated by Sweetwater Authority, as described in
36 Chapter 5, Surface Water Resources and Water Supplies. The reservoir is used to
37 store SWP water. Recreation facilities are managed by Sweetwater Authority.
38 Water-related activities include fishing.

39 **15.3.5.14 Lake Arrowhead**

40 Lake Arrowhead is located in San Bernardino County (LACSD 2014). The lake
41 is owned and operated by Arrowhead Lake Association. The Lake Arrowhead
42 Community Services District stores SWP water in the lake, as described in
43 Chapter 5, Surface Water Resources and Water Supplies. Recreation facilities are

1 managed by the Arrowhead Lake Association. Water-related activities include
2 boating, camping, and fishing (Lake Arrowhead 2014).

3 **15.3.6 Recreational Fishing in San Pablo and San Francisco Bays**

4 Recreational fishing for sturgeon, Striped Bass, steelhead, trout, and salmon in
5 San Pablo and San Francisco bays could be affected by changes in populations
6 that may occur due to implementation of the alternatives considered in this EIS.
7 Of these species, the majority of recreational fishing in the San Francisco Bay
8 Estuary is related to Striped Bass and sturgeon fishing, especially in San Pablo
9 and Suisun bays.

10 Recreational fishing for White Sturgeon is limited to three sturgeons per person
11 each year, with a daily bag limit of one fish/day and a size limitation of 40 to
12 60 inches (from the nose tip to fork in the tail). In addition, White Sturgeon
13 fishing is not allowed in San Francisco Bay from March 16 through December 31.
14 Green sturgeon fishing is not allowed. Striped bass fishing occurs throughout the
15 year with a daily bag limit two fish/day and a minimum size limitation of
16 18 inches. Salmon sportfishing also occurs within the San Francisco Bay Estuary
17 during periods specified by the National Marine Fisheries Service (NMFS).

18 **15.3.7 Recreational Salmon Fishing along Northern California** 19 **Coast**

20 Chinook Salmon, Coho Salmon, and steelhead are generally the primary species
21 for recreational fishing that could be affected by changes in CVP and SWP
22 operations along the Pacific Coast of Northern California from Pigeon Point to
23 southern Oregon (near Elk River). The Pacific Coast salmon fisheries are
24 managed by the Pacific Fishery Management Council (PFMC) in waters between
25 the United States/Canada border to the United States/Mexico border between
26 3 and 200 nautical miles offshore (PFMC 2014). The State DFW manages the
27 salmon fisheries within 0 to 3 nautical miles offshore with regulations that are
28 generally similar to the PFMC to the salmon fishing requirements. The PFMC
29 analyzes the a fisheries evaluation each year; and defines the periods of time for
30 the fishing season and minimum size fish to be caught for commercial,
31 recreational, and tribal salmon fishing activities, as described in more detail for
32 recreational and commercial salmon fishing in Chapter 19, Socioeconomics.

33 **15.4 Impact Analysis**

34 This section describes the potential mechanisms and analytical methods for
35 change in recreation resources; results of the impact analysis; potential mitigation
36 measures; and cumulative effects.

37 **15.4.1 Potential Mechanisms for Change and Analytical Methods**

38 As described in Chapter 4, Approach to Environmental Analysis, the impact
39 analysis considers changes in recreational resources conditions related to changes

1 in CVP and SWP operations under the alternatives as compared to the No Action
2 Alternative and Second Basis of Comparison.

3 As described in Section 15.3, Affected Environment, there are a wide range of
4 recreational opportunities at the reservoirs and along the downstream rivers. This
5 analysis focuses on the potential changes in these recreational opportunities and
6 not specific recreational actions. For example, this analysis focuses on changes in
7 surface water elevations at reservoirs which could affect boating, shoreline
8 camping and picnicking, and use of trails. The changes in reservoir elevations
9 would occur within the historical range of elevation changes; therefore, none of
10 the recreational opportunities would be permanently reduced or expanded. The
11 changes that would occur within the alternatives would change the potential for
12 enjoyable recreational opportunities based upon changes in reservoir surface
13 water elevations and river flows.

14 Changes in CVP and SWP operations under the alternatives as compared to the
15 No Action Alternative and Second Basis of Comparison could change recreational
16 opportunities at water bodies affected by CVP and SWP operations.

17 **15.4.1.1 Changes in Recreational Resources at Reservoirs that Store CVP**
18 **and SWP Water**

19 Reservoirs that store CVP and SWP water provide a wide diversity of recreational
20 experiences on the water surface, at shoreline campgrounds, and along shoreline
21 trails. By the end of September, the surface water elevations can decline from
22 higher elevations in the spring by up to 100 feet in Shasta Lake and Lake
23 Oroville; and over 50 feet in Trinity and Folsom lakes and New Melones and San
24 Luis reservoirs. As the water elevations declines, boat ramps become unavailable
25 and the water surface recedes along steep slopes from shoreline campgrounds and
26 trails. Changes in CVP and SWP operations under the alternatives could change
27 the surface water elevations, especially in dry and critical dry years as compared
28 to the No Action Alternative and Second Basis of Comparison.

29 The CalSim II model output includes monthly reservoir elevations for CVP and
30 SWP reservoirs in the Central Valley and Trinity Lake. The end of September
31 reservoir elevations generally indicate low reservoir elevations. To assess
32 changes in recreational resources, changes in reservoir elevations for the end of
33 September were compared between alternatives and the No Action
34 Alternative and Second Basis of Comparison. The reservoir elevations at the end
35 of September were compared to minimum allowable boat ramp elevations as a
36 measure of surface water accessibility.

37 Reservoirs in the San Francisco Bay Area, Central Coast, and Southern California
38 regions store water from multiple water supplies including CVP and SWP water;
39 however, these reservoirs are not included in the CalSim II model simulation. For
40 the purposes of this EIS analysis, changes in surface water elevations in these
41 reservoirs were assumed to be related to changes in CVP and SWP water
42 deliveries to the areas located to the south of the Delta.

1 **15.4.1.2 Changes in Recreational Resources along Rivers downstream of**
2 **CVP and SWP Reservoirs**

3 Changes in CVP and SWP operations under the alternatives could change the
4 river flows in Trinity, Sacramento, Feather, American, and Stanislaus rivers in a
5 manner that would affect recreational opportunities including boating and
6 swimming during the spring and summer months, especially in dry and critical
7 dry years.

8 Results of the CalSim II model were used to assess changes in average monthly
9 flows that could affect recreational opportunities under the alternatives, the No
10 Action Alternative, and the Second Basis of Comparison. This analysis is focused
11 on the Trinity, Sacramento, Feather, American, and Stanislaus rivers. Generally,
12 flow in rivers downstream of San Luis Reservoir and the reservoirs in the San
13 Francisco Bay Area, Central Coast, and Southern California that store CVP and
14 SWP water are based upon minimum instream flow requirements except in high
15 flow events because the reservoirs are operated primarily to provide water into
16 downstream water distribution systems.

17 **15.4.1.3 Changes in Recreational Opportunities at Wildlife Refuges**

18 Changes in CVP and SWP operations under the alternatives would not change
19 water supplies to wildlife refuges that use CVP water for Level 2 water demands,
20 as described in Chapter 5, Surface Water Resources and Water Supplies.
21 Therefore, these changes are not analyzed in this EIS.

22 **15.4.1.4 Effects Related to Water Transfers**

23 Historically water transfer programs have been developed on an annual basis.
24 The demand for water transfers is dependent upon the availability of water
25 supplies to meet water demands. Water transfer transactions have increased over
26 time as CVP and SWP water supply availability has decreased, especially during
27 drier water years.

28 Water transfers using CVP and SWP Delta pumping plants and south of Delta
29 canals generally occur when there is unused capacity in these facilities. These
30 conditions generally occur during drier water year types when the flows from
31 upstream reservoirs plus unregulated flows are adequate to meet the Sacramento
32 Valley water demands and the CVP and SWP export allocations. In non-wet
33 years, the CVP and SWP water allocations would be less than full contract
34 amounts; therefore, capacity may be available in the CVP and SWP conveyance
35 facilities to move water from other sources.

36 Projecting future recreational conditions related to water transfer activities is
37 difficult because specific water transfer actions required to make the water
38 available, convey the water, and/or use the water would change each year due to
39 changing hydrological conditions, CVP and SWP water availability, specific local
40 agency operations, and local cropping patterns. Reclamation recently prepared a
41 long-term regional water transfer environmental document which evaluated
42 potential changes in conditions related to water transfer actions (Reclamation
43 2014f). Results from this analysis were used to inform the impact assessment of

1 potential effects of water transfers under the alternatives as compared to the No
2 Action Alternative and the Second Basis of Comparison.

3 **15.4.2 Conditions in Year 2030 without Implementation of**
4 **Alternatives 1 through 5**

5 This EIS includes two bases of comparison, as described in Chapter 3,
6 Description of Alternatives: the No Action Alternative and the Second Basis of
7 Comparison. Both of these bases are evaluated at 2030 conditions. Changes that
8 would occur over the next 15 years without implementation of the alternatives are
9 not analyzed in this EIS. However, the changes to recreational resources that are
10 assumed to occur by 2030 under the No Action Alternative and the Second Basis
11 of Comparison are summarized in this section. Many of the changed conditions
12 would occur in the same manner under both the No Action Alternative and the
13 Second Basis of Comparison.

14 **15.4.2.1 Common Changes in Conditions under the No Action**
15 **Alternative and Second Basis of Comparison**

16 Conditions in 2030 would be different than existing conditions due to:

- 17 • Climate change and sea level rise
18 • General plan development throughout California, including increased water
19 demands in portions of Sacramento Valley
20 • Implementation of reasonable and foreseeable water resources management
21 projects to provide water supplies

22 It is anticipated that climate change would result in more short-duration high-
23 rainfall events and less snowpack in the winter and early spring months. The
24 reservoirs would be full more frequently by the end of April or May by 2030 than
25 in recent historical conditions. However, as the water is released in the spring,
26 there would be less snowpack to refill the reservoirs. This condition would
27 reduce reservoir storage and available water supplies to downstream uses in the
28 summer. The reduced end of September storage also would reduce the ability to
29 release stored water to downstream regional reservoirs. These conditions would
30 occur for all reservoirs in the California foothills and mountains, including non-
31 CVP and SWP reservoirs.

32 Under the No Action Alternative and the Second Basis of Comparison, land uses
33 in 2030 would occur in accordance with adopted general plans. Development
34 under the general plans would could increase demand for recreational resources.

35 The No Action Alternative and the Second Basis of Comparison assumes
36 completion of water resources management and environmental restoration
37 projects that would have occurred without implementation of Alternatives 1
38 through 5, including regional and local recycling projects, surface water and
39 groundwater storage projects, conveyance improvement projects, and desalination
40 projects, as described in Chapter 3, Description of Alternatives. The No Action
41 Alternative and the Second Basis of Comparison also assumes implementation of
42 actions included in the 2008 USFWS Biological Opinion (BO) and 2009 NMFS

1 BO that would have been implemented without the BOs by 2030, as described in
 2 Chapter 3, Description of Alternatives. These projects would include several
 3 projects that would affect recreational resources, including restoration of more
 4 than 10,000 acres of intertidal and associated subtidal wetlands in Suisun Marsh
 5 and Cache Slough; and at least 17,000 to 20,000 acres of seasonal floodplain
 6 restoration in Yolo Bypass.

7 **15.4.3 Evaluation of Alternatives**

8 Alternatives 1 through 5 have been compared to the No Action Alternative; and
 9 the No Action Alternative and Alternatives 1 through 5 have been compared to
 10 the Second Basis of Comparison.

11 During review of the numerical modeling analyses used in this EIS, an error was
 12 determined in the CalSim II model assumptions related to the Stanislaus River
 13 operations for the Second Basis of Comparison, Alternative 1, and Alternative 4
 14 model runs. Appendix 5C includes a comparison of the CalSim II model run
 15 results presented in this chapter and CalSim II model run results with the error
 16 corrected. Appendix 5C also includes a discussion of changes in the comparison
 17 of groundwater conditions for the following alternative analyses.

- 18 • No Action Alternative compared to the Second Basis of Comparison
- 19 • Alternative 1 compared to the No Action Alternative
- 20 • Alternative 3 compared to the Second Basis of Comparison
- 21 • Alternative 5 compared to the Second Basis of Comparison

22 **15.4.3.1 No Action Alternative**

23 The No Action Alternative is compared to the Second Basis of Comparison.

24 **15.4.3.1.1 Trinity River Region**

25 *Potential Changes in Recreational Resources at Reservoirs that Store CVP and* 26 *SWP Water*

27 Changes in CVP water supplies and operations under the No Action
 28 Alternative as compared to the Second Basis of Comparison would result in
 29 similar end of September reservoir elevations (changes within 5 percent) and
 30 related recreational resources at Trinity Lake in all water year types, as described
 31 in Chapter 5, Surface Water Resources and Water Supplies.

32 There are several boat ramps at Trinity Lake that provide access at different
 33 elevations. Boat ramps at Stuart Fork and Bowerman are not useable when the
 34 water elevation is less than 2,323 feet which occurs approximately 80 percent of
 35 the time under the No Action Alternative and Second Basis of Comparison. Boat
 36 ramps at Clark Springs, Fairview, and Trinity Center are not useable when the
 37 water elevation is lower than 2,300 feet which occurs approximately 62 percent of
 38 the time under the No Action Alternative and Second Basis of Comparison. The
 39 Minersville boat ramp is accessible until the elevation declines below 2,170 feet
 40 which occurs approximately 5 percent of the time under the No Action
 41 Alternative and Second Basis of Comparison.

1 *Potential Changes in Recreational Resources along Rivers Downstream of the*
2 *CVP and SWP Reservoirs*

3 The following changes would occur on the Trinity River under the No Action
4 Alternative as compared to the Second Basis of Comparison, as summarized in
5 Chapter 5, Surface Water Resources and Water Supplies.

- 6 • Over long-term conditions, flows would be similar in March through
7 November; and reduced in December through February (up to 9.5 percent).
- 8 • In wet years, flows would be similar in April through November; and reduced
9 in December through March (up to 11.2 percent).
- 10 • In dry years, flows would be similar in all months.

11 Flows in Trinity River would be similar during the recreation season (spring and
12 summer months); therefore, recreational opportunities would be similar.

13 **15.4.3.1.2 Central Valley Region**

14 *Potential Changes in Recreational Resources at Reservoirs that Store CVP and*
15 *SWP Water*

16 Changes in CVP water supplies and operations under the No Action
17 Alternative as compared to the Second Basis of Comparison would result in
18 similar end of September reservoir elevations and related recreational resources at
19 Shasta Lake, Lake Oroville, Folsom Lake, and New Melones Reservoir in all
20 water year types; and at San Luis Reservoir in above normal, below normal, and
21 dry years, as described in Chapter 5, Surface Water Resources and Water
22 Supplies. Changes in recreational resources at San Luis Reservoir would be
23 reduced in wet year and critical dry years because the end of September surface
24 water elevations would be reduced by 6.2 percent in wet and critical dry years.

25 There are several boat ramps at each of the reservoirs that provide access at
26 different elevations. At Shasta Lake, boat ramps at Antlers, Hirz Bay, Packers
27 Bay, Sugar Loaf, and Centimundi and Jones Valley are not accessible
28 approximately 55, 35, 20, 10, and 9 percent of the time, respectively, under the
29 No Action Alternative; and approximately 55, 30, 15, 10, and 7 percent of the
30 time, respectively, under the Second Basis of Comparison.

31 At Lake Oroville, boat ramps at Enterprise, Vinton Gulch, and Nelson Bar;
32 Foreman Creek; Dark Canyon and Loafer Creek; and Bidwell Canyon, Lime
33 Saddle, and Spillway are not accessible approximately 95, 87, 73, and 35 percent
34 of the time, respectively, under the No Action Alternative; and approximately
35 85, 75, 62, and 25 percent of the time, respectively, under the Second Basis of
36 Comparison.

37 At Folsom Lake, boat ramps at Rattlesnake Bar, Beal's Point; Peninsula, Brown's
38 Ravine, and Folsom Point; Hobie Cove; and Granite Bay are not accessible
39 approximately 80, 65, 40, 10, and 7 percent of the time, respectively, under the
40 No Action Alternative; and approximately 65, 40, 10, and 7 percent of the time,
41 respectively, under the Second Basis of Comparison.

1 At New Melones Reservoir, the boat ramp at Angels Creek, Parrott's Ferry, Glory
 2 Hole, and Mark Twain are not accessible approximately 65, 25, 18, and 5 percent
 3 of the time, respectively, under the No Action Alternative; and approximately
 4 30, 25, 15, 5 percent of the time, respectively, under the Second Basis of
 5 Comparison.

6 At San Luis Reservoir, the boat ramps at Dinosaur Point and Basalt Area are not
 7 useable approximately 50 and 10 percent of the time, respectively, under the No
 8 Action Alternative; and approximately 20 and 5 percent of the time, respectively,
 9 under the Second Basis of Comparison.

10 At all reservoirs, boating opportunities would be decreased, and shoreline
 11 recreational opportunities would be similar or decreased under the No Action
 12 Alternative as compared to the Second Basis of Comparison.

13 *Potential Changes in Recreational Resources along Rivers Downstream of the*
 14 *CVP and SWP Reservoirs*

15 The recreational opportunities along the Sacramento, Feather, American, and
 16 Stanislaus rivers would be affected by the following changes in river flows, as
 17 described in Chapter 5.

- 18 • Sacramento River downstream of Keswick Dam
 - 19 – Over long-term conditions, similar flows would occur in October,
 20 February through May, July, and August; increased flows in September
 21 and November (up to 37.7 percent); and reduced flows in December,
 22 January, and June (up to 7.8 percent).
 - 23 – In wet years, similar flows would occur in January through July; increased
 24 flows in September through November (up to 77.7 percent); and reduced
 25 flows in December and August (up to 14.6 percent).
 - 26 – In dry years, similar flows would occur in July through October,
 27 December through March, and May; increased flows in November
 28 (33.4 percent).
- 29 • Sacramento River at Freeport
 - 30 – Over long-term conditions, similar flows would occur in October,
 31 December through May, and August; increased flows in September,
 32 November, and July (up to 43.3 percent); and reduced flows in June
 33 (11.4 percent).
 - 34 – In wet years, similar flows would occur in January through June and
 35 October; increased flows in July through September and November (up to
 36 90.3 percent); and reduced flows in December (10.7 percent).
 - 37 – In dry years, similar flows would occur in August through October and
 38 December through April; increased flows in November and July (up to
 39 15.8 percent); and reduced flows in May and June (up to 11.9 percent).

- 1 • Feather River downstream of the Thermalito Complex
 - 2 – Over long-term conditions, similar flows would occur in November and
 - 3 April; increased flows in July through September (up to 76.1 percent); and
 - 4 reduced flows in October, December through March, May, and June (up to
 - 5 27.2 percent).
 - 6 – In wet years, similar flows would occur in October through November and
 - 7 March through May; increased flows in July through September (up to
 - 8 184 percent) and reduced flows in December through February (up to
 - 9 26.0 percent).
 - 10 – In dry years, similar flows would occur in November through March;
 - 11 increased flows in April and July (up to 52.4 percent); and reduced flows
 - 12 in August through October and May and June (up to 27.6 percent).
- 13 • American River downstream of Nimbus Dam
 - 14 – Over long-term conditions, similar flows would occur in November
 - 15 through May and July; increased flows in September and October (up to
 - 16 44.7 percent); and reduced flows in June and August (up to 6.1 percent).
 - 17 – In wet years, similar flows would occur in October through November and
 - 18 January through July; increased flows in September (91.1 percent) and
 - 19 reduced flows in December and August (up to 10.7 percent).
 - 20 – In dry years, similar flows would occur in all months except October,
 - 21 February and July; increased flows in October (16.5 percent); and reduced
 - 22 flows in February and July (up to 7.3 percent).
- 23 • Stanislaus River downstream of Goodwin Dam
 - 24 – Over long-term conditions, similar flows would occur in May and July
 - 25 through September; increased flows in October, March, and April (up to
 - 26 148.7 percent); and reduced flows in November through February and
 - 27 June (up to 33.8 percent).
 - 28 – In wet years, similar flows would occur in February and April; increased
 - 29 flows in October, March, May, July, and August (up to 117.1 percent);
 - 30 and reduced flows in September, November through January, and June (up
 - 31 to 50.8 percent).
 - 32 – In dry years, similar flows would occur in July through September;
 - 33 increased flows in October and April (up to 154.3 percent); and reduced
 - 34 flows in November through March, May, and June (up to 35.7 percent).

35 During the spring and summer months, the changes in flow conditions between
36 the No Action Alternative and the Second Basis of Comparison vary on a monthly
37 basis in the Sacramento, Feather, American, and Stanislaus rivers within a water
38 year type. For example, flows in the Sacramento River at Freeport would
39 increase in several months under the No Action Alternative as compared to the
40 Second Basis of Comparison by up to 90 percent, and decrease in several months
41 up to 11 percent. The overall range of flows is within the historical operational

1 range; therefore, recreational opportunities still exist. However, the value of the
 2 recreational opportunities would be both improved and reduced depending upon
 3 the timing of the changes.

4 Overall, under the No Action Alternative and the Second Basis of Comparison,
 5 recreational opportunities would be reduced on the Sacramento River downstream
 6 of Keswick Dam; and both improved and reduced on the Sacramento River near
 7 Freeport, Feather River downstream of Thermalito Complex, American River
 8 downstream of Nimbus Dam, and the Stanislaus River downstream of Goodwin
 9 Dam depending upon the month.

10 *Effects Related to Cross Delta Water Transfers*

11 Potential effects to recreational resources could be similar to those identified in a
 12 recent environmental analysis conducted by Reclamation for long-term water
 13 transfers from the Sacramento to San Joaquin valleys (Reclamation 2014c).

14 Potential effects to recreational resources were identified as changes in reservoir
 15 surface water elevations, streams, and the Delta. The analysis indicated that these
 16 potential impacts would not be substantial because the conditions with and
 17 without the water transfers would be similar.

18 Under the No Action Alternative, the timing of cross Delta water transfers would
 19 be limited to July through September and include annual volumetric limits, in
 20 accordance with the 2008 USFWS BO and 2009 NMFS BO. Under the Second
 21 Basis of Comparison, water could be transferred throughout the year without an
 22 annual volumetric limit. Overall, the potential for cross Delta water transfers
 23 would be less under the No Action Alternative than under the Second Basis of
 24 Comparison.

25 **15.4.3.1.3 San Francisco Bay Area, Central Coast, and Southern California** 26 **Region**

27 *Potential Changes in Recreational Resources at Reservoirs that Store CVP and* 28 *SWP Water*

29 Changes in recreational resources at reservoirs that store CVP and SWP water
 30 supplies are assumed to be related to changes in water deliveries over long-term
 31 conditions for this EIS analysis. Monthly deliveries are not necessarily indicative
 32 of reservoir storage because all or a portion of the water deliveries could be
 33 directly conveyed to water users in any specific month. Therefore, annual
 34 deliveries are considered to be relatively proportional to the amount of water that
 35 could be stored over all water year types. In the San Francisco Bay Area Region,
 36 values for the CVP municipal and industrial water deliveries and the SWP south
 37 of the Delta water deliveries (without Article 21 deliveries) were considered; and
 38 SWP south of the Delta water deliveries (without Article 21 deliveries) were
 39 considered for the Central Coast and Southern California regions. Under the No
 40 Action Alternative as compared to the Second Basis of Comparison CVP water
 41 deliveries would be reduced by 10 percent and SWP water deliveries would be
 42 reduced by 18 percent. Therefore, for this EIS analysis, it is assumed that
 43 recreational resources related to surface water elevations in reservoirs that store
 44 CVP and SWP water supplies would be reduced by 10 to 18 percent in the

1 San Francisco Bay Area Region and 18 percent in the Central Coast and Southern
2 California regions.

3 **15.4.3.2 Alternative 1**

4 Alternative 1 is identical to the Second Basis of Comparison. As described in
5 Chapter 4, Approach to Environmental Analysis, Alternative 1 is compared to the
6 No Action Alternative and the Second Basis of Comparison. However, because
7 recreational resource conditions under Alternative 1 are identical to recreational
8 resource conditions under the Second Basis of Comparison; Alternative 1 is only
9 compared to the No Action Alternative.

10 **15.4.3.2.1 Alternative 1 Compared to the No Action Alternative**

11 *Trinity River Region*

12 *Potential Changes in Recreational Resources at Reservoirs that Store CVP*
13 *and SWP Water*

14 Changes in CVP water supplies and operations under Alternative 1 as compared
15 to the No Action Alternative would result in similar end of September reservoir
16 elevations and related recreational resources at Trinity Lake in all water year
17 types, as described in Chapter 5, Surface Water Resources and Water Supplies.

18 There are several boat ramps at Trinity Lake that provide access at different
19 elevations. Boat ramps at Stuart Fork and Bowerman are not useable when the
20 water elevation is less than 2,323 feet which occurs approximately 80 percent of
21 the time under Alternative 1 and the No Action Alternative. Boat ramps at Clark
22 Springs, Fairview, and Trinity Center are not useable when the water elevation is
23 lower than 2,300 feet which occurs approximately 62 percent of the time under
24 Alternative 1 and the No Action Alternative. The Minersville boat ramp is
25 accessible until the elevation declines below 2,170 feet which occurs
26 approximately 5 percent of the time under Alternative 1 and the No Action
27 Alternative.

28 The potential for reduced recreational resources at Trinity Lake related to
29 shoreline activities would be less under the No Action Alternative as compared to
30 the Second Basis of Comparison.

31 *Potential Changes in Recreational Resources along Rivers Downstream of the*
32 *CVP and SWP Reservoirs*

33 The following changes would occur on the Trinity River under Alternative 1 as
34 compared to the No Action Alternative, as summarized in Chapter 5, Surface
35 Water Resources and Water Supplies.

- 36 • Over long-term conditions, flows would be similar in March through
37 November; and increased in December through February (up to 10.5 percent).
- 38 • In wet years, flows would be similar in April through November; and
39 increased in December through March (up to 12.6 percent).
- 40 • In dry years, flows would be similar all months.

1 Flows in Trinity River would be similar during the recreation season (spring and
2 summer months); therefore, recreational opportunities would be similar.

3 *Central Valley Region*

4 *Potential Changes in Recreational Resources at Reservoirs that Store CVP* 5 *and SWP Water*

6 Changes in CVP water supplies and operations under Alternative 1 as compared
7 to the No Action Alternative would result in similar end of September reservoir
8 elevations and related recreational resources at Shasta Lake, Lake Oroville,
9 Folsom Lake, and New Melones Reservoir in all water year types; and at San Luis
10 Reservoir in above normal, below normal, and dry years, as described in
11 Chapter 5, Surface Water Resources and Water Supplies. Changes in recreational
12 resources at San Luis Reservoir would be reduced in wet year and critical dry
13 years because the end of September surface water elevations would be increased
14 by 6.6 percent in wet and critical dry years.

15 There are several boat ramps at each of the reservoirs that provide access at
16 different elevations. At Shasta Lake, boat ramps at Antlers, Hirz Bay, Packers
17 Bay, Sugar Loaf, and Centimundi and Jones Valley are not accessible
18 approximately 55, 30, 15, 10, and 7 percent of the time, respectively, under
19 Alternative 1; and approximately 55, 35, 20, 10, and 9 percent of the time,
20 respectively, under the No Action Alternative.

21 At Lake Oroville, boat ramps at Enterprise, Vinton Gulch, and Nelson Bar;
22 Foreman Creek; Dark Canyon and Loafer Creek; and Bidwell Canyon, Lime
23 Saddle, and Spillway are not accessible approximately 85, 75, 62, and 25 percent
24 of the time, respectively, under Alternative 1; and approximately 95, 87, 73, and
25 35 percent of the time, respectively, under the No Action Alternative.

26 At Folsom Lake, boat ramps at Rattlesnake Bar, Beal's Point; Peninsula, Brown's
27 Ravine, and Folsom Point; Hobie Cove; and Granite Bay are not accessible
28 approximately 65, 40, 10, and 7 percent of the time, respectively, under
29 Alternative 1; and approximately 80, 65, 40, 10, and 7 percent of the time,
30 respectively, under the No Action Alternative.

31 At New Melones Reservoir, the boat ramp at Angels Creek, Parrott's Ferry, Glory
32 Hole, and Mark Twain are not accessible approximately 30, 25, 15, 5 percent of
33 the time, respectively, under Alternative 1 as compared to approximately 65, 25,
34 18, and 5 percent of the time, respectively, under the No Action Alternative.

35 At San Luis Reservoir, the boat ramps at Dinosaur Point and Basalt Area are not
36 useable approximately 20 and 5 percent of the time, respectively, under
37 Alternative 1; and approximately 50 and 10 percent of the time, respectively,
38 under the No Action Alternative.

39 At all reservoirs, boating opportunities would be increased, and shoreline
40 recreational opportunities would be similar or increased under Alternative 1 as
41 compared to the No Action Alternative.

1 *Potential Changes in Recreational Resources along Rivers Downstream of the*
2 *CVP and SWP Reservoirs*

3 The recreational opportunities along the Sacramento, Feather, American, and
4 Stanislaus rivers would be affected by the following changes in river flows, as
5 described in Chapter 5.

- 6 • Sacramento River downstream of Keswick Dam
 - 7 – Over long-term conditions, similar flows would occur in October,
8 February through May, July, and August; reduced flows in September and
9 November (up to 27.4 percent); and increased flows in December,
10 January, and June (up to 8.4 percent).
 - 11 – In wet years, similar flows would occur in January through July; reduced
12 flows in September through November (up to 43.7 percent); and increased
13 flows in December and August (up to 17.0 percent).
 - 14 – In dry years, similar flows would occur in July through October,
15 December through March, and May; reduced flows in November
16 (25.0 percent); and increased flows in April and June (up to 7.8 percent).
- 17 • Sacramento River at Freeport
 - 18 – Over long-term conditions, similar flows would occur in October,
19 December through May, and August; reduced flows in September,
20 November, and July (up to 30.2 percent); and increased flows in June
21 (12.8 percent).
 - 22 – In wet years, similar flows would occur in January through June and
23 October; reduced flows in July through September and November (up to
24 47.4 percent); and increased flows in December (6.6 percent).
 - 25 – In dry years, similar flows would occur in August through October and
26 December through April; reduced flows in November and July (up to
27 13.6 percent); and increased flows in May and June (up to 13.5 percent).
- 28 • Feather River downstream of the Thermalito Complex
 - 29 – Over long-term conditions, similar flows would occur in November and
30 April; reduced flows in July through September (up to 43.2 percent); and
31 increased flows in October, December through March, May, and June (up
32 to 37.4 percent).
 - 33 – In wet years, similar flows would occur in October, November, and March
34 through May; reduced flows in July through September (up to
35 64.9 percent); and increased flows in December through February and
36 June (up to 35.1 percent).
 - 37 – In dry years, similar flows would occur in December through April;
38 reduced flows in July (34.4 percent); and increased flows in August
39 through October, May, and June (up to 38.1 percent).

- 1 • American River downstream of Nimbus Dam
 - 2 – Over long-term conditions, similar flows would occur in November
 - 3 through May and July; reduced flows in September and October (up to
 - 4 30.9 percent); and increased flows in June (5.4 percent).
 - 5 – In wet years, similar flows would occur in October, November, and
 - 6 January through July; reduced flows in September (47.7 percent); and
 - 7 increased flows in August (12.0 percent).
 - 8 – In dry years, similar flows would occur in November through January,
 - 9 March through June, August, and September; reduced flows in October
 - 10 (14.1 percent); and increased flows in February and July (up to
 - 11 7.9 percent).
- 12 • Stanislaus River downstream of Goodwin Dam
 - 13 – Over long-term conditions, similar flows would occur in July through
 - 14 September; reduced flows in October, March, and April (up to
 - 15 59.8 percent); and increased flows in November through February and
 - 16 June (up to 51.1 percent).
 - 17 – In wet years, similar flows would occur in February and April; reduced
 - 18 flows in October, March, May, July, and August (up to 53.9 percent); and
 - 19 increased flows in September, November through January, and June (up to
 - 20 103.2 percent).
 - 21 – In dry years, similar flows would occur in July through September;
 - 22 reduced flows in October and April (up to 60.7 percent); and increased
 - 23 flows in November through March, May, and June (up to 55.5 percent).

24 During the spring and summer months, the changes in flow conditions between
 25 Alternative 1 as compared to the No Action Alternative vary on a monthly basis
 26 in the Sacramento, Feather, American, and Stanislaus rivers within a water year
 27 type. For example, flows in the Sacramento River at Freeport would increase in
 28 several months under Alternative 1 as compared to the No Action Alternative by
 29 up to 17 percent, and decrease in several months up to 44 percent. The overall
 30 range of flows is within the historical operational range; therefore, recreational
 31 opportunities still exist. However, the value of the recreational opportunities
 32 would be both improved and reduced depending upon the timing of the changes.

33 Overall, under Alternative 1 as compared to the No Action Alternative,
 34 recreational opportunities would be improved on the Sacramento River
 35 downstream of Keswick Dam; and both improved and reduced on the Sacramento
 36 River near Freeport, Feather River downstream of Thermalito Complex,
 37 American River downstream of Nimbus Dam, and the Stanislaus River
 38 downstream of Goodwin Dam depending upon the month.

39 *Effects Related to Cross Delta Water Transfers*

40 Potential effects to recreational resources could be similar to those identified in a
 41 recent environmental analysis conducted by Reclamation for long-term water
 42 transfers from the Sacramento to San Joaquin valleys (Reclamation 2014c) as

1 described above under the No Action Alternative compared to the Second Basis
2 of Comparison. For the purposes of this EIS, it is anticipated that similar
3 conditions would occur during implementation of cross Delta water transfers
4 under Alternative 1 and the No Action Alternative, and that impacts on
5 recreational resources would not be substantial in the seller's service area due to
6 implementation requirements of the transfer programs.

7 Under Alternative 1, water could be transferred throughout the year without an
8 annual volumetric limit. Under the No Action Alternative, the timing of cross
9 Delta water transfers would be limited to July through September and include
10 annual volumetric limits, in accordance with the 2008 USFWS BO and 2009
11 NMFS BO. Overall, the potential for cross Delta water transfers would be
12 increased under Alternative 1 as compared to the No Action Alternative.

13 *San Francisco Bay Area, Central Coast, and Southern California Regions*

14 *Potential Changes in Recreational Resources at Reservoirs that Store CVP*
15 *and SWP Water*

16 Changes in recreational resources at reservoirs that store CVP and SWP water
17 supplies are assumed to be related to changes in water deliveries over long-term
18 conditions for this EIS analysis, as described above under the No Action
19 Alternative as compared to the Second Basis of Comparison. Therefore, under
20 Alternative 1 as compared to the No Action Alternative, recreational resources
21 related to surface water elevations in reservoirs that store CVP and SWP water
22 supplies would be increased by 11 to 21 percent in the San Francisco Bay Area
23 Region and 21 percent in the Central Coast and Southern California regions.

24 **15.4.3.2.2 Alternative 1 Compared to the Second Basis of Comparison**

25 Alternative 1 is identical to the Second Basis of Comparison.

26 **15.4.3.3 Alternative 2**

27 The CVP and SWP operations under Alternative 2 are identical to the CVP and
28 SWP operations under the No Action Alternative; therefore, Alternative 2 is only
29 compared to the Second Basis of Comparison.

30 **15.4.3.3.1 Alternative 2 Compared to the Second Basis of Comparison**

31 The CVP and SWP operations under Alternative 2 are identical to the CVP and
32 SWP operations under the No Action Alternative. Therefore, changes to
33 recreational resources conditions under Alternatives 2 as compared to the Second
34 Basis of Comparison would be the same as the impacts described in Section
35 15.4.3.1, No Action Alternative.

36 **15.4.3.4 Alternative 3**

37 As described in Chapter 3, Description of Alternatives, CVP and SWP operations
38 under Alternative 3 are similar to the Second Basis of Comparison with modified
39 Old and Middle River flow criteria and New Melones Reservoir operations; and
40 additional predation control actions to reduce the populations of striped bass. As

1 described in Chapter 4, Approach to Environmental Analysis, Alternative 3 is
2 compared to the No Action Alternative and the Second Basis of Comparison.

3 **15.4.3.4.1 Alternative 3 Compared to the No Action Alternative**

4 *Trinity River Region*

5 *Potential Changes in Recreational Resources at Reservoirs that Store CVP* 6 *and SWP Water*

7 Changes in CVP water supplies and operations under Alternative 3 as compared
8 to the No Action Alternative would result in similar end of September reservoir
9 elevations and related recreational resources at Trinity Lake in all water year
10 types, as described in Chapter 5, Surface Water Resources and Water Supplies.

11 There are several boat ramps at Trinity Lake that provide access at different
12 elevations. Boat ramps at Stuart Fork and Bowerman are not useable when the
13 water elevation is less than 2,323 feet which occurs approximately 80 percent of
14 the time under Alternative 3 and the No Action Alternative. Boat ramps at Clark
15 Springs, Fairview, and Trinity Center are not useable when the water elevation is
16 lower than 2,300 feet which occurs approximately 62 percent of the time under
17 Alternative 3 and the No Action Alternative. The Minersville boat ramp is
18 accessible until the elevation declines below 2,170 feet which occurs
19 approximately 5 percent of the time under Alternative 3 and the No Action
20 Alternative.

21 *Potential Changes in Recreational Resources along Rivers Downstream of the* 22 *CVP and SWP Reservoirs*

23 The following changes would occur on the Trinity River under Alternative 3 as
24 compared to the No Action Alternative, as summarized in Chapter 5, Surface
25 Water Resources and Water Supplies.

- 26 • Over long-term conditions, flows would be similar in March through
27 November; and increased in December through February (up to 11.8 percent).
- 28 • In wet years, flows would be similar in April through October; reduced in
29 November (7.0 percent); and increased in December through March (up to
30 15.1 percent).
- 31 • In dry years, flows would be similar in all months.

32 Flows in Trinity River would be similar during the recreation season (spring and
33 summer months); therefore, recreational opportunities would be similar.

34 *Central Valley Region*

35 *Potential Changes in Recreational Resources at Reservoirs that Store CVP* 36 *and SWP Water*

37 Changes in CVP water supplies and operations under Alternative 3 as compared
38 to the No Action Alternative would result in similar end of September reservoir
39 elevations and related recreational resources at Shasta Lake, Lake Oroville,
40 Folsom Lake, and New Melones Reservoir in all water year types; and at San Luis
41 Reservoir in below normal, dry, and critical dry years, as described in Chapter 5,

1 Surface Water Resources and Water Supplies. Changes in recreational resources
2 at San Luis Reservoir would be reduced in wet year and critical dry years because
3 the end of September surface water elevations would be increased by 7.9 percent
4 in wet years and 5.7 percent in above normal years.

5 There are several boat ramps at each of the reservoirs that provide access at
6 different elevations. At Shasta Lake, boat ramps at Antlers, Hirz Bay, Packers
7 Bay, Sugar Loaf, and Centimundi and Jones Valley are not accessible
8 approximately 55, 30, 15, 10, and 7 percent of the time, respectively, under
9 Alternative 3; and approximately 55, 35, 20, 10, and 9 percent of the time,
10 respectively, under the No Action Alternative.

11 At Lake Oroville, boat ramps at Enterprise, Vinton Gulch, and Nelson Bar;
12 Foreman Creek; Dark Canyon and Loafer Creek; and Bidwell Canyon, Lime
13 Saddle, and Spillway are not accessible approximately 85, 75, 62, and 25 percent
14 of the time, respectively, under Alternative 3; and approximately 95, 87, 73, and
15 35 percent of the time, respectively, under the No Action Alternative.

16 At Folsom Lake, boat ramps at Rattlesnake Bar, Beal's Point; Peninsula, Brown's
17 Ravine, and Folsom Point; Hobie Cove; and Granite Bay are not accessible
18 approximately 65, 40, 10, and 7 percent of the time, respectively, under
19 Alternative 3; and approximately 80, 65, 40, 10, and 7 percent of the time,
20 respectively, under the No Action Alternative.

21 At New Melones Reservoir, the boat ramp at Angels Creek, Parrott's Ferry, Glory
22 Hole, and Mark Twain are not accessible approximately 22, 18, 10, and 5 percent
23 of the time, respectively, under Alternative 3 as compared to approximately
24 65, 25, 18, and 5 percent of the time, respectively, under the No Action
25 Alternative.

26 At San Luis Reservoir, the boat ramps at Dinosaur Point and Basalt Area are not
27 useable approximately 28 and 8 percent of the time, respectively, under
28 Alternative 3; and approximately 50 and 10 percent of the time, respectively,
29 under the No Action Alternative.

30 At Lake Oroville, Folsom Lake, New Melones Reservoir, and San Luis Reservoir,
31 boating opportunities would be increased, and opportunities would be similar at
32 Shasta Lake under Alternative 3 as compared to the No Action Alternative. At
33 Shasta Lake, Lake Oroville, and New Melones Reservoir shoreline recreational
34 opportunities would be increased, and opportunities would be similar at Folsom
35 Lake and San Luis Reservoir under Alternative 3 as compared to the No Action
36 Alternative.

37 *Potential Changes in Recreational Resources along Rivers Downstream of the*
38 *CVP and SWP Reservoirs*

39 The recreational opportunities along the Sacramento, Feather, American, and
40 Stanislaus rivers would be affected by the following changes in river flows, as
41 described in Chapter 5.

- 1 • Sacramento River downstream of Keswick Dam
- 2 – Over long-term conditions, similar flows would occur in October,
3 February through May, July, and August; reduced flows in September and
4 November (up to 20.1 percent); and increased flows in December,
5 January, and June (up to 8.9 percent).
- 6 – In wet years, similar flows would occur in February through August;
7 reduced flows in September through November (up to 42.1 percent); and
8 increased flows in December and January (up to 16.9 percent).
- 9 – In dry years, similar flows would occur in July through September and
10 December through May; reduced flows in November (24.6 percent); and
11 increased flows in January and June (up to 7.3 percent).
- 12 • Sacramento River at Freeport
- 13 – Over long-term conditions, similar flows would occur in October,
14 December through May, July, and August; reduced flows in September
15 and November (up to 30.1 percent); and increased flows in June
16 (12.1 percent).
- 17 – In wet years, similar flows would occur in January through May, July, and
18 October; reduced flows in August, September, and November (up to
19 48.1 percent); and increased flows in December and June (up to
20 6.6 percent).
- 21 – In dry years, similar flows would occur in July through October and
22 December through April; reduced flows in November (14.2 percent); and
23 increased flows in May and June (up to 15.7 percent).
- 24 • Feather River downstream of the Thermalito Complex
- 25 – Over long-term conditions, similar flows would occur in October,
26 November, March, April, and July; reduced flows in August and
27 September (up to 49.4 percent); and increased flows in December through
28 February, May, and June (up to 33.9 percent).
- 29 – In wet years, similar flows would occur in October, November, February
30 through May, and July; reduced flows in August and September (up to
31 70.0 percent) and increased flows in December, January, and June (up to
32 28.1 percent).
- 33 – In dry years, similar flows would occur in September and January through
34 April; reduced flows in October through December and July (up to
35 14.5 percent); and increased flows in May, June, and August
36 (36.9 percent).
- 37 • American River downstream of Nimbus Dam
- 38 – Over long-term conditions, similar flows would occur in November,
39 January through May, July, and August; reduced flows in September and
40 October (up to 28.7 percent); and increased flows in June (5.8 percent).

- 1 – In wet years, similar flows would occur in October, November, and
2 January through July; reduced flows in September (45.9 percent); and
3 increased flows in August and December (up to 8.5 percent).
- 4 – In dry years, similar flows would occur in November through January and
5 March through September; reduced flows in October (11.2 percent); and
6 increased flows in February (6.1 percent).
- 7 • Stanislaus River downstream of Goodwin Dam
- 8 – Over long-term conditions, reduced flows would occur in October and
9 March through June (up to 58.3 percent); and increased flows in
10 November through February and July through September (up to
11 36.81 percent).
- 12 – In wet years, similar flows would occur in April; reduced flows in
13 October, March, and May (up to 52.9 percent); and increased flows in
14 June through September and November through February (up to
15 67.8 percent).
- 16 – In dry years, similar flows would occur in March and July through
17 September; reduced flows in October and April through June (up to
18 59.6 percent); and increased flows in November through February (up to
19 37.0 percent).

20 During the spring and summer months, the changes in flow conditions between
21 Alternative 3 and the No Action Alternative vary on a monthly basis in the
22 Sacramento, Feather, American, and Stanislaus rivers within a water year type.
23 For example, flows in the Sacramento River at Freeport would increase in several
24 months under Alternative 3 as compared to the No Action Alternative by up to
25 15 percent, and decrease in several months up to 30 percent. The overall range of
26 flows is within the historical operational range; therefore, recreational
27 opportunities still exist. However, the value of the recreational opportunities
28 would be both improved and reduced depending upon the timing of the changes.

29 Overall, under Alternative 3 as compared to the No Action Alternative,
30 recreational opportunities would be similar or improved on the Sacramento River
31 downstream of Keswick Dam and American River downstream of Nimbus Dam;
32 and both improved and reduced on the Sacramento River near Freeport, Feather
33 River downstream of Thermalito Complex, and the Stanislaus River downstream
34 of Goodwin Dam depending upon the month.

35 Recreational opportunities related to Striped Bass fishing would initially be
36 increased when Alternative 3 is implemented. However, by 2030, Striped Bass
37 fishing opportunities would be reduced under Alternative 3 as compared to the No
38 Action Alternative due to actions to reduce predation.

39 Recreational opportunities related to sport ocean salmon fishing would be reduced
40 under Alternative 3 as compared to the No Action Alternative.

1 *Effects Related to Cross Delta Water Transfers*

2 Potential effects to recreational resources could be similar to those identified in a
3 recent environmental analysis conducted by Reclamation for long-term water
4 transfers from the Sacramento to San Joaquin valleys (Reclamation 2014c) as
5 described above under the No Action Alternative compared to the Second Basis
6 of Comparison. For the purposes of this EIS, it is anticipated that similar
7 conditions would occur during implementation of cross Delta water transfers
8 under Alternative 3 and the No Action Alternative, and that impacts on
9 recreational resources would not be substantial in the seller's service area due to
10 implementation requirements of the transfer programs.

11 Under Alternative 3, water could be transferred throughout the year without an
12 annual volumetric limit. Under the No Action Alternative, the timing of cross
13 Delta water transfers would be limited to July through September and include
14 annual volumetric limits, in accordance with the 2008 USFWS BO and 2009
15 NMFS BO. Overall, the potential for cross Delta water transfers would be
16 increased under Alternative 3 as compared to the No Action Alternative.

17 *San Francisco Bay Area, Central Coast, and Southern California Regions*

18 *Potential Changes in Recreational Resources at Reservoirs that Store CVP*
19 *and SWP Water*

20 Changes in recreational resources at reservoirs that store CVP and SWP water
21 supplies are assumed to be related to changes in water deliveries over long-term
22 conditions for this EIS analysis, as described above under the No Action
23 Alternative as compared to the Second Basis of Comparison. Therefore, under
24 Alternative 3 as compared to the No Action Alternative, recreational resources
25 related to surface water elevations in reservoirs that store CVP and SWP water
26 supplies would be increased by 9 to 17 percent in the San Francisco Bay Area
27 Region and 17 percent in the Central Coast and Southern California regions.

28 **15.4.3.4.2 Alternative 3 Compared to the Second Basis of Comparison**

29 *Trinity River Region*

30 *Potential Changes in Recreational Resources at Reservoirs that Store CVP*
31 *and SWP Water*

32 Changes in CVP water supplies and operations under Alternative 3 as compared
33 to the Second Basis of Comparison would result in similar end of September
34 reservoir elevations and related recreational resources at Trinity Lake in all water
35 year types, as described in Chapter 5, Surface Water Resources and Water
36 Supplies.

37 There are several boat ramps at Trinity Lake that provide access at different
38 elevations. Boat ramps at Stuart Fork and Bowerman are not useable when the
39 water elevation is less than 2,323 feet which occurs approximately 80 percent of
40 the time under Alternative 3 and the Second Basis of Comparison. Boat ramps at
41 Clark Springs, Fairview, and Trinity Center are not useable when the water
42 elevation is lower than 2,300 feet which occurs approximately 62 percent of the
43 time under Alternative 3 and the Second Basis of Comparison. The Minersville

1 boat ramp is accessible until the elevation declines below 2,170 feet which occurs
2 approximately 5 percent of the time under Alternative 3 and the Second Basis of
3 Comparison.

4 The potential for reduced recreational resources at Trinity Lake related to
5 shoreline activities would be greater in critical dry years and similar in dry years
6 and over the long-term average conditions under the No Action Alternative as
7 compared to the Second Basis of Comparison.

8 *Potential Changes in Recreational Resources along Rivers Downstream of the*
9 *CVP and SWP Reservoirs*

10 Flows in the Trinity River and recreational opportunities under Alternative 3
11 would be similar to the Second Basis of Comparison, as summarized in Chapter 5,
12 Surface Water Resources and Water Supplies.

13 *Central Valley Region*

14 *Potential Changes in Recreational Resources at Reservoirs that Store CVP*
15 *and SWP Water*

16 Changes in CVP water supplies and operations under Alternative 3 as compared
17 to the Second Basis of Comparison would result in similar end of September
18 reservoir elevations and related recreational resources at Shasta Lake, Lake
19 Oroville, Folsom Lake, New Melones Reservoir, and San Luis Reservoir in all
20 water year types, as described in Chapter 5, Surface Water Resources and Water
21 Supplies.

22 There are several boat ramps at each of the reservoirs that provide access at
23 different elevations. At Shasta Lake, boat ramps at Antlers, Hirz Bay, Packers
24 Bay, Sugar Loaf, and Centimundi and Jones Valley are not accessible
25 approximately 55, 30, 15, 10, and 7 percent of the time, respectively, under
26 Alternative 3 and the Second Basis of Comparison.

27 At Lake Oroville, boat ramps at Enterprise, Vinton Gulch, and Nelson Bar;
28 Foreman Creek; Dark Canyon and Loafer Creek; and Bidwell Canyon, Lime
29 Saddle, and Spillway are not accessible approximately 85, 75, 62, and 35 percent
30 of the time, respectively, under Alternative 3 and the Second Basis of
31 Comparison.

32 At Folsom Lake, boat ramps at Rattlesnake Bar; Beal's Point; Peninsula, Brown's
33 Ravine, and Folsom Point; Hobie Cove; and Granite Bay are not accessible
34 approximately 70, 65, 40, 10, and 7 percent of the time, respectively, under
35 Alternative 3 and the Second Basis of Comparison.

36 At New Melones Reservoir, the boat ramp at Angels Creek, Parrott's Ferry, Glory
37 Hole, and Mark Twain are not accessible approximately 22, 18, 10, and 8 percent
38 of the time, respectively, under Alternative 3 as compared to approximately
39 30, 25, 15, and 3 percent of the time, respectively, under the Second Basis of
40 Comparison.

41 At San Luis Reservoir, the boat ramps at Dinosaur Point and Basalt Area are not
42 useable approximately 28 and 8 percent of the time, respectively, under

1 Alternative 3; and approximately 20 and 5 percent of the time, respectively, under
2 the Second Basis of Comparison.

3 Boating opportunities would be increased at New Melones Reservoir, decreased
4 at San Luis Reservoir, and similar at all other reservoirs under Alternative 3 as
5 compared to the Second Basis of Comparison. Shoreline recreational
6 opportunities would be increased at New Melones Reservoir, decreased at Lake
7 Oroville, and similar at all other reservoirs under Alternative 3 as compared to the
8 Second Basis of Comparison.

9 *Potential Changes in Recreational Resources along Rivers Downstream of the*
10 *CVP and SWP Reservoirs*

11 The recreational opportunities along the Sacramento, Feather, American, and
12 Stanislaus rivers would be affected by the following changes in river flows, as
13 described in Chapter 5.

- 14 • Similar or increased flows in the Sacramento River downstream of Keswick
15 Dam and at Freeport.
- 16 • Feather River downstream of the Thermalito Complex
 - 17 – Over long-term conditions, similar flows would occur in November and
18 January through June; reduced flows in October, December, and
19 September (up to 12.5 percent); and increased flows in July and August
20 (up to 17.0 percent).
 - 21 – In wet years, similar flows would occur in November and January through
22 May; reduced flows in October, December, and September (up to
23 14.6 percent); and increased flows in June through August (up to
24 10.9 percent).
 - 25 – In dry years, similar flows would occur in November and January through
26 June; reduced flows in August through October (up to 21.2 percent); and
27 increased flows in July (37.1 percent).
- 28 • Similar flows in American River downstream of Nimbus Dam.
- 29 • Stanislaus River downstream of Goodwin Dam
 - 30 – Over long-term conditions, similar flows would occur in October,
31 December, January, and March; reduced flows would occur in November,
32 May, and June (up to 52.3 percent); and increased flows in February,
33 April, and July through September (up to 26.8 percent).
 - 34 – In wet years, similar flows would occur in October, November, January,
35 and April; reduced flows in May and June (up to 44.8 percent); and
36 increased flows in December, February, March, and July through
37 September (up to 68.6 percent).
 - 38 – In dry years, similar flows would occur in July through October; reduced
39 flows in November through March and May through June (up to
40 36.0 percent); and increased flows in April (40.2 percent).

1 During the spring and summer months, the changes in flow conditions between
2 Alternative 3 and the Second Basis of Comparison vary on a monthly basis in the
3 Sacramento, Feather, American, and Stanislaus rivers within a water year type.
4 For example, flows in the Stanislaus River downstream of Goodwin Dam would
5 increase in several months under Alternative 3 as compared to the Second Basis
6 of Comparison by up to 90 percent, and decrease in several months up to
7 11 percent. The overall range of flows is within the historical operational range;
8 therefore, recreational opportunities still exist.

9 Overall, under Alternative 3 as compared to the Second Basis of Comparison,
10 recreational opportunities would be similar or improved on the Sacramento,
11 Feather, and American rivers; and both improved and reduced on the Stanislaus
12 River depending upon the month.

13 Recreational opportunities related to Striped Bass fishing would initially be
14 increased when Alternative 3 is implemented. However, by 2030, Striped Bass
15 fishing opportunities would be reduced under Alternative 3 as compared to the
16 Second Basis of Comparison due to actions to reduce predation.

17 Recreational opportunities related to sport ocean salmon fishing would be reduced
18 under Alternative 3 as compared to the Second Basis of Comparison.

19 *Effects Related to Cross Delta Water Transfers*

20 Potential effects to recreational resources could be similar to those identified in a
21 recent environmental analysis conducted by Reclamation for long-term water
22 transfers from the Sacramento to San Joaquin valleys (Reclamation 2014c) as
23 described above under the No Action Alternative compared to the Second Basis
24 of Comparison. For the purposes of this EIS, it is anticipated that similar
25 conditions would occur during implementation of cross Delta water transfers
26 under Alternative 3 and the Second Basis of Comparison, and that impacts on
27 recreational resources would not be substantial in the seller's service area due to
28 implementation requirements of the transfer programs.

29 Under Alternative 3 and the Second Basis of Comparison, water could be
30 transferred throughout the year without an annual volumetric limit. Overall, the
31 potential for cross Delta water transfers would be similar under Alternative 3 and
32 the Second Basis of Comparison.

33 *San Francisco Bay Area, Central Coast, and Southern California Regions*

34 *Potential Changes in Recreational Resources at Reservoirs that Store CVP*
35 *and SWP Water*

36 Changes in recreational resources at reservoirs that store CVP and SWP water
37 supplies are assumed to be related to changes in water deliveries over long-term
38 conditions for this EIS analysis, as described above under the No Action
39 Alternative as compared to the Second Basis of Comparison. Therefore, under
40 Alternative 3 as compared to the Second Basis of Comparison, recreational
41 resources related to surface water elevations in reservoirs that store CVP and
42 SWP water supplies would be similar (changes within 5 percent).

1 **15.4.3.5 Alternative 4**

2 The recreational resources under Alternative 4 would be similar to the conditions
3 under the Second Basis of Comparison with additional predation control actions
4 to reduce the populations of striped bass.

5 **15.4.3.5.1 Alternative 4 Compared to the No Action Alternative**

6 The CVP and SWP operations under Alternative 4 are identical to the CVP and
7 SWP operations under the Second Basis of Comparison and Alternative 1.
8 However, Alternative 4 includes predation controls as compared to the Second
9 Basis. Therefore, reservoir and flow-related changes in recreational resources
10 under Alternative 4 as compared to the No Action Alternative would be the same
11 as the impacts described in Section 15.4.3.2.1, Alternative 1 Compared to the No
12 Action Alternative.

13 Recreational opportunities related to Striped Bass fishing would initially be
14 increased when Alternative 4 is implemented. However, by 2030, Striped Bass
15 fishing opportunities would be reduced under Alternative 4 as compared to the No
16 Action Alternative due to actions to reduce predation.

17 Recreational opportunities related to sport ocean salmon fishing would be reduced
18 under Alternative 4 as compared to the No Action Alternative.

19 **15.4.3.5.2 Alternative 4 Compared to the Second Basis of Comparison**

20 The CVP and SWP operations under Alternative 4 are identical to the CVP and
21 SWP operations under the Second Basis of Comparison and Alternative 1.
22 However, Alternative 4 includes predation controls as compared to the Second
23 Basis of Comparison. Therefore, flow-related changes in recreational resources
24 under Alternative 4 are the same as recreational resources under the Second Basis
25 of Comparison.

26 Recreational opportunities related to Striped Bass fishing would initially be
27 increased when Alternative 4 is implemented. However, by 2030, Striped Bass
28 fishing opportunities would be reduced under Alternative 4 as compared to the
29 Second Basis of Comparison due to actions to reduce predation.

30 Recreational opportunities related to sport ocean salmon fishing would be reduced
31 under Alternative 4 as compared to the Second Basis of Comparison.

32 **15.4.3.6 Alternative 5**

33 As described in Chapter 3, Description of Alternatives, CVP and SWP operations
34 under Alternative 5 are similar to the No Action Alternative with modified Old
35 and Middle River flow criteria and New Melones Reservoir operations. As
36 described in Chapter 4, Approach to Environmental Analysis, Alternative 5 is
37 compared to the No Action Alternative and the Second Basis of Comparison.

1 **15.4.3.6.1 Alternative 5 Compared to the No Action Alternative**

2 *Trinity River Region*

3 *Potential Changes in Recreational Resources at Reservoirs that Store CVP*
4 *and SWP Water*

5 Changes in CVP water supplies and operations under Alternative 5 as compared
6 to the No Action Alternative would result in similar end of September reservoir
7 elevations and related recreational resources at Trinity Lake in all water year
8 types, as described in Chapter 5, Surface Water Resources and Water Supplies.

9 There are several boat ramps at Trinity Lake that provide access at different
10 elevations. Boat ramps at Stuart Fork and Bowerman are not useable when the
11 water elevation is less than 2,323 feet which occurs approximately 80 percent of
12 the time under Alternative 5 and the No Action Alternative. Boat ramps at Clark
13 Springs, Fairview, and Trinity Center are not useable when the water elevation is
14 lower than 2,300 feet which occurs approximately 62 percent of the time under
15 Alternative 5 and the No Action Alternative. The Minersville boat ramp is
16 accessible until the elevation declines below 2,170 feet which occurs
17 approximately 8 percent of the time under Alternative 5 and 5 percent of the time
18 under the No Action Alternative.

19 The potential for reduced recreational resources at Trinity Lake related to
20 shoreline activities would be slightly less in critical dry years and similar over the
21 long-term average conditions and dry years under Alternative 5 as compared to
22 the No Action Alternative.

23 *Potential Changes in Recreational Resources along Rivers Downstream of the*
24 *CVP and SWP Reservoirs*

25 Flows in the Trinity River and recreational opportunities under Alternative 5
26 would be similar to the No Action Alternative, as summarized in Chapter 5,
27 Surface Water Resources and Water Supplies.

28 *Central Valley Region*

29 *Potential Changes in Recreational Resources at Reservoirs that Store CVP*
30 *and SWP Water*

31 Changes in CVP water supplies and operations under Alternative 5 as compared
32 to the No Action Alternative would result in similar end of September reservoir
33 elevations and related recreational resources at Shasta Lake, Lake Oroville,
34 Folsom Lake, New Melones Reservoir, and San Luis Reservoir in all water year
35 types, as described in Chapter 5, Surface Water Resources and Water Supplies.

36 There are several boat ramps at each of the reservoirs that provide access at
37 different elevations. At Shasta Lake, boat ramps at Antlers, Hirz Bay, Packers
38 Bay, Sugar Loaf, and Centimundi and Jones Valley are not accessible
39 approximately 55, 35, 20, 10, and 9 percent of the time, respectively, under
40 Alternative 5 and the No Action Alternative.

41 At Lake Oroville, boat ramps at Enterprise, Vinton Gulch, and Nelson Bar;
42 Foreman Creek; Dark Canyon and Loafer Creek; and Bidwell Canyon, Lime
43 Saddle, and Spillway are not accessible approximately 95, 87, 73, and 35 percent

1 of the time, respectively, under Alternative 5 and the Second Basis of
2 Comparison.

3 At Folsom Lake, boat ramps at Rattlesnake Bar, Beal's Point; Peninsula, Brown's
4 Ravine, and Folsom Point; Hobie Cove; and Granite Bay are not accessible
5 approximately 80, 65, 40, 10, and 7 percent of the time, respectively, under
6 Alternative 5 and the No Action Alternative.

7 At New Melones Reservoir, the boat ramp at Angels Creek, Parrott's Ferry, Glory
8 Hole, and Mark Twain are not accessible approximately 35, 30, 22, and 8 percent
9 of the time, respectively, under Alternative 5 as compared to approximately
10 65, 25, 18, and 5 percent of the time, respectively, under the No Action
11 Alternative.

12 At San Luis Reservoir, the boat ramps at Dinosaur Point and Basalt Area are not
13 useable approximately 50 and 10 percent of the time, respectively, under
14 Alternative 5 and the No Action Alternative.

15 Increased shoreline recreational opportunities at New Melones Reservoir in long-
16 term average conditions and dry years, decreased opportunities at New Melones
17 Reservoir in critical dry years, and similar opportunities at all times analyzed at
18 all other reservoirs under Alternative 5 as compared to the No Action Alternative.
19 Increased boating opportunities at New Melones Reservoir and similar
20 opportunities at all other reservoirs under Alternative 5 as compared to the No
21 Action Alternative.

22 *Potential Changes in Recreational Resources along Rivers downstream of the*
23 *CVP and SWP Reservoirs*

24 The recreational opportunities along the Sacramento, Feather, American, and
25 Stanislaus rivers would be affected by the following changes in river flows, as
26 described in Chapter 5.

- 27 • Flows in the Sacramento River downstream of Keswick Dam and near
28 Freeport would be similar.
- 29 • Feather River downstream of the Thermalito Complex
 - 30 – Over long-term conditions, similar flows would occur in June through
31 April; and reduced flows in May (6.6 percent).
 - 32 – In wet years, similar flows would occur in all months.
 - 33 – In dry years, similar flows would occur in September through April and
34 June; reduced flows in May (27.1 percent); and increased flows in July
35 and August (up to 8.9 percent).
- 36 • Flows in the American River downstream of Nimbus Dam would be similar.
- 37 • Stanislaus River downstream of Goodwin Dam
 - 38 – Over long-term conditions, flows would be similar in September through
39 February and June; reduced flows would occur in March, July, and August

- 1 (up to 8.0 percent); and increased flows in April and May (up to
2 22.4 percent).
- 3 – In wet years, similar flows would occur in October, November, January,
4 February, and April through June; reduced flows in December, March, and
5 July through September (up to 18.0 percent).
 - 6 – In dry years, similar flows would occur in June through March; and
7 increased flows in April and May (up to 47.3 percent).

8 During the spring and summer months, the changes in flow conditions between
9 Alternative 5 and the No Action Alternative vary on a monthly basis in the
10 Sacramento, Feather, American, and Stanislaus rivers within a water year type.
11 For example, flows in the Feather River downstream of Thermalito Complex
12 would increase in several months under Alternative 5 and the No Action
13 Alternative by up to 9 percent, and decrease in several months up to 27 percent.
14 The overall range of flows is within the historical operational range; therefore,
15 recreational opportunities still exist. However, the value of the recreational
16 opportunities would be both improved and reduced depending upon the timing of
17 the changes.

18 Overall, under Alternative 5 and the No Action Alternative, recreational
19 opportunities would be similar or improved on the Sacramento and American
20 rivers; and both improved and reduced on the Feather and Stanislaus rivers.

21 *Effects Related to Cross Delta Water Transfers*

22 Potential effects to recreational resources could be similar to those identified in a
23 recent environmental analysis conducted by Reclamation for long-term water
24 transfers from the Sacramento to San Joaquin valleys (Reclamation 2014c) as
25 described above under the No Action Alternative compared to the Second Basis
26 of Comparison. For the purposes of this EIS, it is anticipated that similar
27 conditions would occur during implementation of cross Delta water transfers
28 under Alternative 5 and the No Action Alternative, and that impacts on
29 recreational resources would not be substantial in the seller's service area due to
30 implementation requirements of the transfer programs.

31 Under Alternative 5 and the No Action Alternative, the timing of cross Delta
32 water transfers would be limited to July through September and include annual
33 volumetric limits, in accordance with the 2008 USFWS BO and 2009 NMFS BO.
34 Overall, the potential for cross Delta water transfers would be similar under
35 Alternative 5 and the No Action Alternative.

36 *San Francisco Bay Area, Central Coast, and Southern California Region*

37 *Potential Changes in Recreational Resources at Reservoirs that Store CVP* 38 *and SWP Water*

39 Changes in recreational resources at reservoirs that store CVP and SWP water
40 supplies are assumed to be related to changes in water deliveries over long-term
41 conditions for this EIS analysis, as described above under the No Action
42 Alternative as compared to the Second Basis of Comparison. Therefore, under

1 Alternative 5 as compared to the No Action Alternative, recreational resources
2 would be similar.

3 **15.4.3.6.2 Alternative 5 Compared to the Second Basis of Comparison**

4 *Trinity River Region*

5 *Potential Changes in Recreational Resources at Reservoirs that Store CVP* 6 *and SWP Water*

7 Changes in CVP water supplies and operations under Alternative 5 as compared
8 to the Second Basis of Comparison would result in similar end of September
9 reservoir elevations and related recreational resources at Trinity Lake in all water
10 year types, as described in Chapter 5, Surface Water Resources and Water
11 Supplies.

12 There are several boat ramps at Trinity Lake that provide access at different
13 elevations. Boat ramps at Stuart Fork and Bowerman are not useable when the
14 water elevation is less than 2,323 feet which occurs approximately 80 percent of
15 the time under Alternative 5 and the Second Basis of Comparison. Boat ramps at
16 Clark Springs, Fairview, and Trinity Center are not useable when the water
17 elevation is lower than 2,300 feet which occurs approximately 62 percent of the
18 time under Alternative 5 and the Second Basis of Comparison. The Minersville
19 boat ramp is accessible until the elevation declines below 2,170 feet which occurs
20 approximately 8 percent of the time under Alternative 5 and 5 percent of the time
21 under the Second Basis of Comparison.

22 The potential for reduced recreational resources at Trinity Lake related to
23 shoreline activities would be similar under Alternative 5 as compared to the
24 Second Basis of Comparison.

25 *Potential Changes in Recreational Resources along Rivers Downstream of the* 26 *CVP and SWP Reservoirs*

27 Flows in Trinity River would be similar during the recreation season (spring and
28 summer months); therefore, recreational opportunities would be similar under
29 Alternative 5 as compared to the Second Basis of Comparison.

30 *Central Valley Region*

31 *Potential Changes in Recreational Resources at Reservoirs that Store CVP* 32 *and SWP Water*

33 Changes in CVP water supplies and operations under Alternative 5 as compared
34 to the Second Basis of Comparison would result in similar end of September
35 reservoir elevations and related recreational resources at Shasta Lake, Lake
36 Oroville, Folsom Lake, and New Melones Reservoir in all water year types; and
37 at San Luis Reservoir in wet, above normal, and below normal years, as described
38 in Chapter 5, Surface Water Resources and Water Supplies. Changes in
39 recreational resources at San Luis Reservoir would be reduced in dry year and
40 critical dry years because the end of September surface water elevations would be
41 decreased by 6.2 percent in dry years and 8.5 percent in critical dry years.

- 1 There are several boat ramps at each of the reservoirs that provide access at
2 different elevations. At Shasta Lake, boat ramps at Antlers, Hirz Bay, Packers
3 Bay, Sugar Loaf, and Centimundi and Jones Valley are not accessible
4 approximately 55, 35, 20, 10, and 9 percent of the time, respectively, under
5 Alternative 5; and approximately 55, 30, 15, 10, and 7 percent of the time,
6 respectively, under the Second Basis of Comparison.
- 7 At Lake Oroville, boat ramps at Enterprise, Vinton Gulch, and Nelson Bar;
8 Foreman Creek; Dark Canyon and Loafer Creek; and Bidwell Canyon, Lime
9 Saddle, and Spillway are not accessible approximately 95, 87, 73, and 35 percent
10 of the time, respectively, under Alternative 5; and approximately 85, 75, 62, and
11 25 percent of the time, respectively, under the Second Basis of Comparison.
- 12 At Folsom Lake, boat ramps at Rattlesnake Bar are not accessible 80 percent of
13 the time under Alternative 5, and 70 percent of the time, respectively, under the
14 Second Basis of Comparison. Boat ramps at Beal's Point; Peninsula, Brown's
15 Ravine, and Folsom Point; Hobie Cove; and Granite Bay are not accessible
16 approximately 65, 40, 10, and 7 percent of the time, respectively, under
17 Alternative 5 and the Second Basis of Comparison.
- 18 At New Melones Reservoir, the boat ramp at Angels Creek, Parrott's Ferry, Glory
19 Hole, and Mark Twain are not accessible approximately 35, 30, 22, and 8 percent
20 of the time, respectively, under Alternative 5 as compared to approximately
21 30, 25, 15, and 5 percent of the time, respectively, under the Second Basis of
22 Comparison.
- 23 At San Luis Reservoir, the boat ramps at Dinosaur Point and Basalt Area are not
24 useable approximately 50 and 10 percent of the time, respectively, under
25 Alternative 5; and approximately 20 and 5 percent of the time, respectively, under
26 the Second Basis of Comparison.
- 27 Decreased shoreline recreational opportunities at Shasta Lake, Lake Oroville, and
28 New Melones Reservoir, and similar opportunities at all other reservoirs under
29 Alternative 5 as compared to the Second Basis of Comparison. Decreased
30 boating opportunities at Lake Oroville, New Melones Reservoir, and San Luis
31 Reservoir and similar opportunities at all other reservoirs under Alternative 5 as
32 compared to the Second Basis of Comparison.
- 33 *Potential Changes in Recreational Resources along Rivers Downstream of the*
34 *CVP and SWP Reservoirs*
- 35 The recreational opportunities along the Sacramento, Feather, American, and
36 Stanislaus rivers would be affected by the following changes in river flows, as
37 described in Chapter 5.
- 38 • Sacramento River downstream of Keswick Dam
 - 39 – Over long-term conditions, flows would be similar in July, August,
40 October, and February through April; reduced in December, January, May
41 and June (up to 8.2 percent); and increased in September and November
42 (up to 38.5 percent).

- 1 – In wet years, flows would be similar in January through July; reduced in
2 December and August (up to 15.0 percent); and increased in September
3 through November (up to 77.3 percent).
- 4 – In dry years, similar flows would occur in July through October and
5 December through March; reduced in April through June (up to
6 10.1 percent); and increased flows in November (32.1 percent).
- 7 • Sacramento River at Freeport
- 8 – Over long-term conditions, flows would be similar in October and
9 December through April; reduced in May and June (up to 11.5 percent);
10 and increased in July through September and November (43.4 percent).
- 11 – In wet years, flows would be similar in October and January through June;
12 reduced in December (6.2 percent); and increased in July through
13 September and November (up to 89.0 percent).
- 14 – In dry years, similar flows would occur in August through October and
15 December through April; reduced in May and June (up to 13.6 percent);
16 and increased flows in July and November (up to 19.3 percent).
- 17 • Feather River downstream of the Thermalito Complex
- 18 – Over long-term conditions, similar flows would occur in November and
19 April; reduced flows in October, December through March, May, and June
20 (up to 27.7 percent); and increased flows in July through September (up to
21 76.2 percent).
- 22 – In wet years, similar flows would occur in October, November, March
23 through May; reduced flows in December through February and June (up
24 to 25.6 percent); and increased flows in July through September (up to
25 181.9 percent).
- 26 – In dry years, similar flows would occur in November through April;
27 reduced flows in October, May, June, August, and September (up to
28 45.4 percent); and increased flows in July (60.4 percent).
- 29 • American River downstream of Nimbus Dam
- 30 – Over long-term conditions, similar flows would occur in November
31 through July; reduced flows in August (5.8 percent); and increased in
32 September and October (42.4 percent).
- 33 – In wet years, similar flows would occur in October, November, and
34 January through July; reduced flows in December and August (up to
35 13.7 percent); and increased flows in September (88.2 percent).
- 36 – In dry years, similar flows would occur in November through September;
37 and increased flows in October (16.7 percent).
- 38 • Stanislaus River downstream of Goodwin Dam
- 39 – Over long-term conditions, similar flows would occur in August; reduced
40 flows would occur in November through February, June, July, August, and

- 1 September (up to 35.8 percent); and increased flows in October and March
2 through May (up to 144.8 percent).
- 3 – In wet years, similar flows would occur in February and April; reduced
4 flows in November through January and June through September (up to
5 52.8 percent); and increased flows in October and March (up to
6 113.1 percent).
- 7 – In dry years, similar flows would occur in July through September;
8 reduced flows in November through March and June (up to 35.7 percent);
9 and increased flows in October, April, and May (150.1 percent).

10 During the spring and summer months, the changes in flow conditions between
11 Alternative 5 and the Second Basis of Comparison vary on a monthly basis in the
12 Sacramento, Feather, American, and Stanislaus rivers within a water year type.
13 For example, flows in the Sacramento River at Freeport would increase in several
14 months under Alternative 5 as compared to the Second Basis of Comparison by
15 up to 89 percent, and decrease in several months up to 13 percent. The overall
16 range of flows is within the historical operational range; therefore, recreational
17 opportunities still exist. However, the value of the recreational opportunities
18 would be both improved and reduced depending upon the timing of the changes.

19 Overall, under Alternative 5 as compared to the Second Basis of Comparison,
20 recreational opportunities would be similar or improved on the Sacramento River
21 downstream of Keswick Dam and American River downstream of Nimbus Dam;
22 and both improved and reduced on the Sacramento River near Freeport, Feather
23 River downstream of Thermalito Complex, and the Stanislaus River downstream
24 of Goodwin Dam depending upon the month.

25 *Effects Related to Cross Delta Water Transfers*

26 Potential effects to recreational resources could be similar to those identified in a
27 recent environmental analysis conducted by Reclamation for long-term water
28 transfers from the Sacramento to San Joaquin valleys (Reclamation 2014c) as
29 described above under the No Action Alternative compared to the Second Basis
30 of Comparison. For the purposes of this EIS, it is anticipated that similar
31 conditions would occur during implementation of cross Delta water transfers
32 under Alternative 5 and the Second Basis of Comparison, and that impacts on
33 recreational resources would not be substantial in the seller's service area due to
34 implementation requirements of the transfer programs.

35 Under Alternative 5, the timing of cross Delta water transfers would be limited to
36 July through September and include annual volumetric limits, in accordance with
37 the 2008 USFWS BO and 2009 NMFS BO. Under the Second Basis of
38 Comparison, water could be transferred throughout the year without an annual
39 volumetric limit. Overall, the potential for cross Delta water transfers would be
40 reduced under Alternative 5 as compared to the Second Basis of Comparison.

1 *San Francisco Bay Area, Central Coast, and Southern California Regions*
 2 *Potential Changes in Recreational Resources at Reservoirs that Store CVP*
 3 *and SWP Water*
 4 Changes in recreational resources at reservoirs that store CVP and SWP water
 5 supplies are assumed to be related to changes in water deliveries over long-term
 6 conditions for this EIS analysis, as described above under the No Action
 7 Alternative as compared to the Second Basis of Comparison. Therefore, under
 8 Alternative 5 as compared to the Second Basis of Comparison, recreational
 9 resources related to surface water elevations in reservoirs that store CVP and
 10 SWP water supplies would be reduced by 10 to 18 percent in the San Francisco
 11 Bay Area Region and 18 percent in the Central Coast and Southern California
 12 regions.

13 **15.4.3.7 Summary of Impact Assessment**

14 The results of the impact assessment of implementation of Alternatives 1
 15 through 5 as compared to the No Action Alternative and the Second Basis of
 16 Comparison are presented in Tables 15.28 and 15.29.

17 **Table 15.28 Comparison of Alternatives 1 through 5 to No Action Alternative**

Alternative	Potential Change	Consideration for Mitigation Measures
Alternative 1	<p>Recreational resources would be similar at Trinity Lake, Shasta Lake, Lake Oroville, Folsom Lake, and New Melones Reservoir in all water year types; and at San Luis Reservoir in above normal, below normal, and dry years. Recreational resources would be increased by 6 percent in wet and critical dry years at San Luis Reservoir, by 11 to 21 percent in the San Francisco Bay Area Region, and by 21 percent in the Central Coast and Southern California regions.</p> <p>Recreational opportunities would be similar or improved on Trinity River, Sacramento River downstream of Keswick Dam, and American River downstream of Nimbus Dam. On the Sacramento River near Freeport, Feather River downstream of Thermalito Complex, and the Stanislaus River downstream of Goodwin Dam recreational opportunities would be similar or improved in most spring and summer months; and reduced in July in all years and August in wetter years.</p>	No mitigation measures identified at this time to reduce flow reduction impacts on recreation opportunities.
Alternative 2	No effects on recreational resources.	None needed

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Alternative	Potential Change	Consideration for Mitigation Measures
Alternative 3	<p>Recreational resources would be similar at Trinity Lake, Shasta Lake, Lake Oroville, Folsom Lake, and New Melones Reservoir in all water year types; and at San Luis Reservoir in above normal, below normal, and dry years. Recreational resources would be increased by 8 percent in wet years and 6 percent in above normal years at San Luis Reservoir, by 9 to 17 percent in the San Francisco Bay Area Region, and by 17 percent in the Central Coast and Southern California regions.</p> <p>Recreational opportunities would be similar or improved on Trinity River, Sacramento River downstream of Keswick Dam, and American River downstream of Nimbus Dam. On the Sacramento River near Freeport and Feather River downstream of Thermalito Complex, recreational opportunities would be similar or improved in most spring and summer months; and reduced in August in all years on both rivers and in July on the Feather River in dry years. On the Stanislaus River downstream of Goodwin Dam recreational opportunities would be similar or improved in summer months; and reduced in May and June in all water year types.</p> <p>Recreational opportunities related to Striped Bass fishing and sport ocean salmon fishing would be reduced.</p>	<p>No mitigation measures identified at this time to reduce flow reduction impacts on recreation opportunities.</p> <p>No mitigation measures identified at this time to reduce impacts to reduction in Striped Bass and sport ocean salmon fishing opportunities.</p>
Alternative 4	<p>Reservoir and flow-related recreational opportunities would be as described for Alternative 1 compared to the No Action Alternative.</p> <p>Recreational opportunities related to Striped Bass fishing and sport ocean salmon fishing would be reduced.</p>	<p>No mitigation measures identified at this time to reduce flow reduction impacts on recreation opportunities.</p> <p>No mitigation measures identified at this time to reduce impacts to reduction in Striped Bass and sport ocean salmon fishing opportunities.</p>
Alternative 5	<p>Recreational resources would be similar at Trinity Lake, Shasta Lake, Lake Oroville, Folsom Lake, San Luis Reservoir, and other reservoirs that store CVP and SWP water in the San Francisco Bay Area, Central Coast, and Southern California regions.</p> <p>Recreational opportunities would be similar or improved on Trinity River, Sacramento River downstream of Keswick Dam and near Freeport, and American River downstream of Nimbus Dam. On the Feather River downstream of Thermalito Complex, recreational opportunities would be similar or improved in most spring and summer months; and reduced in May in all years. On the Stanislaus River downstream of Goodwin Dam recreational opportunities would be similar or improved in spring months; and reduced in July and August in most water year types.</p>	<p>No mitigation measures identified at this time to reduce flow reduction impacts on recreation opportunities.</p>

1 Note: Due to the limitations and uncertainty in the CalSim II monthly model and other
2 analytical tools, incremental differences of 5 percent or less between alternatives and the
3 No Action Alternative are considered to be “similar.”

1 **Table 15.29 Comparison of No Action Alternative and Alternatives 1 through 5 to**
 2 **Second Basis of Comparison**

Alternative	Potential Change	Consideration for Mitigation Measures
No Action Alternative	<p>Recreational resources would be similar at Trinity Lake, Shasta Lake, Lake Oroville, Folsom Lake, and New Melones Reservoir in all water year types; and at San Luis Reservoir in above normal, below normal, and dry years. Recreational resources would be reduced by 6 percent in wet and critical dry years at San Luis Reservoir, by 10 to 18 percent in the San Francisco Bay Area Region, and by 18 percent in the Central Coast and Southern California regions.</p> <p>Recreational opportunities would be similar or improved on Trinity River. On the Sacramento River downstream of Keswick Dam and near Freeport, Feather River downstream of Thermalito Complex, American River downstream of Nimbus Dam, and the Stanislaus River downstream of Goodwin Dam recreational opportunities would be similar or improved in most spring and summer months; and reduced in June in most years, August in some years on the Feather and American rivers, and in May in some years on Sacramento River near Freeport and on the Feather River.</p>	Not considered for this comparison.
Alternative 1	No effects on recreational resources.	Not considered for this comparison.
Alternative 2	Same effects as described for No Action Alternative as compared to the Second Basis of Comparison.	Not considered for this comparison.
Alternative 3	<p>Recreational resources would be similar at Trinity Lake, Shasta Lake, Lake Oroville, Folsom Lake, San Luis Reservoir, and other reservoirs that store CVP and SWP water in the San Francisco Bay Area, Central Coast, and Southern California regions.</p> <p>Recreational opportunities would be similar or improved on Trinity River, Sacramento River downstream of Keswick Dam and near Freeport, and American River downstream of Nimbus Dam. On the Feather River downstream of Thermalito Complex, recreational opportunities would be similar or improved in most spring and summer months; and reduced in August in dry years. On the Stanislaus River downstream of Goodwin Dam recreational opportunities would be similar or improved in summer months; and reduced in May and June in all water year types.</p> <p>Recreational opportunities related to Striped Bass fishing and sport ocean salmon fishing would be reduced.</p>	Not considered for this comparison.
Alternative 4	<p>Reservoir and flow-related recreational opportunities would be similar.</p> <p>Recreational opportunities related to Striped Bass fishing and sport ocean salmon fishing would be reduced.</p>	Not considered for this comparison.

Alternative	Potential Change	Consideration for Mitigation Measures
Alternative 5	<p>Recreational resources would be similar at Trinity Lake, Shasta Lake, Lake Oroville, Folsom Lake, and New Melones Reservoir in all water year types; and at San Luis Reservoir in above normal, below normal, and dry years. Recreational resources would be reduced by 6 percent in dry years and 9 percent in critical dry years at San Luis Reservoir, by 10 to 18 percent in the San Francisco Bay Area Region, and by 18 percent in the Central Coast and Southern California regions.</p> <p>Recreational opportunities would be similar or improved on Trinity River. On the Sacramento River downstream of Keswick Dam and near Freeport, Feather River downstream of Thermalito Complex, American River downstream of Nimbus Dam, and the Stanislaus River downstream of Goodwin Dam recreational opportunities would be similar or improved in many spring and summer months. Flows would reduce in May and June in most years on the Sacramento and Feather rivers; in August on the American River; and in June through August on the Stanislaus River.</p>	Not considered for this comparison.

1 Note: Due to the limitations and uncertainty in the CalSim II monthly model and other
 2 analytical tools, incremental differences of 5 percent or less between alternatives and the
 3 No Action Alternative are considered to be “similar.”

4 **15.4.3.8 Potential Mitigation Measures**

5 Mitigation measures are not included in this EIS to address adverse impacts under
 6 the alternatives as compared to the Second Basis of Comparison because this
 7 analysis was included in this EIS for information purposes only.

8 Changes in CVP and SWP operations under Alternatives 1 through 5 as compared
 9 to the No Action Alternative would not result in adverse changes in recreational
 10 resources at reservoirs. However, implementation of Alternatives 1, 3, 4, and 5
 11 would result in adverse changes in recreational opportunities along rivers
 12 downstream of CVP and SWP reservoirs. Implementation of Alternatives 3 and 4
 13 would result in adverse changes in recreational Striped Bass and sport ocean
 14 salmon fishing opportunities. Mitigation measures have not been identified at this
 15 time.

16 **15.4.3.9 Cumulative Effects Analysis**

17 As described in Chapter 3, the cumulative effects analysis considers projects,
 18 programs, and policies that are not speculative; and are based upon known or
 19 reasonably foreseeable long-range plans, regulations, operating agreements, or
 20 other information that establishes them as reasonably foreseeable.

21 The cumulative effects analysis for Alternatives 1 through 5 for Recreational
 22 Opportunities are summarized in Table 15.30.

1 **Table 15.30 Summary of Cumulative Effects on Recreational Opportunities with**
 2 **Implementation of Alternatives 1 through 5 as Compared to the No Action**
 3 **Alternative**

Scenarios	Actions	Cumulative Effects of Actions
<p>Past & Present, and Future Actions Included and in the No Action Alternative and in All Alternatives in Year 2030</p>	<p>Consistent with Affected Environment conditions plus:</p> <p>Actions in the 2008 USFWS BO and 2009 NMFS BO that would have occurred without implementation of the BOs, as described in Section 3.3.1.2 (of Chapter 3, Descriptions of Alternatives), including climate change and sea level rise</p> <p>Actions not included in the 2008 USFWS BO and 2009 NMFS BO that would have occurred without implementation of the BOs, as described in Section 3.3.1.3 (of Chapter 3, Descriptions of Alternatives):</p> <ul style="list-style-type: none"> - Implementation of Federal and state policies and programs, including Clean Water Act (e.g., Total Maximum Daily Loads); Safe Drinking Water Act; Clean Air Act; and flood management programs - General plans for 2030. - Trinity River Restoration Program. - Central Valley Project Improvement Act programs - Folsom Dam Water Control Manual Update - FERC Relicensing for the Middle Fork of the American River Project - San Joaquin River Restoration Program - Contra Loma Recreation Resource Management Plan - San Luis Reservoir State Recreation Area Resource Management Plan/General Plan 	<p><u>These effects would be the same under all alternatives.</u></p> <p>Climate change and sea level rise and development under the general plans are anticipated to reduce carryover storage in reservoirs and changes in stream flow patterns in a manner that would change recreational opportunities, and could reduce the opportunities for sport ocean salmon fishing.</p> <p>Other actions, including restoration projects, FERC relicensing projects, and some future projects to improve water quality and/or habitat are anticipated to improve recreational opportunities.</p>
<p>Future Actions Considered as Cumulative Effects Actions in All Alternatives in Year 2030</p>	<p>Actions as described in Section 3.5 (of Chapter 3, Descriptions of Alternatives):</p> <ul style="list-style-type: none"> - Bay-Delta Water Quality Control Plan Update - FERC Relicensing Projects - Bay Delta Conservation Plan (including the California WaterFix alternative) - Shasta Lake Water Resources, North-of-the-Delta Offstream Storage, Los Vaqueros Reservoir Expansion Phase 2, and Upper San Joaquin River Basin Storage Investigations - El Dorado Water and Power Authority Supplemental Water Rights Project - Semitropic Water Storage District Delta Wetlands - North Bay Aqueduct Alternative Intake - Irrigated Lands Regulatory Program 	<p><u>These effects would be the same under all alternatives.</u></p> <p>Some of the future reasonably foreseeable actions to improve water quality and FERC Relicensing projects would improve recreational opportunities.</p> <p>Other future reasonably foreseeable actions, such as expanded or new reservoirs would improve recreational opportunities.</p>
<p>No Action Alternative with Associated Cumulative Effects Actions in Year 2030</p>	<p>Full implementation of the 2008 USFWS BO and 2009 NMFS BO</p>	<p>Implementation of No Action Alternative with future reasonably foreseeable actions would result in changes stream flows would result in changes to related recreational opportunities as compared to historical conditions prior to the BOs.</p>

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Scenarios	Actions	Cumulative Effects of Actions
Alternative 1 with Associated Cumulative Effects Actions in Year 2030	No implementation of the 2008 USFWS BO and 2009 NMFS BO actions unless the actions would have been implemented without the BO (e.g., Red Bluff Pumping Plant)	Implementation of Alternative 1 with future reasonably foreseeable actions would result in reduced stream flows and related recreational opportunities along the Sacramento River near Freeport, Feather River downstream of Thermalito Complex, American River downstream of Nimbus Dam, and the Stanislaus River downstream of Goodwin Dam in July in all years and August in wetter years compared to the No Action Alternative with the added actions.
Alternative 2 with Associated Cumulative Effects Actions in Year 2030	Full implementation of the 2008 USFWS BO and 2009 NMFS BO CVP and SWP operational actions No implementation of structural improvements or other actions that require further study to develop a more detailed action description.	Implementation of Alternative 2 with future reasonably foreseeable actions for recreational opportunities would be the same as for the No Action Alternative with the added actions.
Alternative 3 with Associated Cumulative Effects Actions in Year 2030	No implementation of the 2008 USFWS BO and 2009 NMFS BO actions unless the actions would have been implemented without the BO (e.g., Red Bluff Pumping Plant) Slight increase in positive Old and Middle River flows in the winter and spring months Increased bag limits for Striped Bass and Pikeminnow Increased sport ocean salmon fishing harvest limitations	Implementation of Alternative 3 with future reasonably foreseeable actions would result in reduced stream flows and related recreational opportunities along the Sacramento River near Freeport, Feather River downstream of Thermalito Complex would be reduced in August in all years on both rivers and in July on the Feather River in dry years. On the Stanislaus River downstream of Goodwin Dam recreational opportunities would be reduced in May and June in all water year types compared to the No Action Alternative with the added actions. Recreational opportunities related to Striped Bass fishing would initially be increased; however by 2030 recreational fishing related to Striped Bass would be reduced. Recreational opportunities related to sport ocean salmon fishing would be reduced.
Alternative 4 with Associated Cumulative Effects Actions in Year 2030	No implementation of the 2008 USFWS BO and 2009 NMFS BO actions unless the actions would have been implemented without the BO (e.g., Red Bluff Pumping Plant) Increased bag limits for Striped Bass and Pikeminnow Increased sport ocean salmon fishing harvest limitations	Implementation of Alternative 4 with future reasonably foreseeable actions would result in reduced stream flows and related recreational opportunities along the Sacramento River near Freeport, Feather River downstream of Thermalito Complex, American River downstream of Nimbus Dam, and the Stanislaus River downstream of Goodwin Dam in July in all years and August in wetter years compared to the No Action Alternative with the added actions. Recreational opportunities related to Striped Bass fishing would initially be increased; however by 2030 recreational fishing related to Striped Bass would be reduced. Recreational opportunities related to sport ocean salmon fishing would be reduced.

Scenarios	Actions	Cumulative Effects of Actions
Alternative 5 with Associated Cumulative Effects Actions in Year 20530	Full implementation of the 2008 USFWS BO and 2009 NMFS BO Positive Old and Middle River flows and increased Delta outflow in spring months	Implementation of Alternative 5 with future reasonably foreseeable actions would result in reduced stream flows and related recreational opportunities along the Feather River downstream of Thermalito Complex would be reduced in May in all years compared to the No Action Alternative with the added actions. On the Stanislaus River downstream of Goodwin Dam recreational opportunities would be reduced in July and August in most water year types compared to the No Action Alternative with the added actions.

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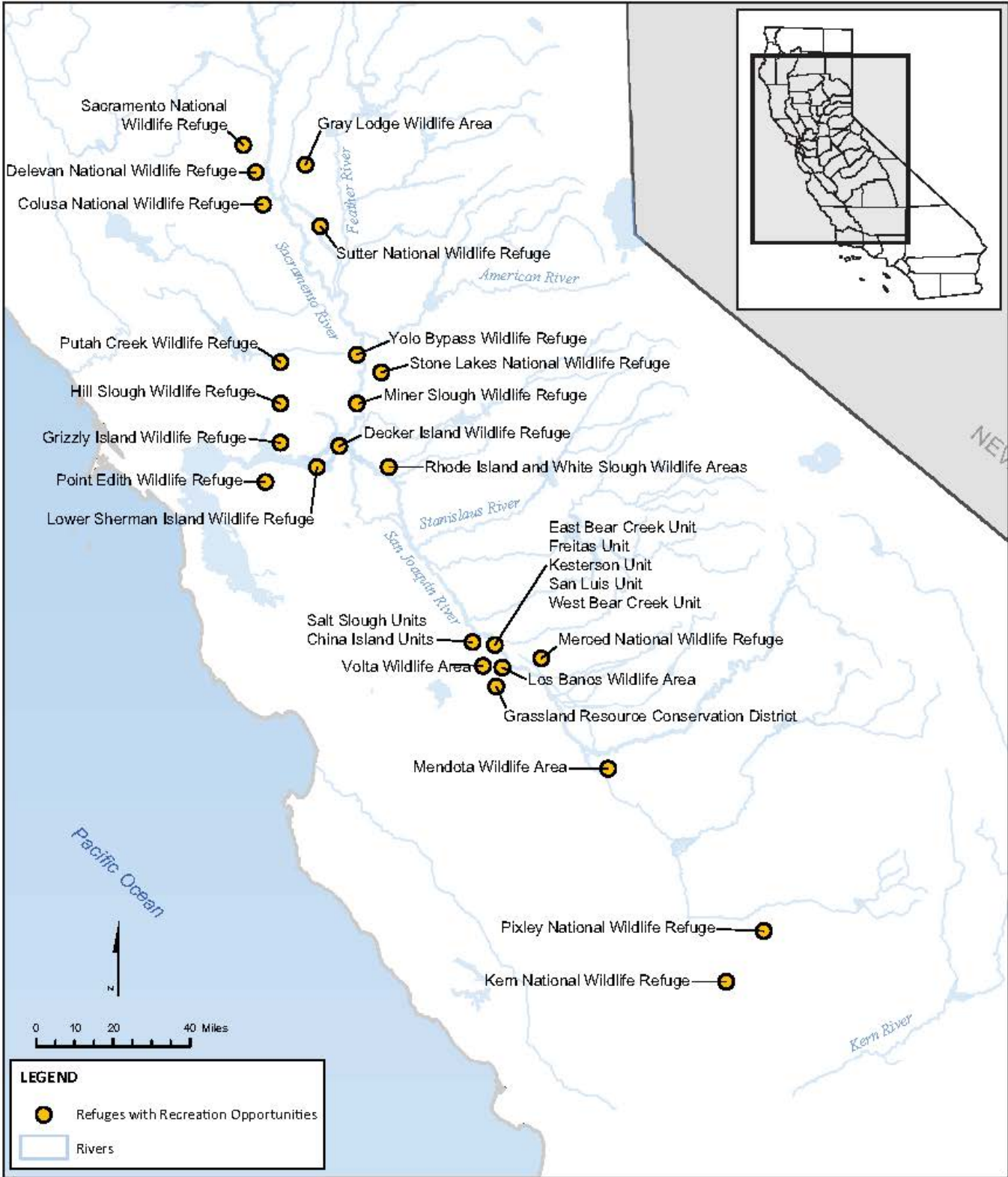


Figure 15.1 Wildlife Refuges Identified to Receive Central Valley Project Water Supplies

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Chapter 16

1 Air Quality and Greenhouse Gas 2 Emissions

3 16.1 Introduction

4 This chapter describes existing and future air quality conditions and the potential
5 for greenhouse gas emissions that could occur as a result of implementing the
6 alternatives that could change the long-term operation of the Central Valley
7 Project (CVP) and State Water Project (SWP) as evaluated in this Environmental
8 Impact Statement (EIS). Implementation of the alternatives could affect CVP and
9 SWP water deliveries which could indirectly affect air quality.

10 16.2 Terminology

11 Important air quality and greenhouse gas emission terminology used in this
12 chapter are defined by the U.S. Environmental Protection Agency (USEPA) and
13 the California Air Resources Board (ARB), as summarized below.

- 14 • **Attainment Area:** A geographic area considered to have air quality as good
15 as or better than the national and/or state ambient air quality standards. An
16 area may be an attainment area for one pollutant and a non-attainment area for
17 others (USEPA 2006).
- 18 • **California Ambient Air Quality Standard (CAAQS):** A legal limit that
19 specifies the maximum level and time of exposure in the outdoor air for a
20 given air pollutant and which is protective of human health and public welfare
21 (California Health and Safety Code section 39606b). CAAQS are
22 recommended by the California Office of Environmental Health Hazard
23 Assessment and adopted into regulation by the ARB. CAAQS are the
24 standards which must be met per the requirements of the California Clean Air
25 Act (ARB 2010).
- 26 • **Criteria Pollutant:** An air pollutant for which acceptable levels of exposure
27 can be determined and for which an ambient air quality standard has been set
28 (ARB 2010). The criteria pollutants are ozone (O₃), carbon monoxide (CO),
29 nitrogen oxides (NO_x), sulfur dioxide (SO₂), particulate matter less than
30 10 microns in aerodynamic diameter (PM₁₀), particulate matter less than
31 2.5 microns in aerodynamic diameter (PM_{2.5}), and lead (Pb).
- 32 • **Greenhouse Gases (GHGs):** Atmospheric gases (such as carbon dioxide
33 (CO₂), methane (CH₄), hydrofluorocarbons (HFC), nitrous oxide (N₂O), O₃,
34 perfluorocarbons (PFC), sulfur hexafluoride (SF₆), and water vapor) that slow
35 the passage of re-radiated heat through the Earth's atmosphere (ARB 2010).

- 1 Six of the GHGs are the subject of reductions under the Kyoto Protocol and
2 California Assembly Bill 32 are CO₂, CH₄, N₂O, HFC, PFC, and SF₆.
- 3 • **National Ambient Air Quality Standard (NAAQS):** Standards established
4 by USEPA that apply for outdoor air throughout the United States (USEPA
5 2006).
 - 6 • **Nonattainment Area:** A geographic area identified by the USEPA and/or
7 ARB as not meeting either NAAQS or CAAQS for a given pollutant
8 (ARB 2010).
 - 9 • **Precursor:** In photochemistry, a compound antecedent to a pollutant. For
10 example, volatile organic compounds (VOC) and NO_x react in sunlight to
11 form the criteria pollutant ozone. As such, VOCs and NO_x are precursors to
12 O₃ (USEPA 2006).
 - 13 • **Reactive Organic Gas (ROG):** A photochemically reactive chemical gas
14 composed of non-methane hydrocarbons (HCs) that may contribute to the
15 formation of smog (ARB 2010). ROG may also be referred to as non-
16 methane organic gases, VOCs, or HCs.
 - 17 • **State Implementation Plan (SIP):** A plan prepared by states and submitted
18 to USEPA describing how each area will attain and maintain NAAQS. SIPs
19 include the technical foundation for understanding the air quality (e.g.,
20 emission inventories and air quality monitoring), control measures and
21 strategies, and enforcement mechanisms (ARB 2010).
 - 22 • **Toxic Air Contaminant (TAC):** An air pollutant, identified in regulation by
23 the ARB, which may cause or contribute to an increase in deaths or in serious
24 illness, or which may pose a present or potential hazard to human health.
25 Health effects of TACs may occur at extremely low levels and it is typically
26 difficult to identify levels of exposure that do not produce adverse health
27 effects (ARB 2010).
- 28 In California, local air districts have been established to oversee the attainment of
29 air quality standards within air basins as defined by the State. Local air districts
30 administer air quality laws and regulations within the air basins. The local air
31 districts have permitting authority over all stationary sources of air pollutants
32 within their district boundaries and provide the primary review of environmental
33 documents prepared for projects with air quality issues.

34 **16.3 Regulatory Environment and Compliance** 35 **Requirements**

36 Potential actions that could be implemented under the alternatives evaluated in
37 this EIS could affect future air quality conditions and the potential for GHG
38 emissions. Implementation of the alternatives could affect CVP and SWP water
39 deliveries which could affect air quality related to agricultural operations and
40 fugitive dust generation. Changes in air quality and GHG emissions are analyzed

1 in this EIS relative to appropriate Federal and state agency policies and
2 regulations, as described in Chapter 4, Approach to Environmental Analyses.

3 Several of the Federal and state laws and regulations that provide quantitative
4 criteria to determine compliance also are summarized in this subsection of this
5 chapter to provide context for information provided in the remaining sections of
6 this chapter, including:

- 7 • Federal Clean Air Act
 - 8 – National Ambient Air Quality Standards and Federal Air Quality
 - 9 Designations
 - 10 – Federal General Conformity Requirements
- 11 • California Clean Air Act
- 12 • California Assembly Bill 32, California Global Warming Solutions Act
- 13 of 2006

14 **16.3.1 Federal Clean Air Act**

15 National air quality policies are regulated through the Federal Clean Air Act
16 (FCAA) of 1970 and its 1977 and 1990 amendments. Basic elements of the
17 FCCA include NAAQS for criteria air pollutants, hazardous air pollutants
18 standards, state attainment plans, motor vehicle emissions standards, stationary
19 source emissions standards and permits, acid rain control measures, stratospheric
20 ozone protection, and enforcement provisions.

21 **16.3.1.1 National Ambient Air Quality Standards and Federal Air Quality** 22 **Designations**

23 Pursuant to the FCAA, the USEPA established NAAQS for O₃, CO, NO₂, sulfur
24 dioxide (SO_x as SO₂), PM₁₀, PM_{2.5}, and lead. These pollutants are referred to as
25 criteria pollutants because numerical health-based criteria have been established
26 that define acceptable levels of exposure for each pollutant. The NAAQS and the
27 CAAQS are summarized in Table 16.1 (ARB 2013).

1

Table 16.1 Federal and State Ambient Air Quality Standards

Pollutant	Averaging Time	National Standards ^a Primary ^{b, i}	National Standards ^a Secondary ^{c, i}	California Standards ^d
Ozone	8 Hour 1 Hour	0.075 ppm –	0.075 ppm –	0.07 ppm 0.09 ppm
Carbon monoxide	8 Hour 1 Hour	9 ppm 35 ppm	– –	9.0 ppm 20 ppm
Nitrogen dioxide ^j	Annual Arithmetic Mean 1 Hour	0.053 ppm 100 ppb	0.053 ppm –	0.30 ppm 0.18 ppm
Sulfur dioxide ^e	Annual Arithmetic Mean 24 Hour 3 Hour 1 Hour	0.030 ppm 0.14 ppm – 75 ppb	– – 0.5 ppm –	– 0.04 ppm – 0.25 ppm
PM ₁₀ ^f	Annual Arithmetic Mean 24 Hour	– 150 µg/m ³	– 150 µg/m ³	20 µg/m ³ 50 µg/m ³
PM _{2.5} ^f	Annual Arithmetic Mean 24 Hour	12 µg/m ³ 35 µg/m ³	15 µg/m ³ 35 µg/m ³	12 µg/m ³ –
Sulfates	24 Hour	–	–	25 µg/m ³
Lead ^{g, k}	30 Day Average Calendar Quarter Rolling 3-Month Average	– 1.5 µg/m ³ 0.15 µg/m ³	– 1.5 µg/m ³ 0.15 µg/m ³	1.5 µg/m ³ – –
Hydrogen sulfide	1 Hour	–	–	0.03 ppm
Vinyl chloride	24 Hour	–	–	0.01 ppm
Visibility-reducing particles	8 Hour	–	–	See Note ^h

2 Source: ARB 2012, ARB 2013b.

3 Notes:

4 a. National standards, other than ozone, particulate matter, and those based on annual
5 averages or annual arithmetic means, are not to be exceeded more than once a year.
6 The ozone standard is attained when the fourth highest eight hour concentration in a
7 year, averaged over three years, is equal to or less than the standard. For PM₁₀, the
8 24-hour standard is attained when the expected number of days per calendar year with a
9 24-hour average concentration above 150 µg/m³ is equal to or less than one. For PM_{2.5},
10 the 24-hour standard is attained when 98 percent of the daily concentrations, averaged
11 over 3 years, are equal to or less than the standard.

12 b. National Primary Standards: The levels of air quality necessary, with an adequate
13 margin of safety, to protect the public health.

- 1 c. National Secondary Standards: The levels of air quality necessary to protect the public
 2 welfare from any known or anticipated adverse effects of a pollutant.
- 3 d. California standards for ozone, carbon monoxide, sulfur dioxide (1-hour and 24-hour),
 4 nitrogen dioxide, suspended particulate matter (PM₁₀, PM_{2.5}, and visibility reducing
 5 particles), are values that are not to be exceeded. All others are not to be equaled or
 6 exceeded. All others are not to be equaled or exceeded. California ambient air quality
 7 standards are listed in the Table of Standards in Section 70200 of Title 17 of the
 8 California Code of Regulations.
- 9 e. On June 2, 2010, a new 1-hour SO₂ standard was established and the existing 24-hour
 10 and annual primary standards were revoked. To attain the 1-hour national standard, the
 11 3-year average of the annual 99th percentile of the 1-hour daily maximum concentrations
 12 at each site must not exceed 75 ppb. The 1971 SO₂ national standards (24-hour and
 13 annual) remain in effect until one year after an area is designated for the 2010 standard,
 14 except for areas designated nonattainment for the 1971 standards, where the 1971
 15 standards remain in effect until implementation plans to attain or maintain the 2010
 16 standards are approved.
- 17 f. On December 14, 2012, the national annual PM_{2.5} primary standard was lowered from
 18 15 µg/m³ to 12.0 µg/m³. The existing national 24-hour PM_{2.5} standards (primary and
 19 secondary) were retained at 35 µg/m³, as was the annual secondary standard of
 20 15 µg/m³. The existing 24-hour PM₁₀ standards (primary and secondary) of 150 µg/m³
 21 also were retained. The form of the annual primary and secondary standards is the
 22 annual mean, averaged over 3 years.
- 23 g. The national standard for lead was revised on October 15, 2008, to a rolling 3-month
 24 average. The 1978 lead standard (1.5 µg/m³ as a quarterly average) remains in effect
 25 until one year after an area is designated for the 2008 standard, except for areas
 26 designated nonattainment for the 1978 standard, where the 1978 standard remains in
 27 effect until implementation plans to attain or maintain the 2008 standard are approved.
- 28 h. In 1989, the ARB converted both the general statewide 10-mile visibility standard and
 29 the Lake Tahoe 30-mile visibility standard to instrumental equivalents, which are
 30 “extinction of 0.23 per kilometer” and “extinction of 0.07 per kilometer” for the statewide
 31 and Lake Tahoe Air Basin standards, respectively.
- 32 i. Concentration expressed first in units in which it was promulgated. Equivalent units
 33 given in parentheses are based upon a reference temperature of 25°C and a reference
 34 pressure of 760 torr. Most measurements of air quality are to be corrected to a reference
 35 temperature of 25°C and a reference pressure of 760 torr; ppm in this table refers to ppm
 36 by volume, or micromoles of pollutant per mole of gas.
- 37 j. To attain the 1-hour national standard, the 3-year average of the annual 98th percentile
 38 of the 1-hour daily maximum concentrations at each site must not exceed 100 ppb. Note
 39 that the national 1-hour standard is in units of parts per billion (ppb). California standards
 40 are in units of parts per million (ppm). To directly compare the national 1-hour standard
 41 to the California standards the units can be converted from ppb to ppm. In this case, the
 42 national standard of 100 ppb is identical to 0.100 ppm.
- 43 k. The ARB has identified lead and vinyl chloride as 'toxic air contaminants' with no
 44 threshold level of exposure for adverse health effects determined. These actions allow
 45 for the implementation of control measures at levels below the ambient concentrations
 46 specified for these pollutants.
- 47 µg/m³ = micrograms per cubic meter.
 48 ppb = parts per billion (by volume).
 49 ppm = parts per million (by volume).

1 The USEPA designates areas as attainment, nonattainment, or unclassified for
2 individual criteria pollutants depending on whether the areas achieve (i.e., attain)
3 the applicable NAAQS for each pollutant. For some pollutants, there are
4 numerous classifications of the nonattainment designation, depending on the
5 severity of an area's nonattainment status. Areas that lack monitoring data are
6 designated as unclassified areas, and considered as attainment areas for regulatory
7 purposes.

8 Under the 1977 FCAA amendments, states (or areas within states) with ambient
9 air quality concentrations that do not meet the NAAQS are required to develop
10 and maintain SIPs. These implementation plans constitute a federally enforceable
11 definition of the state's approach and schedule for the attainment of the NAAQS.
12 If a nonattainment area achieves compliance, the area is classified as an
13 attainment maintenance area for 20 years.

14 **16.3.1.2 Federal General Conformity Requirements**

15 The 1977 FCAA amendments state that the Federal government is prohibited
16 from engaging in, supporting, providing financial assistance for, licensing,
17 permitting, or approving any activity that does not conform to an applicable SIP.
18 In the 1990 FCAA amendments, the USEPA included provisions requiring
19 Federal agencies to ensure that actions undertaken in nonattainment or attainment
20 maintenance areas are consistent with applicable SIPs. The process of
21 determining whether a Federal action is consistent with applicable SIPs is called
22 "conformity" determination. A conformity determination is required only for the
23 project alternative that is ultimately selected and approved. The USEPA general
24 conformity regulation applies only to Federal actions that result in emissions of
25 "nonattainment or maintenance pollutants" or their precursors in federally
26 designated nonattainment or maintenance areas. The emission thresholds that
27 trigger requirements of the general conformity regulation for Federal actions
28 emitting nonattainment or maintenance pollutants, or their precursors, are called
29 *de Minimis* levels, as summarized in Table 16.2.

1 **Table 16.2 General Conformity *de Minimis* Levels**

Pollutant	Area Type	Tons/Year
Ozone (VOC or NOx)	Serious nonattainment	50
	Severe nonattainment	25
	Extreme nonattainment	10
	Other areas outside an ozone transport region	100
Ozone (NOx)	Marginal and moderate nonattainment inside an ozone transport region	100
	Maintenance	100
Ozone (VOC)	Marginal and moderate nonattainment inside an ozone transport region	50
	Maintenance within an ozone transport region	50
	Maintenance outside an ozone transport region	100
Carbon monoxide, SO ₂ and NO ₂	All nonattainment and maintenance	100
PM ₁₀	Serious nonattainment	70
	Moderate nonattainment and maintenance	100
PM _{2.5} Direct emissions, SO ₂ , NOx (unless determined not to be a significant precursor), VOC or ammonia (if determined to be significant precursors)	All nonattainment and maintenance	100
Lead (Pb)	All nonattainment and maintenance	25

2 Source: USEPA 2015b

3 **16.3.1.3 California Clean Air Act**

4 The California Clean Air Act (CCAA) provides the State with a comprehensive
 5 framework for air quality planning regulation. Prior to passage of the CCAA,
 6 Federal law contained the only comprehensive planning framework. The CCAA
 7 requires attainment of state ambient air quality standards by the earliest
 8 practicable date.

9 The FCAA requires adoption of SIPs for nonattainment areas to describe actions
 10 that will be undertaken to achieve the NAAQS. In addition, the CCAA requires
 11 local air districts in nonattainment areas to prepare and maintain Air Quality
 12 Management Plans (AQMPs) to achieve compliance with CAAQS. These
 13 AQMPs also serve as a basis for preparing the SIP for the State of California,

1 which must ultimately be approved by the USEPA and codified in the Code of
2 Federal Register (CFR).

3 **16.4 Affected Environment**

4 This section describes the area of analysis, ambient air quality and conditions, and
5 GHG emissions in the study area.

6 The air basins and air districts in California, including those in the study area, do
7 not specifically align with the study area regions, as noted below and in the
8 description of each air basin (ARB 2011a; ARB 2011b).

9 The discussion in this chapter area is organized by the study area regions and air
10 basins. The study area regions include the following air basins and counties.

- 11 • Trinity River Region is located within portions of the North Coast Air Basin.
 - 12 – The Trinity River Region includes the area in Trinity County along the
 - 13 Trinity River from Trinity Lake to the confluence with the Klamath River;
 - 14 and the area in Humboldt and Del Norte counties along the Klamath River
 - 15 from the confluence with the Trinity River to the Pacific Ocean.
- 16 • Central Valley Region is located within portions of the Sacramento Valley,
17 Mountain Counties, San Joaquin Valley, San Francisco Bay Area, Mojave
18 Desert air basins.
 - 19 – The Central Valley Region includes all or portions the counties of Shasta,
 - 20 Plumas, Tehama, Glenn, Colusa, Butte, Sutter, Yuba, Nevada, Placer,
 - 21 El Dorado, Sacramento, Yolo, Solano, Napa, San Joaquin, Stanislaus,
 - 22 Merced, Madera, Fresno, Kings, Tulare, and Kern that are within the CVP
 - 23 and SWP service areas.
- 24 • San Francisco Bay Area Region is located within portions of the San
25 Francisco Bay Area and North Central Coast air basins.
 - 26 – The San Francisco Bay Area Region includes portions of Contra Costa,
 - 27 Alameda, Santa Clara, and San Benito counties that are within the CVP
 - 28 and SWP service areas.
- 29 • Central Coast Region is located within portions of the South Central Coast
30 Air Basin.
 - 31 – The Central Coast Region includes portions of San Luis Obispo and Santa
 - 32 Barbara counties served by the SWP.
- 33 • Southern California Region is located within portions of the South Central
34 Coast, South Coast, San Diego, Mojave Desert, and Salton Sea air basins.
 - 35 – The Southern California Region includes portions of Ventura, Los
 - 36 Angeles, Orange, San Diego, Riverside, and San Bernardino counties
 - 37 served by the SWP.

16.4.1 Ambient Air Quality

Air quality conditions and potential impacts in the project area are evaluated and discussed qualitatively, rather than quantitatively. The following subsections briefly describe the existing air quality environmental setting by air basin for the project area. The counties within each air basin in the project area are presented in Table 16.3, along with non-attainment designations to characterize existing ambient air quality. Non-attainment designations indicate that concentrations of pollutants measured in ambient air exceed the applicable ambient air quality standards. As shown in Table 16.3, many of the counties included in the project area are designated as nonattainment for the Federal and/or State ozone and particulate matter standards. These air quality issues may be exacerbated under dry conditions because when irrigation water supplies are decreased, there is increased potential for the formation and transport of fugitive dust.

Table 16.3 Pollutants Designated as Nonattainment Pursuant to Federal and State Ambient Air Quality Standards

County	Air Basin	Air District	Federal Nonattainment Designations ^a	State Nonattainment Designations ^b
Trinity River Region				
Trinity	North Coast	North Coast Unified	–	–
Humboldt	North Coast	North Coast Unified	–	–
Del Norte	North Coast	North Coast Unified	–	–
Central Valley Region				
Shasta	Sacramento Valley	Shasta	–	Ozone, PM ₁₀
Tehama	Sacramento Valley	Tehama	Ozone (Tuscan Buttes area)	Ozone, PM ₁₀
Butte	Sacramento Valley	Butte	Ozone and PM _{2.5} in Chico	Ozone, PM ₁₀ , PM _{2.5}
Glenn	Sacramento Valley	Glenn	–	PM ₁₀
Colusa	Sacramento Valley	Colusa	–	PM ₁₀
Yuba	Sacramento Valley	Feather River	–	Ozone, PM ₁₀
Sutter	Sacramento Valley	Feather River	Ozone	Ozone, PM ₁₀
Yolo	Sacramento Valley	Yolo-Solano	Ozone, PM _{2.5}	Ozone, PM ₁₀
Sacramento	Sacramento Valley	Sacramento Metro	Ozone, PM _{2.5}	Ozone, PM ₁₀

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County	Air Basin	Air District	Federal Nonattainment Designations^a	State Nonattainment Designations^b
Plumas	Mountain Counties	Northern Sierra	–	PM ₁₀ PM _{2.5} (Portola Valley)
Placer	Sacramento Valley, Mountain Counties, Lake Tahoe	Placer	Ozone, PM _{2.5}	Ozone, PM ₁₀
El Dorado	Sacramento Valley, Mountain Counties, Lake Tahoe	El Dorado	Ozone, PM _{2.5}	Ozone, PM ₁₀
San Joaquin	San Joaquin Valley	San Joaquin Valley	Ozone, PM _{2.5}	Ozone, PM ₁₀ , PM _{2.5}
Stanislaus	San Joaquin Valley	San Joaquin Valley	Ozone, PM _{2.5}	Ozone, PM ₁₀ , PM _{2.5}
Merced	San Joaquin Valley	San Joaquin Valley	Ozone, PM _{2.5}	Ozone, PM ₁₀ , PM _{2.5}
Fresno	San Joaquin Valley	San Joaquin Valley	Ozone, PM _{2.5}	Ozone, PM ₁₀ , PM _{2.5}
Madera	San Joaquin Valley	San Joaquin Valley	Ozone, PM _{2.5}	Ozone, PM ₁₀ , PM _{2.5}
Kings	San Joaquin Valley	San Joaquin Valley	Ozone, PM _{2.5}	Ozone, PM ₁₀ , PM _{2.5}
Tulare	San Joaquin Valley	San Joaquin Valley	Ozone, PM _{2.5}	Ozone, PM ₁₀ , PM _{2.5}
Kern	San Joaquin Valley, Mojave Desert	San Joaquin Valley, Kern	Ozone, PM _{2.5} , PM ₁₀ (East Kern)	Ozone, PM ₁₀ , PM _{2.5} (San Joaquin Valley Air Basin)
San Francisco Bay Area Region				
Napa	San Francisco Bay Area	Bay Area	Ozone, PM _{2.5}	Ozone, PM ₁₀ , PM _{2.5}
Solano	Sacramento Valley, San Francisco Bay Area	Yolo-Solano and Bay Area	Ozone, PM _{2.5}	Ozone, PM ₁₀ , PM _{2.5}
Contra Costa	San Francisco Bay Area	Bay Area	Ozone, PM _{2.5}	Ozone, PM ₁₀ , PM _{2.5}
Alameda	San Francisco Bay Area	Bay Area	Ozone, PM _{2.5}	Ozone, PM ₁₀ , PM _{2.5}
Santa Clara	San Francisco Bay Area	Bay Area	Ozone, PM _{2.5}	Ozone, PM ₁₀ , PM _{2.5}

County	Air Basin	Air District	Federal Nonattainment Designations ^a	State Nonattainment Designations ^b
San Benito	North Central Coast	Monterey Bay Unified	–	Ozone, PM ₁₀
Central Coast Region				
San Luis Obispo	South Central Coast	San Luis Obispo	Ozone (Eastern San Luis Obispo)	Ozone, PM ₁₀
Santa Barbara	South Central Coast	Santa Barbara	–	Ozone, PM ₁₀
Southern California Region				
Ventura	South Central Coast	Ventura	Ozone	Ozone, PM ₁₀
Los Angeles	South Coast, Mojave Desert	South Coast, Antelope Valley	Ozone, PM _{2.5} , Lead	Ozone; PM ₁₀ ; PM _{2.5}
San Bernardino	South Coast, Mojave Desert	South Coast, Mojave Desert	Ozone, PM ₁₀ , PM _{2.5}	Ozone, PM ₁₀ , PM _{2.5}
Riverside	South Coast, Mojave Desert, Salton Sea	South Coast, Mojave Desert	Ozone, PM ₁₀ , PM _{2.5}	Ozone; PM ₁₀ ; PM _{2.5}
Orange	South Coast	South Coast	Ozone, PM _{2.5}	Ozone, PM ₁₀ , PM _{2.5}
San Diego	San Diego County	San Diego	Ozone	Ozone, PM ₁₀ , PM _{2.5}

- 1 Sources: USEPA 2014; ARB 2015
- 2 Notes:
- 3 a. Areas designated as nonattainment by U.S. Environmental Protection Agency related
- 4 to National Ambient Air Quality Standards as of January 30, 2015.
- 5 b. Areas designated as nonattainment by California Air Resources Board related to
- 6 California Ambient Air Quality Standards as of April 10, 2014. No changes to the state
- 7 area designations were proposed for 2014.

8 **16.4.1.1 North Coast Air Basin**

9 The North Coast Air Basin includes Humboldt, Del Norte, Trinity, Mendocino,
 10 and north Sonoma counties (ARB 2013a). This air basin is located within the
 11 Trinity River Region of the study area. The basin is sparsely populated, and
 12 stretches along the northern coastline through forested mountains. Prevailing
 13 winds blow clean air inland from the Pacific Ocean, and air quality is typically
 14 good. Humboldt, Del Norte, and Trinity counties are designated attainment for
 15 the federal and state air quality standards (USEPA 2015b, ARB 2014).

1 **16.4.1.2 Sacramento Valley Air Basin**

2 The Sacramento Valley Air Basin encompasses 9 air districts and 11 counties,
3 including: all of Shasta, Tehama, Glenn, Colusa, Butte, Sutter, Yuba, Sacramento,
4 and Yolo counties; the westernmost portion of Placer County; and the
5 northeastern half of Solano County. The air basin is bounded by tall mountains,
6 including the Coast Range to the west, the Cascade Range to the north, and the
7 Sierra Nevada Range to the east. This air basin is located within the northern
8 portion of the Central Valley Region of the study area.

9 Winters are wet and cool, and summers are hot and dry. When air stagnates, or is
10 trapped by an inversion layer in the valley, ambient pollutant concentrations can
11 reach or exceed threshold levels. On-road vehicles are the largest source of smog-
12 forming pollutants, and particulate matter emissions are primarily from area
13 sources, such as fugitive dust from paved and unpaved roads and vehicle travel
14 (ARB 2013a).

15 To characterize the existing ambient air quality in the Sacramento Valley Air
16 Basin, data from area monitoring stations were reviewed (ARB 2011d). For the
17 three years from 2007 to 2009, monitoring data indicated the following:

- 18 • Concentrations of O₃ and 24-hour PM_{2.5} have exceeded the NAAQS and
19 CAAQS.
- 20 • Concentrations of PM₁₀ have exceeded the CAAQS but are below the
21 NAAQS.
- 22 • Measured concentrations of CO and NO₂ have complied with the NAAQS and
23 CAAQS.
- 24 • Monitored SO₂ concentrations are extremely low, and lead concentrations are
25 monitored as part of the air toxics program.

26 In the time since ARB compiled the 2007 to 2009 air quality monitoring data
27 reported above, Glenn and Colusa counties have been redesignated as attainment
28 for the California ozone standards (ARB 2014). In addition, Sacramento County
29 has been redesignated as attainment for the California PM_{2.5} standards (ARB
30 2014). No other changes in air quality nonattainment designations have been
31 recorded (USEPA 2014; ARB 2014).

32 **16.4.1.3 Mountain Counties Air Basin**

33 The Mountain Counties Air Basin includes the mountainous areas of the central
34 and northern Sierra Nevada Mountains, from Plumas County south to Mariposa
35 County, including Plumas, Sierra, Nevada, Central Placer, West El Dorado,
36 Amador, Calaveras, Tuolumne, and Mariposa counties (ARB 2013a). This air
37 basin includes portions of the central-eastern Central Valley Region of the study
38 area; as well as areas located to the east of the study area.

39 Sparsely populated, motor vehicles are the primary source of emissions in the air
40 basin. Air quality issues often result when eastward surface winds transport
41 pollution from more populated air basins to the west and south. Wood smoke
42 from stoves and fireplaces contribute to elevated ambient PM₁₀ concentrations

1 during winter. Nevada, Placer, El Dorado, Amador, Calaveras, Tuolumne, and
 2 Mariposa counties are designated as nonattainment for the Federal and State
 3 ozone standards (ARB 2014). Plumas, Sierra, Nevada, Placer, El Dorado, and
 4 Calaveras counties are designated as nonattainment for the State PM₁₀ standards
 5 (ARB 2014).

6 **16.4.1.4 San Joaquin Valley Air Basin**

7 The San Joaquin Valley Air Basin encompasses eight counties, including: all of
 8 San Joaquin, Stanislaus, Madera, Merced, Fresno, Kings, Tulare counties; and
 9 western Kern County. It is bounded on the west by the Coast Range, on the east
 10 by the Sierra Nevada, and in the south by the Tehachapi Mountains. This air
 11 basin is located within the central and southern portions of the Central Valley
 12 Region of the study area.

13 Winters are cool and wet and summers are dry and very hot. The area is heavily
 14 agricultural, and hosts other localized industries such as forest products, oil and
 15 gas production, and oil refining. On-road vehicles are the largest source of smog-
 16 forming pollutants, and PM₁₀ emissions are primarily from sources such as
 17 agricultural operations and fugitive dust from paved and unpaved roads and
 18 vehicle travel (ARB 2013a). Air quality issues may be exacerbated under dry
 19 conditions. When water supplies and irrigation levels are decreased in urban,
 20 rural, and agricultural areas, there is increased potential for the formation and
 21 transport of fugitive dust.

22 To characterize the existing ambient air quality for the San Joaquin Valley Air
 23 Basin, data from area monitoring stations were reviewed (ARB 2011d). For the
 24 three years from 2007 to 2009, monitoring data indicated the following:

- 25 • Concentrations of O₃ and 24-hour PM_{2.5} have exceeded the NAAQS and
 26 CAAQS.
- 27 • Concentrations of PM₁₀ have exceeded the CAAQS but are below the
 28 NAAQS.
- 29 • Measured concentrations of CO and NO₂ have complied with the NAAQS and
 30 CAAQS.
- 31 • Monitored SO₂ concentrations are extremely low, and lead concentrations are
 32 monitored as part of the air toxics program.

33 In the time since ARB compiled the 2007 to 2009 air quality monitoring data
 34 reported above, no changes in air quality nonattainment designations have been
 35 recorded in the San Joaquin Valley Region counties in this study (USEPA 2015;
 36 ARB 2014).

37 **16.4.1.4.1 Dust and Particulate Matter in San Joaquin Valley**

38 The San Joaquin Valley Air Pollution Control District (SJVAPCD) is the local
 39 regulatory agency with jurisdiction over air quality issues in the San Joaquin
 40 Valley area. In response to the area's historical air quality problems with dust and
 41 particulate matter, the SJVAPCD was the first agency in the state to regulate

1 emissions from on-field agricultural operations. In 2004, the agency adopted
2 Rule 4550, the Conservation Management Practices rule, and Rule 3190, the
3 Conservation Management Practices Fee rule. To comply with these rules,
4 farmers with 100 acres or more of contiguous land must prepare and implement
5 biennial Conservation Management Plans to reduce dust and particulate matter
6 emissions from on-farm sources, such as unpaved roads and equipment yards,
7 land preparation, harvest activities, and other farming activities. A handbook
8 titled “Agricultural Air Quality Conservation Management Practices for San
9 Joaquin Valley Farms” was published by the agriculture industry in 2004 to
10 provide guidance to farmers on Conservation Management Practices (SJVAPCD
11 2004a, 2004b). Examples of Conservation Management Practices include
12 activities that reduce or eliminate the need for soil disturbance, activities that
13 protect soil from wind, dust suppressants, alternatives to burning agricultural
14 wastes, and reduced travel speeds on unpaved roads and equipment yards. Lands
15 not currently under cultivation or used for pasture are exempt from Rule 4550,
16 other than recordkeeping to document the exemption. Fees vary depending on the
17 size of the farm, and include an initial application fee, and a biennial renewal fee.

18 In addition to requirements for on-field agricultural practices, the SJVAPCD rules
19 and regulations address avoidance of nuisance conditions (Rule 4102),
20 prohibitions on opening burning (Rule 4103), and fugitive-dust control
21 (Regulation VIII). Specifically, the SJVAPCD dust-control rules include
22 Rule 8021 for control of PM₁₀ from construction, demolition, excavation,
23 extraction, and other earth moving activities; Rule 8031 for control of PM₁₀ from
24 handling and storage of bulk materials; Rule 8051 for control of PM₁₀ from
25 disturbed open areas; Rule 8061 for control of PM₁₀ from travel on paved and
26 unpaved roads; Rule 8071 for control of PM₁₀ from unpaved vehicle and
27 equipment traffic areas; and Rule 8081 for off-field agricultural sources, such as
28 bulk materials handling and transport and travel on unpaved roads. Each of these
29 rules requires fugitive dust control, often through application of water, gravel, or
30 chemical dust stabilizers.

31 **16.4.1.5 San Francisco Bay Area Air Basin**

32 The San Francisco Bay Area Air Basin consists of a single air district and nine
33 counties, including: all of Napa, Marin, San Francisco, Contra Costa, Alameda,
34 San Mateo, and Santa Clara counties; the southern portion of Sonoma County;
35 and the southwestern portion of Solano County (ARB 2013a). The hills of the
36 Coast Range bound the San Francisco and San Pablo bays and the inland valleys
37 of the air basin. This air basin includes the San Francisco Bay Area Region of the
38 study area.

39 The San Francisco Bay Area Air Basin includes the second largest urban area in
40 California, hosting industry, airports, international ports, freeways, and surface
41 streets. On-road vehicles are the largest source of smog-forming pollutants, and
42 PM₁₀ emissions are primarily from area sources, such as fugitive dust from paved
43 and unpaved roads and vehicle travel (ARB 2013a). Air quality in the San
44 Francisco Bay Area is often good as sea breezes blow clean air from the Pacific
45 Ocean into the air basin, but transport of pollutants from the San Francisco Bay

1 Area can exacerbate air quality problems in the downwind portions of the
 2 San Francisco Bay Area Air Basin; as well as in the Sacramento Valley and San
 3 Joaquin Valley air basins.

4 To characterize the existing ambient air quality for the San Francisco Bay Area
 5 Air Basin, data from area monitoring stations were reviewed (ARB 2011d). For
 6 the three years from 2007 to 2009, monitoring data indicated the following:

- 7 • Concentrations of O₃ and 24-hour PM_{2.5} have exceeded the NAAQS and
 8 CAAQS.
- 9 • Concentrations of PM₁₀ exceeded the CAAQS in 2008 but were below the
 10 CAAQS in 2007 and 2009. Concentrations of PM₁₀ were below the NAAQS.
- 11 • Measured concentrations of CO and NO₂ have complied with the NAAQS and
 12 CAAQS.
- 13 • Monitored SO₂ concentrations are extremely low, and lead concentrations are
 14 monitored as part of the air toxics program.

15 In the time since ARB compiled the 2007 to 2009 air quality monitoring data
 16 reported above, no changes in air quality nonattainment designations have been
 17 recorded in the San Francisco Bay Region counties in this study (USEPA 2015;
 18 ARB 2014).

19 **16.4.1.6 North Central Coast Air Basin**

20 The North Central Coast Air Basin includes Santa Cruz, San Benito and Monterey
 21 counties (ARB 2013a). This air basin includes San Benito County which is
 22 located within the San Francisco Bay Area Region of the study area.

23 The North Central Coast Air Basin is in attainment for all NAAQS, and is
 24 designated as nonattainment for the State ozone and PM₁₀ standards (ARB 2014).
 25 Though separated by the Santa Cruz Mountains and Coast Ranges to the north,
 26 wind can transport air pollution from the San Francisco Bay Area Air Basin and
 27 contribute to elevated ozone concentrations in the area (ARB 2013a).

28 **16.4.1.7 South Central Coast Air Basin**

29 The South Central Coast Air Basin includes San Luis Obispo, Santa Barbara and
 30 Ventura counties. It is bordered by the Pacific Ocean on the south and west and
 31 lies just north of the highly populated South Coast Air Basin. This air basin
 32 includes the Central Coast Region and the northern Southern California Region of
 33 the study area.

34 Sources of pollutants in the air basin include power plants, oil production and
 35 refining, vehicle travel, and agricultural operations. San Luis Obispo, Santa
 36 Barbara, and Ventura counties are designated as nonattainment for the State ozone
 37 and PM₁₀ standards. Eastern San Luis Obispo and Ventura counties are
 38 designated as nonattainment for the Federal ozone standard (USEPA 2015).
 39 Wind patterns link Ventura and Santa Barbara counties, resulting in pollutant
 40 transport between the South Central Coast and South Coast air basins. San Luis
 41 Obispo County is separated from these counties by mountains, and the air quality

1 in San Luis Obispo County is linked more with conditions in the San Francisco
2 Bay Area Air Basin and San Joaquin Valley Air Basin. Additionally, air
3 emissions from the South Coast Air Basin can be blown offshore, and then carried
4 to the coastal cities of the South Central Coast Air Basin. Under some conditions,
5 the reverse air flow can carry pollutants from the South Central Coast Air Basin to
6 the South Coast Air Basin and contribute to ozone violations there (ARB 2013a).

7 **16.4.1.8 South Coast Air Basin**

8 The South Coast Air Basin is California's largest metropolitan region. The area
9 includes the southern two-thirds of Los Angeles County, all of Orange County,
10 and the western urbanized portions of Riverside and San Bernardino counties.
11 The South Coast Air Basin is bounded by the Pacific Ocean on the west and by
12 mountains on the other three sides. This air basin includes the western-central
13 portion of the Southern California Region of the study area.

14 The area includes industry, airports, international ports, freeways, and surface
15 streets. On-road vehicles are the largest source of smog-forming pollutants, and
16 PM₁₀ emissions are primarily from area sources, such as fugitive dust from paved
17 and unpaved roads and vehicle travel (ARB 2013a). One-third of the state's total
18 criteria pollutant emissions are generated within the basin (ARB 2013a). The
19 pollutant emissions and fugitive dust generated in the South Coast Air Basin
20 affects other air basins. For example, fugitive dust generated in the South Coast
21 Air Basin contributes to poor air quality in the Salton Sea Air Basin and the
22 Coachella Valley portion of Riverside County (USGS 2014).

23 The persistent high pressure system and frequent low inversion heights caused by
24 the surrounding mountains on three sides of the air basin trap pollutants in the air
25 basin (ARB 2013a). Sunny weather contributes to smog formation. Portions of
26 the South Coast Air Basin are designated as nonattainment for the Federal and
27 State ozone, PM₁₀, and PM_{2.5} standards (ARB 2014; USEPA 2015). Wind often
28 transports air pollutants from the South Coast Air Basin to nearby air basins.

29 **16.4.1.9 Mojave Desert Air Basin**

30 The sparsely populated Mojave Desert Air Basin covers most of California's high
31 desert and is made up of eastern Kern and Riverside counties and northern Los
32 Angeles and San Bernardino counties. The San Gabriel and San Bernardino
33 mountains lie to the south, separating the Mojave Desert Air Basin from the South
34 Coast Air Basin. To the northwest, the Tehachapi Mountains separate the Mojave
35 Desert Air Basin from the San Joaquin Valley Air Basin. This air basin includes
36 the southeastern portion of the Central Valley Region and the northeastern portion
37 of the Southern California Region of the study area.

38 The primary sources of air pollution in the air basin are military bases, highways,
39 railroads, cement manufacturing, and mineral processing (ARB 2013a). The
40 Mojave Desert Air Basin also is affected by air quality conditions in the San
41 Joaquin Valley and South Coast air basins. Air from the South Coast Air Basin is
42 transported over the San Gabriel Mountains, heavily impacting the areas of the
43 Mojave Desert Air Basin located to the north of the South Coast Air Basin.

1 The Mojave Desert Air Basin also is located downwind of the San Joaquin Valley
2 Air Basin; and the winds pass through the Tehachapi Mountains carrying air
3 emissions from the San Joaquin Valley Air Basin. Due to the impacts from the
4 South Coast Air Basin, the worst air quality in the Mojave Desert Air Basin is
5 along the southern edge that borders the South Coast Air Basin. This is also
6 where most of the population within the Mojave Desert Air Basin is located
7 (ARB 2013a).

8 Portions of the Mojave Desert Air Basin are designated as nonattainment for the
9 Federal and State ozone and PM₁₀ standards (ARB 2014; USEPA 2015).

10 **16.4.1.10 San Diego Air Basin**

11 The San Diego Air Basin is in the southwest corner of California and comprises
12 all of San Diego County. This air basin includes the southwestern portion of the
13 Southern California Region of the study area.

14 The population and emissions are concentrated in the western portion of the air
15 basin, which is bordered on the west by the Pacific Ocean. The climate is
16 relatively mild near the ocean, with higher temperatures and seasonal variations
17 further inland (ARB 2013a).

18 The air basin includes industrial facilities, airports, an international port,
19 freeways, and surface streets. The San Diego Air Basin is designated as
20 nonattainment for the Federal ozone standard and the State ozone, PM₁₀, and
21 PM_{2.5} standards (ARB 2014). Air quality in the San Diego Air Basin is impacted
22 not only by local emission sources, but also from transport of air emissions from
23 the South Coast Air Basin and Mexico.

24 **16.4.1.11 Salton Sea Air Basin**

25 The Salton Sea Air Basin is in the southeast corner of California and includes all
26 of Imperial County and central Riverside County. The air basin is characterized
27 by flat terrain and the Salton Sea surrounded by high mountains to the west, north,
28 and east. The southern portion of the air basin extends towards the Gulf of
29 California. The flat terrain and strong temperature differentials created by intense
30 heating and cooling patterns produce moderate winds and deep thermal
31 circulation systems which disperse local air emissions (DWR 2006). This air
32 basin includes the northeastern portion of the Southern California Region of the
33 study area.

34 The primary sources of air pollution are from vehicles and equipment exhaust and
35 particulate matter from disturbed soils and wind erosion. The Salton Sea Air
36 Basin is designated as nonattainment for the Federal and State ozone and PM₁₀
37 standards (ARB 2014; USEPA 2015). Portions of the Salton Sea Air Basin
38 located outside of the study area near Calexico also are in nonattainment for PM_{2.5}
39 standards.

1 **16.4.2 Existing Greenhouse Gases and Emissions Sources**

2 This subsection presents an overview of the greenhouse effect and climate
3 change, and potential sources of GHG emissions and information related to
4 climate change and GHG emissions in California. GHG emissions and their
5 climate-related impacts are not limited to specific geographic locations, but occur
6 on global or regional scales. GHG emissions contribute cumulatively to the
7 overall heat-trapping capability of the atmosphere, and the effects of the warming,
8 such as climate change, are manifested in different ways across the planet.

9 **16.4.2.1 Greenhouse Gas Emissions Regulations and Analyses**

10 Global warming is the name given to the increase in the average temperature of
11 the Earth's near-surface air and oceans since the mid-20th century and its
12 projected continuation. Warming of the climate system is now considered to be
13 unequivocal (DWR 2010) with global surface temperature increasing
14 approximately 1.33°F over the last one hundred years. Continued warming is
15 projected to increase global average temperature between 2 and 11 degrees
16 Fahrenheit (°F) over the next one hundred years.

17 The causes of this warming have been identified as both natural processes and as
18 the result of human actions. The Intergovernmental Panel on Climate Change
19 (IPCC) concludes that variations in natural phenomena such as solar radiation and
20 volcanoes produced most of the warming from pre-industrial times to 1950 and
21 had a small cooling effect afterward. However, after 1950, increasing GHGs
22 concentrations resulting from human activity such as fossil fuel burning and
23 deforestation have been responsible for most of the observed temperature
24 increase. These basic conclusions have been endorsed by more than 45 scientific
25 societies and academies of science, including all of the national academies of
26 science of the major industrialized countries.

27 Increases in GHG concentrations in the Earth's atmosphere are thought to be the
28 main cause of human-induced climate change. GHGs naturally trap heat by
29 impeding the exit of solar radiation that has hit the Earth and is reflected back into
30 space. Some GHGs occur naturally and are necessary for keeping the Earth's
31 surface inhabitable. However, increases in the concentrations of these gases in
32 the atmosphere during the last hundred years have decreased the amount of solar
33 radiation that is reflected back into space, intensifying the natural greenhouse
34 effect and resulting in the increase of global average temperature (DWR 2010).

35 The principal GHGs considered in this EIS are CO₂, CH₄, N₂O, SF₆, PFC, and
36 HFC, in accordance with the California Health and Safety Code section 38505(g)
37 (DWR 2010). Each of the principal GHGs has a long atmospheric lifetime (one
38 year to several thousand years). In addition, the potential heat-trapping ability of
39 each of these gases varies significantly from one another, and also vary over time.
40 For example, CH₄ is 25 times as potent as CO₂; while SF₆ is 32,800 times more
41 potent than CO₂ with a 100-year time horizon (IPCC 2007).

42 The primary man-made processes that release these gases include: burning of
43 fossil fuels for transportation, heating and electricity generation; agricultural
44 practices that release CH₄, such as livestock grazing and crop residue

1 decomposition; and industrial processes that release smaller amounts of high
 2 global warming potential gases such as SF₆, PFCs, and HFCs (DWR 2010).
 3 Deforestation and land cover conversion have also been identified as contributing
 4 to global warming by reducing the Earth's capacity to remove CO₂ from the air
 5 and altering the Earth's albedo or surface reflectance, allowing more solar
 6 radiation to be absorbed.

7 **16.4.2.2 An Overview of the Greenhouse Effect**

8 The greenhouse effect is a natural phenomenon that is essential to keeping the
 9 Earth's surface warm (DWR 2010). Like a greenhouse window, GHGs allow
 10 sunlight to enter and then prevent heat from leaving the atmosphere. Solar
 11 radiation enters the Earth's atmosphere from space. A portion of this radiation is
 12 reflected by particles in the atmosphere back into space, and a portion is absorbed
 13 by the Earth's surface and emitted back into space. The portion absorbed by the
 14 Earth's surface and emitted back into space is emitted as lower-frequency infrared
 15 radiation. This infrared radiation is absorbed by various GHGs present in the
 16 atmosphere. While these GHGs are transparent to the incoming solar radiation,
 17 they are effective at absorbing infrared radiation emitted by the Earth's surface.
 18 Therefore, some of the lower-frequency infrared radiation emitted by the Earth's
 19 surface is retained in the atmosphere, creating a warming of the atmosphere.

20 **16.4.2.2.1 Global Climate Trends and Associated Impacts**

21 The rate of increase in global average surface temperature over the last hundred
 22 years has not been consistent (DWR 2010). The last three decades have warmed
 23 at a much faster rate than the previous seven decades – on average 0.32°F per
 24 decade. Eleven of the twelve years from 1995 to 2006, rank among the twelve
 25 warmest years in the instrumental record of global average surface temperature
 26 since 1850.

27 Increased global warming has occurred concurrent with many other changes have
 28 occurred in other natural systems (DWR 2010). Global sea levels have risen on
 29 average 1.8 millimeters per year; precipitation patterns throughout the world have
 30 shifted, with some areas becoming wetter and other drier; tropical storm activity
 31 in the North Atlantic has increased; peak runoff timing of many glacial and snow
 32 fed rivers has shifted earlier; as well as numerous other observed conditions.
 33 Though it is difficult to prove a definitive cause and effect relationship between
 34 global warming and other observed changes to natural systems, there is high
 35 confidence in the scientific community that these changes are a direct result of
 36 increased global temperatures.

37 **16.4.2.2.2 Overview of Greenhouse Gas Emission Sources**

38 Naturally occurring GHGs include water vapor, CO₂, methane, and nitrous oxide.
 39 Water vapor is introduced to the atmosphere from oceans and the natural
 40 biosphere. Water vapor introduced directly to the atmosphere from agricultural or
 41 other activities is not long lived, and thus does not contribute substantially to a
 42 warming effect (NAS 2005). Carbon and nitrogen contained in CO₂, methane,
 43 and nitrous oxide naturally cycle from gaseous forms to organic biomass through

1 processes such as plant and animal respiration and seasonal cycles of plant growth
2 and decay (USEPA 2012). Although naturally occurring, the emissions and
3 sequestration of these gases are also influenced by human activities, and in some
4 cases, are caused by human activities (anthropogenic). In addition to these
5 GHGs, several classes of halogenated substances that contain fluorine, chlorine,
6 or bromine also contribute to the greenhouse effect. However, these compounds
7 are the product of industrial activities for the most part.

8 Each of the GHGs has a different capacity to trap heat in the atmosphere, with
9 some of these gases being more effective at trapping heat than others. For
10 calculating emissions, ARB (ARB 2007) uses a metric developed by the IPCC to
11 account for these differences and to provide a standard basis for calculations. The
12 metric, called the global warming potential (GWP), is used to compare the future
13 climate impacts of emissions of various long-lived GHGs. The GWP of each
14 GHG is indexed to the heat-trapping capability of CO₂, and allows comparison of
15 the global warming influence of each GHG relative to CO₂. The GWP is used to
16 translate emissions of each GHG to emissions of carbon dioxide equivalents, or
17 CO₂e. In this way, emissions of various GHGs can be summed, and total GHG
18 emissions can be inventoried in common units of metric tons per year of CO₂e.
19 Most international inventories, including the United States inventory, use GWP
20 values from the IPCC Fourth Assessment Report, per international consensus
21 (IPCC 2007; USEPA 2012).

22 CO₂ is a byproduct of burning fossil fuels and biomass, as well as land-use
23 changes and other industrial processes (USEPA 2012). It is the principal
24 anthropogenic GHG that contributes to the Earth's radiative balance, and it
25 represents the dominant portion of GHG emissions from activities that result from
26 the combustion of fossil fuels (e.g., construction activities, electrical generation,
27 and transportation).

28 **16.4.2.3 California Climate Trends and Greenhouse Gas Emissions**

29 Maximum (daytime) and minimum (nighttime) temperatures are increasing
30 almost everywhere in California but at different rates. The annual minimum
31 temperature averaged over all of California has increased 0.33°F per decade
32 during the period 1920 to 2003, while the average annual maximum temperature
33 has increased 0.1°F per decade (DWR 2010).

34 With respect to California's water resources, the most significant impacts of
35 global warming have been changes to the water cycle and sea level rise. Over the
36 past century, the precipitation mix between snow and rain has shifted in favor of
37 more rainfall and less snow, and snow pack in the Sierra Nevada is melting earlier
38 in the spring (DWR 2010). The average early spring snowpack in the Sierra
39 Nevada has decreased by about 10 percent during the last century, a loss of
40 1.5 million acre-feet of snowpack storage. These changes have significant
41 implications for water supply, flooding, aquatic ecosystems, energy generation,
42 and recreation throughout the state.

1 During the same period, sea levels along California’s coast have risen. The Fort
 2 Point tide gauge in San Francisco was established in 1854 and is the longest
 3 continually monitored gauge in the United States. Sea levels measured at this
 4 gauge and two other west coast gauges indicate that the sea levels have risen at an
 5 average rate of about 7.9 inches/century (0.08 inch/year) over the past 150 years
 6 (BCDC 2011). Continued sea level rise associated with global warming may
 7 threaten coastal lands and infrastructure, increase flooding at the mouths of rivers,
 8 place additional stress on levees in the Sacramento-San Joaquin Delta, and
 9 intensify the difficulty of managing the Sacramento-San Joaquin Delta as the
 10 heart of the state’s water supply system (DWR 2010).

11 **16.4.2.3.1 Potential Effects of Global Climate Change in California**

12 Warming of the atmosphere has broad implications for the environment. In
 13 California, one of the effects of climate change could be increases in temperature
 14 that could affect the timing and quantity of precipitation. California receives most
 15 of its precipitation in the winter months, and a warming environment would raise
 16 the elevation of snow pack and result in reduced spring snowmelt and more
 17 winter runoff. These effects on precipitation and water storage in the snow pack
 18 could have broad implications on the environment in California.

19 The following are some of the potential effects of a warming climate in California
 20 (California Climate Change Portal 2007):

- 21 • Loss of snowpack storage will cause increased winter runoff that generally
 22 would not be captured and stored because of the need to reserve flood
 23 capacity in reservoirs during the winter.
- 24 • Less spring runoff would mean lower early summer storage at major
 25 reservoirs, which would result in less hydroelectric power production.
- 26 • Higher temperatures and reduced snowmelt would compound the problem of
 27 providing suitable cold water habitat for salmonid species. Lower reservoir
 28 levels would also contribute to this problem, reducing the flexibility of cold
 29 water releases.
- 30 • Sea level rise would affect the Delta, worsening existing levee problems,
 31 causing more saltwater intrusion, and adversely affecting many coastal
 32 marshes and wildlife reserves. Release of water to streams to meet water
 33 quality requirements could further reduce storage levels.
- 34 • Increased temperatures would increase the agricultural demand for water and
 35 increase the level of stress on native vegetation, potentially allowing for an
 36 increase in pest and insect epidemics and a higher frequency of large,
 37 damaging wildfires.

38 Future climate scenarios have also been evaluated in the U.S. Global Change
 39 Research Program National Climate Assessments. The most recent assessment,
 40 *Climate Change Impacts in the United States*, was released in May 2014
 41 (USGCRP 2014). For the Southwest Region of the United States, the report
 42 projects that water supply availability would be reduced as compared to recent

1 conditions due to reduced snowpack and declining stream flows. Rising
 2 temperatures in the future would increase disruptions to electricity generation
 3 which could further reduce water availability. The National Climate Assessment
 4 also indicates that mitigation policies and other factors have lowered the United
 5 States' nationwide GHG emissions in recent years; however, substantial global
 6 emissions reductions are needed to avoid many of the predicted consequences. A
 7 considerable amount of planning for resilience and adaptation is underway, but
 8 implementation of adaptive measures have been limited in scope.

9 **16.4.2.3.2 Current California Emission Sources**

10 The recent California's GHG emission inventory was released on April 6, 2012,
 11 with data updated through October 2011. The GHG emissions in California have
 12 been estimated for each year from 2000 to 2009, and are reported for several large
 13 sectors of emission sources. The estimates for 2009 are summarized in
 14 Table 16.4, reported by sector as millions of tons per year of CO₂ (ARB 2011e).

15 **Table 16.4 California Greenhouse Gas Emissions by Sector in 2009**

Sector	Total Emissions (million tons/year of CO ₂ e)	Percent of Statewide Total Gross Emissions ^a
Agriculture	32.1	7
Commercial and Residential	43	9.4
Electric Power	103.6	22.7
Forestry (excluding CO ₂ sinks)	0.2	< 1.0
Industrial	81.4	17.8
Recycling and Waste	7.3	1.6
Transportation	172.9	37.9
High Global Warming Potential substance and ozone-depleting substance use ^b	16.3	3.6
Total	456.8	100
Forestry Net Emissions	-3.8	-

16 Source: ARB 2011e.

17 Notes:

18 a. Based on the 456.8 million tons/year of CO₂e Total Gross Emissions estimate.

19 b. High Global Warming Potential substance and ozone-depleting substance use are not
 20 attributed to an individual sector.

21 Total gross statewide GHG emissions in 2009 were estimated to be 456.8 million
 22 tons per year of CO₂e. The two largest sectors contributing to emissions in
 23 California are transportation and electric power (the latter sector includes both
 24 in-state generation and imported electricity). The agricultural sector represents
 25 only 7 percent of the total gross statewide emissions.

1 The agricultural sector includes manure management, enteric fermentation,
 2 agricultural residue burning, and soils management. The forestry sector
 3 contributes to overall emissions, but is a net sink of emissions.

4 The California Global Warming Solutions Act of 2006 (California Assembly
 5 Bill 32) requires California to reduce statewide emissions to 1990 levels by 2020.

6 In December 2007, ARB adopted an emission limit for 2020 of 427 million tons
 7 per year of CO₂e. Increases in the stateside renewable energy portfolio and
 8 reductions in importation of coal-based electrical power will contribute to meeting
 9 California's near-term GHG emission reduction goals. The ARB estimates that a
 10 reduction of 169 million metric tons net CO₂e emissions below business-as-usual
 11 would be required by 2020 to meet the 1990 levels (ARB 2007). This amounts to
 12 approximately a 30 percent reduction from projected "business-as-usual" levels
 13 in 2020.

14 **16.5 Impact Analysis**

15 This section describes the potential mechanisms and analytical methods for
 16 change in air quality and GHG emissions; results of the impact analysis; potential
 17 mitigation measures; and cumulative effects.

18 **16.5.1 Potential Mechanisms for Change and Analytical Methods**

19 As described in Chapter 4, Approach to Environmental Analysis, the impact
 20 analysis considers changes in air quality and GHG emissions related to changes in
 21 CVP and SWP operations under the alternatives as compared to the No Action
 22 Alternative and Second Basis of Comparison.

23 Changes in CVP and SWP operations under the alternatives as compared to the
 24 No Action Alternative and Second Basis of Comparison could directly or
 25 indirectly change air quality and GHG emissions due to use of engines or
 26 electricity that operate groundwater wells, changes in cropping patterns, or odor
 27 emissions.

28 **16.5.1.1 Changes in Emissions of Criteria Air Pollutants and Precursors, 29 and/or Exposure of Sensitive Receptors to Substantial 30 Concentrations of Air Contaminants**

31 Changes in CVP and SWP operations under the alternatives could change the use
 32 of individual engines to operate groundwater wells. The CVHM model is used to
 33 evaluate changes in groundwater conditions in the Central Valley, as described in
 34 Chapter 7, Groundwater Resources and Groundwater Quality. To evaluate the
 35 potential for changes in emissions of criteria air pollutants and precursors, and/or
 36 exposure of sensitive receptors to substantial concentrations of air contaminants,
 37 results from the CVHM model that indicate changes in groundwater withdrawals
 38 due to changes in CVP and SWP operations. However, it is not known how many
 39 of the groundwater pumps use electricity and how many use diesel engines. The
 40 diesel engines have the potential to emit criteria air pollutants and precursors, and
 41 toxic air contaminants.

1 Most of the groundwater wells in the Central Valley use electrical pumps. As
2 reported in a recent environmental assessment, approximately 14 to 15 percent of
3 the pumps used diesel fuel in 2003 (Reclamation 2013a). It is assumed for this
4 EIS, that the portion of groundwater pumps that use electricity would remain
5 approximately at 85 percent. Therefore, it is assumed that increases or decreases
6 in groundwater pumping would be indicative of an increase or decrease in the use
7 of diesel engines in the Central Valley as well as in the San Francisco Bay Area,
8 Central Coast, and Southern California regions. Changes in CVP and SWP
9 operations would not result in changes in groundwater pumping in the Trinity
10 River Region; therefore, this analysis does not address Trinity River Region.

11 **16.5.1.2 Changes in Exposure of Sensitive Receptors to**
12 **Particulate Matter**

13 Changes in CVP and SWP operations under the alternatives could change the
14 potential for dust generation on irrigated lands that would be idled due to reduced
15 CVP and SWP water supplies. However, as described in Chapter 12, Agricultural
16 Resources, irrigated acreage under Alternatives 1 through 5 would be similar to
17 irrigated acreage under both the No Action Alternative and the Second Basis of
18 Comparison. Therefore, there would be no change in potential for dust
19 generation. Therefore, these changes are not analyzed in this EIS.

20 **16.5.1.3 Changes in Exposure of Sensitive Receptors to Odor Emissions**
21 **from Wetlands**

22 Restoration of seasonal floodplains and tidally-influenced wetlands could result in
23 additional odors at surrounding sensitive receptors near the restoration locations.
24 However, these actions would occur in a similar manner under the No Action
25 Alternative, Alternatives 1 through 5, and Second Basis of Comparison, as
26 described in Chapter 3, Description of Alternatives. Therefore, odor emissions
27 would be the same under all of the alternatives and the Second Basis of
28 Comparison. Therefore, this change is not analyzed in this EIS.

29 **16.5.1.4 Changes in GHG Emissions due to Changes in Energy**
30 **Generation or Use**

31 Changes in CVP and SWP operations under the alternatives could change CVP
32 and SWP energy generation and use, and the associated GHG emissions. In
33 addition, operational changes could also affect the use of energy by CVP and
34 SWP water users through the implementation of regional and local alternative
35 water supplies, such as recycling or desalination. When CVP and SWP water
36 deliveries decline, CVP and SWP net energy generation changes; and water users
37 are anticipated to increase use of groundwater, recycled water, and/or desalinated
38 water from existing facilities or facilities that are reasonably foreseeable to be
39 constructed by 2030. When CVP and SWP water deliveries increase, CVP and
40 SWP net energy generation would change; and water users are anticipated to
41 reduce use of alternate water supplies either due to economic considerations or to
42 allow the amount of stored water to increase under a conjunctive use pattern. It is
43 not known whether the changes in CVP and SWP net energy generation would be

1 similar to the changes in energy use for alternate regional and local water
2 supplies.

3 Changes in the timing and magnitude of net CVP and SWP hydropower
4 generation would result in changes in GHG emissions. Increased net CVP and
5 SWP hydropower generation would reduce the need for electricity generated
6 through fossil fuel combustion, and would avoid the GHG emissions that would
7 result from fossil fuel use. In comparison, reduced hydroelectric generation
8 would increase the need for other types of electricity production, including
9 electricity generated from fossil fuels, with the result that GHG emissions would
10 increase.

11 Potential changes in GHG emissions due to changes in CVP and SWP energy
12 generation or use, and the evaluation of potential for changes in use of energy by
13 CVP and SWP water users to implement alternative water supplies, are analyzed
14 broadly and qualitatively across the overall study area. Some of the changes in
15 energy use and generation will occur across the CVP and SWP system, others
16 may require additional energy resources. Specific locations of the energy sources
17 and users have not been defined.

18 **16.5.1.5 Effects due to Cross Delta Water Transfers**

19 Historically water transfer programs have been developed on an annual basis.
20 The demand for water transfers is dependent upon the availability of water
21 supplies to meet water demands. Water transfer transactions have increased over
22 time as CVP and SWP water supply availability has decreased, especially during
23 drier water years.

24 Parties seeking water transfers generally acquire water from sellers who have
25 available surface water who can make the water available through releasing
26 previously stored water, pump groundwater instead of using surface water
27 (groundwater substitution); idle crops; or substitute crops that uses less water in
28 order to reduce normal consumptive use of surface water.

29 Water transfers using CVP and SWP Delta pumping plants and south of Delta
30 canals generally occur when there is unused capacity in these facilities. These
31 conditions generally occur during drier water year types when the flows from
32 upstream reservoirs plus unregulated flows are adequate to meet the Sacramento
33 Valley water demands and the CVP and SWP export allocations. In non-wet
34 years, the CVP and SWP water allocations would be less than full contract
35 amounts; therefore, capacity may be available in the CVP and SWP conveyance
36 facilities to move water from other sources.

37 Projecting future air quality conditions related to water transfer activities is
38 difficult because specific water transfer actions required to make the water
39 available, convey the water, and/or use the water would change each year due to
40 changing hydrological conditions, CVP and SWP water availability, specific local
41 agency operations, and local cropping patterns. Reclamation recently prepared a
42 long-term regional water transfer environmental document which evaluated
43 potential changes in conditions related to water transfer actions (Reclamation

1 2014c). Results from this analysis were used to inform the impact assessment of
2 potential effects of water transfers under the alternatives as compared to the No
3 Action Alternative and the Second Basis of Comparison.

4 **16.5.2 Conditions in Year 2030 without Implementation of** 5 **Alternatives 1 through 5**

6 This EIS includes two bases of comparison, as described in Chapter 3,
7 Description of Alternatives: the No Action Alternative and the Second Basis of
8 Comparison. Both of these bases are evaluated at 2030 conditions. Changes that
9 would occur over the next 15 years without implementation of the alternatives are
10 not analyzed in this EIS. However, the changes to air quality that are assumed to
11 occur by 2030 under the No Action Alternative and the Second Basis of
12 Comparison are summarized in this section. Many of the changed conditions
13 would occur in the same manner under both the No Action Alternative and the
14 Second Basis of Comparison.

15 **16.5.2.1 Common Changes in Conditions under the No Action Alternative** 16 **and Second Basis of Comparison**

17 Conditions in 2030 would be different than existing conditions due to:

- 18 • Climate change and sea level rise
- 19 • General plan development throughout California, including increased water
20 demands in portions of Sacramento Valley
- 21 • Implementation of reasonable and foreseeable water resources management
22 projects to provide water supplies

23 It is anticipated that climate change would result in warmer temperatures, more
24 short-duration high-rainfall events, and less snowpack in the winter and early
25 spring months. The reservoirs would be full more frequently by the end of April
26 or May by 2030 than in recent historical conditions. However, as the water is
27 released in the spring, there would be less snowpack to refill the reservoirs. This
28 condition would reduce reservoir storage and available water supplies to
29 downstream uses in the summer. The reduced end of September storage also
30 would reduce the ability to release stored water to downstream regional
31 reservoirs. These conditions would occur for all reservoirs in the California
32 foothills and mountains, including non-CVP and SWP reservoirs.

33 These changes would result in a decline of the long-term average CVP and SWP
34 water supply deliveries by 2030 as compared to recent historical long-term
35 average deliveries under the No Action Alternative and the Second Basis of
36 Comparison. However, the CVP and SWP water deliveries would be less under
37 the No Action Alternative as compared to the Second Basis of Comparison, as
38 described in Chapter 5, Surface Water Resources and Water Supplies, which
39 could result in more crop idling which could result in increased dust generation.

1 Under the No Action Alternative and the Second Basis of Comparison, land uses
2 in 2030 would occur in accordance with adopted general plans. Development
3 under the general plans would be required to be implemented in accordance with
4 adopted air quality management plans.

5 The No Action Alternative and the Second Basis of Comparison assumes
6 completion of water resources management and environmental restoration
7 projects that would have occurred without implementation of Alternatives 1
8 through 5, including regional and local recycling projects, surface water and
9 groundwater storage projects, conveyance improvement projects, and desalination
10 projects. These projects would increase energy demand and could be associated
11 with increases in indirect greenhouse gas emissions.

12 By 2030, more efficient energy use, increases in renewable energy production,
13 and energy conservation are also anticipated to reduce future GHG emissions
14 rates.

15 Under the No Action Alternative and the Second Basis of Comparison, there are
16 several major variables with varying degrees of uncertainty. These variables
17 include future population growth in the air basins, the extent and emissivity of
18 various emissions sources from existing and future activities, and the success of
19 the local jurisdictions and others in implementing effective air emissions control
20 measures. It is assumed that air quality in 2030 will be similar to the conditions
21 described in the Affected Environment even with population growth because the
22 current air quality management plans were developed with consideration of future
23 growth by at least 2030. It is anticipated that the non-attainment areas will reduce
24 the contaminants to a level of attainment in accordance with adopted air quality
25 management plans. In addition, it is assumed that the California Renewables
26 Portfolio Standard (RPS) will be implemented by 2020. The RPS was established
27 in accordance with California Senate Bill 1078 in 2002, Senate Bill 107 in 2006,
28 and Senate Bill 2 in 2011 to require investor-owned utilities, electric service
29 providers, and community-choice aggregators (e.g., local agencies that purchase
30 or generate electricity for their community) to provide at least 33 percent of their
31 total energy procurement from renewable energy sources by 2020.

32 Increased groundwater use and related groundwater elevation reductions could
33 occur due to reduction in CVP and SWP water supplies. The increased pumping
34 would increase demand for electricity, and could result indirectly in increases in
35 greenhouse gas emissions. As described above, approximately 15 percent of
36 groundwater pumps rely upon diesel fuels. Increased groundwater pumping could
37 result in increased emissions of criteria air pollutants and precursors, and/or
38 exposure of sensitive receptors to substantial concentrations of air contaminants
39 from increased use of diesel engines.

40 The No Action Alternative and the Second Basis of Comparison would include
41 restoration of more than 10,000 acres of intertidal and associated subtidal
42 wetlands in Suisun Marsh and Cache Slough; and 17,000 to 20,000 acres of
43 seasonal floodplain restoration in Yolo Bypass. Operation of wetlands restoration
44 projects could result in periodic odors due to anaerobic decomposition of organic

1 matter in portions of the wetlands. As a result, odorous compounds, such as
2 ammonia and hydrogen sulfide, are generated and may be released into the
3 environment. Marshes and wetlands can also be a source of odors during some
4 time periods when ponds or shallow water areas undergo algal or vegetative
5 growth. Marshes, wetlands, shallow water areas, or canals may require periodic
6 maintenance to inhibit algal or vegetative growth, and avoid conditions conducive
7 to anaerobic digestion. The occurrence and severity of odor impacts depend on
8 numerous factors, including the nature, frequency, and intensity of the source;
9 wind speed and direction; and the presence of sensitive receptors. Although odors
10 rarely cause any physical harm, they can still be unpleasant to some individuals.

11 **16.5.3 Evaluation of Alternatives**

12 Alternatives 1 through 5 have been compared to the No Action Alternative; and
13 the No Action Alternative and Alternatives 1 through 5 have been compared to
14 the Second Basis of Comparison.

15 During review of the numerical modeling analyses used in this EIS, an error was
16 determined in the CalSim II model assumptions related to the Stanislaus River
17 operations for the Second Basis of Comparison, Alternative 1, and Alternative 4
18 model runs. Appendix 5C includes a comparison of the CalSim II model run
19 results presented in this chapter and CalSim II model run results with the error
20 corrected. Appendix 5C also includes a discussion of changes in the comparison
21 of groundwater conditions for the following alternative analyses.

- 22 • No Action Alternative compared to the Second Basis of Comparison
- 23 • Alternative 1 compared to the No Action Alternative
- 24 • Alternative 3 compared to the Second Basis of Comparison
- 25 • Alternative 5 compared to the Second Basis of Comparison

26 **16.5.3.1 No Action Alternative**

27 The No Action Alternative is compared to the Second Basis of Comparison.

28 **16.5.3.1.1 Central Valley Region**

29 *Changes in Emissions of Criteria Air Pollutants and Precursors, and/or Exposure*
30 *of Sensitive Receptors to Substantial Concentrations of Air Contaminants Related*
31 *to Changes in Groundwater Pumping*

32 As described in Chapter 7, Groundwater Resources and Groundwater Quality,
33 groundwater pumping in the San Joaquin Valley portion of the Central Valley
34 Region would increase by 8 percent under the No Action Alternative as compared
35 to the Second Basis of Comparison. It is not known if the additional groundwater
36 pumping would rely upon electricity or diesel to drive the pump engines. Under
37 the worst case analysis, it is assumed that the increased use of diesel engines
38 would be proportional to the increased use of groundwater. Therefore, under the
39 No Action Alternative, there would be a potential increase in emissions of criteria
40 air pollutants and precursors, and/or exposure of sensitive receptors to substantial
41 concentrations of air contaminants as compared to the Second Basis of
42 Comparison.

1 *Effects Related to Cross Delta Water Transfers*

2 Potential effects to air quality could be similar to those identified in a recent
 3 environmental analysis conducted by Reclamation for long-term water transfers
 4 from the Sacramento to San Joaquin valleys (Reclamation 2014c). Potential
 5 effects to air quality were identified as increased emissions of air pollutants due to
 6 the use of diesel engines for groundwater pumps that were used to provide
 7 transfer water through groundwater substitution programs. The analysis indicated
 8 that the effects could be reduced to avoid substantial impacts through the use of
 9 electric engines or reducing the amount of groundwater substitution. Other
 10 identified effects were considered to be not substantial or beneficial as related to
 11 crop idling to provide transfer water in the seller's service area; and reduction of
 12 groundwater pumping that could use diesel engines or dust generation from crop
 13 idled lands in the purchaser's service area.

14 Under the No Action Alternative, the timing of cross Delta water transfers would
 15 be limited to July through September and include annual volumetric limits, in
 16 accordance with the 2008 USFWS BO and 2009 NMFS BO. Under the Second
 17 Basis of Comparison, water could be transferred throughout the year without an
 18 annual volumetric limit. Overall, the potential for cross Delta water transfers
 19 would be less under the No Action Alternative than under the Second Basis of
 20 Comparison.

21 **16.5.3.1.2 San Francisco Bay Area, Central Coast, and Southern**
 22 **California Regions**

23 *Changes in Emissions of Criteria Air Pollutants and Precursors, and/or Exposure*
 24 *of Sensitive Receptors to Substantial Concentrations of Air Contaminants Related*
 25 *to Changes in Groundwater Pumping*

26 It is anticipated that CVP and SWP water supplies would be decreased by
 27 10 percent and 18 percent, respectively, in the San Francisco Bay Area, Central
 28 Coast, and Southern California regions under No Action Alternative as compared
 29 to the Second Basis of Comparison. The decrease in surface water supplies could
 30 result in additional use of groundwater pumps and emissions of air pollutants and
 31 contaminants if the use of diesel engines is also increased.

32 **16.5.3.1.3 Overall Study Area**

33 *Changes in GHG Emissions due to Changes in Energy Generation or Use*

34 As described in Chapter 8, Energy, changes in CVP and SWP operations under
 35 the No Action Alternative as compared to the Second Basis of Comparison would
 36 result in a reduction of CVP and SWP water deliveries to areas located south of
 37 the Delta; and therefore, annual energy use for conveyance would decline. CVP
 38 annual net generation would be similar; and SWP net energy generation would
 39 increase which could result indirectly in less GHG emissions if the hydropower
 40 generation replaces fossil fuel generation.

41 In addition to changes in CVP and SWP energy generation and use and the
 42 associated GHG emissions, CVP and SWP operations under the No Action
 43 Alternative as compared to the Second Basis of Comparison could potentially

1 increase use of energy by CVP and SWP water users to implement regional and
2 local alternate water supplies, such as increased groundwater pumping and use of
3 recycled water treatment plants and desalination water treatment plants. These
4 facilities would require energy which could result in increased GHG emissions.

5 **16.5.3.2 Alternative 1**

6 Alternative 1 is identical to the Second Basis of Comparison. Alternative 1 is
7 compared to the No Action Alternative and the Second Basis of Comparison.
8 However, because CVP and SWP operations conditions under Alternative 1 are
9 identical to conditions under the Second Basis of Comparison; Alternative 1 is
10 only compared to the No Action Alternative.

11 **16.5.3.2.1 Alternative 1 Compared to the No Action Alternative**

12 *Central Valley Region*

13 *Changes in Emissions of Criteria Air Pollutants and Precursors, and/or*
14 *Exposure of Sensitive Receptors to Substantial Concentrations of Air*
15 *Contaminants Related to Changes in Groundwater Pumping*

16 Groundwater pumping in the San Joaquin Valley portion of the Central Valley
17 Region would decrease by 8 percent under Alternative 1 as compared to the No
18 Action Alternative. It is not known if the reduction in groundwater pumping
19 would result in a reduction of the use of electricity or diesel to drive the pump
20 engines. For this analysis, it is assumed that the decreased use of diesel engines
21 would be proportional to the decreased use of groundwater. Therefore, under
22 Alternative 1, there would be a potential decrease in emissions of criteria air
23 pollutants and precursors, and/or exposure of sensitive receptors to substantial
24 concentrations of air contaminants as compared to the No Action Alternative.

25 *Effects Related to Cross Delta Water Transfers*

26 Potential effects to air quality could be similar to those identified in a recent
27 environmental analysis conducted by Reclamation for long-term water transfers
28 from the Sacramento to San Joaquin valleys (Reclamation 2014c) as described
29 above under the No Action Alternative compared to the Second Basis of
30 Comparison. For the purposes of this EIS, it is anticipated that similar conditions
31 would occur during implementation of cross Delta water transfers under
32 Alternative 1 and the No Action Alternative, and that impacts on air quality would
33 not be substantial due to implementation requirements of the transfer programs.

34 Under Alternative 1, water could be transferred throughout the year without an
35 annual volumetric limit. Under the No Action Alternative, the timing of cross
36 Delta water transfers would be limited to July through September and include
37 annual volumetric limits, in accordance with the 2008 USFWS BO and 2009
38 NMFS BO. Overall, the potential for cross Delta water transfers would be
39 increased under Alternative 1 as compared to the No Action Alternative.

1 *San Francisco Bay Area, Central Coast, and Southern California Regions*
 2 *Changes in Emissions of Criteria Air Pollutants and Precursors, and/or*
 3 *Exposure of Sensitive Receptors to Substantial Concentrations of Air*
 4 *Contaminants Related to Changes in Groundwater Pumping*

5 It is anticipated that CVP and SWP water supplies would be increased by
 6 11 percent and 21 percent, respectively, in the San Francisco Bay Area, Central
 7 Coast, and Southern California regions under Alternative 1 as compared to the
 8 No Action Alternative. The increase in surface water supplies could result in the
 9 reduction in use of groundwater pumps and emissions of air pollutants and
 10 contaminants if the use of diesel engines is also decreased.

11 *Overall Study Area*

12 *Changes in GHG Emissions due to Changes in Energy Generation or Use*

13 As described in Chapter 8, Energy, changes CVP and SWP operations under
 14 Alternative 1 as compared to the No Action Alternative would result in an
 15 increase of CVP and SWP water deliveries to areas located south of the Delta; and
 16 therefore, annual energy use for conveyance would increase. CVP annual net
 17 generation would be similar, and SWP annual net generation would be decrease
 18 over the long-term average conditions. This could result in increased GHG
 19 emissions if fossil fuel generation replaces hydropower generation.

20 In addition to changes in CVP and SWP energy generation and use, and the
 21 associated GHG emissions, CVP and SWP operations under Alternative 1 as
 22 compared to the No Action Alternative could potentially decrease the use of
 23 energy by CVP and SWP water users due to less need to implement regional and
 24 local alternative water supplies, such as increased groundwater pumping and use
 25 of recycled water treatment plants and desalination water treatment plants. As the
 26 need for alternative water supplies is decreased, the associated energy demand
 27 and indirect GHG emissions would also be decreased under Alternative 1 as
 28 compared to the No Action Alternative.

29 **16.5.3.2.2 Alternative 1 Compared to the Second Basis of Comparison**

30 Alternative 1 is identical to the Second Basis of Comparison.

31 **16.5.3.3 Alternative 2**

32 The CVP and SWP operations under Alternative 2 are identical to the CVP and
 33 SWP operations under the No Action Alternative, as described in Chapter 3,
 34 Description of Alternatives; therefore, Alternative 2 is only compared to the
 35 Second Basis of Comparison.

36 **16.5.3.3.1 Alternative 2 Compared to the Second Basis of Comparison**

37 The CVP and SWP operations under Alternative 2 are identical to the CVP and
 38 SWP operations under the No Action Alternative. Therefore, changes to air
 39 quality and GHG emission conditions under Alternatives 2 as compared to the
 40 Second Basis of Comparison would be the same as the impacts described in
 41 Section 16.5.3.1, No Action Alternative.

1 **16.5.3.4 Alternative 3**

2 As described in Chapter 3, Description of Alternatives, CVP and SWP operations
3 under Alternative 3 are similar to the Second Basis of Comparison with modified
4 Old and Middle River flow criteria and New Melones Reservoir operations. As
5 described in Chapter 4, Approach to Environmental Analysis, Alternative 3 is
6 compared to the No Action Alternative and the Second Basis of Comparison.

7 **16.5.3.4.1 Alternative 3 Compared to the No Action Alternative**

8 *Central Valley Region*

9 *Changes in Emissions of Criteria Air Pollutants and Precursors, and/or*
10 *Exposure of Sensitive Receptors to Substantial Concentrations of Air*
11 *Contaminants Related to Changes in Groundwater Pumping*

12 Groundwater pumping in the San Joaquin Valley portion of the Central Valley
13 Region would decrease by 6 percent under Alternative 3 as compared to the No
14 Action Alternative. It is not known if the reduction in groundwater pumping
15 would result in a reduction of the use of electricity or diesel to drive the pump
16 engines. For this analysis, it is assumed that the decreased use of diesel engines
17 would be proportional to the decreased use of groundwater. Therefore, under
18 Alternative 3, there would be a potential decrease in emissions of criteria air
19 pollutants and precursors, and/or exposure of sensitive receptors to substantial
20 concentrations of air contaminants as compared to the No Action Alternative.

21 *Effects Related to Cross Delta Water Transfers*

22 Potential effects to air quality could be similar to those identified in a recent
23 environmental analysis conducted by Reclamation for long-term water transfers
24 from the Sacramento to San Joaquin valleys (Reclamation 2014c) as described
25 above under the No Action Alternative compared to the Second Basis of
26 Comparison. For the purposes of this EIS, it is anticipated that similar conditions
27 would occur during implementation of cross Delta water transfers under
28 Alternative 3 and the No Action Alternative, and that impacts on air quality would
29 not be substantial due to implementation requirements of the transfer programs.

30 Under Alternative 3, water could be transferred throughout the year without an
31 annual volumetric limit. Under the No Action Alternative, the timing of cross
32 Delta water transfers would be limited to July through September and include
33 annual volumetric limits, in accordance with the 2008 USFWS BO and 2009
34 NMFS BO. Overall, the potential for cross Delta water transfers would be
35 increased under Alternative 3 as compared to the No Action Alternative.

36 *San Francisco Bay Area, Central Coast, and Southern California Regions*

37 *Changes in Emissions of Criteria Air Pollutants and Precursors, and/or*
38 *Exposure of Sensitive Receptors to Substantial Concentrations of Air*
39 *Contaminants Related to Changes in Groundwater Pumping*

40 It is anticipated that CVP and SWP water supplies would be increased by
41 9 percent and 17 percent, respectively, in the San Francisco Bay Area, Central
42 Coast, and Southern California regions under Alternative 3 as compared to the
43 No Action Alternative. The increase in surface water supplies could result in the

1 reduction in use of groundwater pumps and emissions of air pollutants and
2 contaminants if the use of diesel engines is also decreased.

3 *Overall Study Area*

4 *Changes in GHG Emissions due to Changes in Energy Generation or Use*

5 As described in Chapter 8, Energy, changes in CVP and SWP operations under
6 Alternative 3 as compared to the No Action Alternative would result in an
7 increase of CVP and SWP water deliveries to areas located south of the Delta; and
8 therefore, annual energy use for conveyance would increase. CVP annual net
9 energy generation would be similar; and SWP annual net energy generation
10 would be less which could result in increased GHG emissions if fossil fuel
11 generation replaces hydropower generation.

12 In addition to changes in CVP and SWP energy generation and use, and the
13 associated GHG emissions, CVP and SWP operations under Alternative 3 as
14 compared to the No Action Alternative could potentially decrease the use of
15 energy by CVP and SWP water users due to less need to implement regional and
16 local alternative water supplies, such as increased groundwater pumping and use
17 of recycled water treatment plants and desalination water treatment plants. As the
18 need for alternative water supplies is decreased, the associated energy demand
19 and GHG emissions would also be decreased under Alternative 3 as compared to
20 the No Action Alternative.

21 **16.5.3.4.2 Alternative 3 Compared to the Second Basis of Comparison**

22 *Central Valley Region*

23 *Changes in Emissions of Criteria Air Pollutants and Precursors, and/or* 24 *Exposure of Sensitive Receptors to Substantial Concentrations of Air* 25 *Contaminants Related to Changes in Groundwater Pumping*

26 Groundwater pumping in the San Joaquin Valley portion of the Central Valley
27 Region would be similar (within a 5 percent change) under Alternative 3 as
28 compared to the Second Basis of Comparison. Therefore, the emissions of
29 criteria air pollutants and precursors, and/or exposure of sensitive receptors to
30 substantial concentrations of air contaminants would be similar under
31 Alternative 3 as compared to the Second Basis of Comparison.

32 *Effects Related to Cross Delta Water Transfers*

33 Potential effects to air quality could be similar to those identified in a recent
34 environmental analysis conducted by Reclamation for long-term water transfers
35 from the Sacramento to San Joaquin valleys (Reclamation 2014c) as described
36 above under the No Action Alternative compared to the Second Basis of
37 Comparison. For the purposes of this EIS, it is anticipated that similar conditions
38 would occur during implementation of cross Delta water transfers under
39 Alternative 3 and the Second Basis of Comparison, and that impacts on air quality
40 would not be substantial in the seller's service area due to implementation
41 requirements of the transfer programs.

1 Under Alternative 3 and the Second Basis of Comparison, water could be
2 transferred throughout the year without an annual volumetric limit. Overall, the
3 potential for cross Delta water transfers would be similar under Alternative 3 and
4 the Second Basis of Comparison.

5 *San Francisco Bay Area, Central Coast, and Southern California Regions*
6 *Changes in Emissions of Criteria Air Pollutants and Precursors, and/or*
7 *Exposure of Sensitive Receptors to Substantial Concentrations of Air*
8 *Contaminants Related to Changes in Groundwater Pumping*

9 It is anticipated that CVP and SWP water supplies and emissions from diesel
10 engines used for groundwater pumping would be similar in the San Francisco Bay
11 Area, Central Coast, and Southern California regions under Alternative 3 as
12 compared to the Second Basis of Comparison.

13 *Overall Study Area*

14 *Changes in GHG Emissions due to Changes in Energy Generation or Use*

15 As described in Chapter 8, Energy, changes in CVP and SWP operations under
16 Alternative 3 as compared to the Second Basis of Comparison would result in a
17 decrease of CVP and SWP water deliveries to areas located south of the Delta;
18 and therefore, annual energy use for conveyance would decrease. CVP annual net
19 energy generation would be similar; and SWP annual net energy generation
20 would be greater which could result in decreased GHG emissions if hydropower
21 generation replaces fossil fuel generation.

22 In addition to changes in CVP and SWP energy generation and use, and the
23 associated GHG emissions, CVP and SWP operations under Alternative 3 as
24 compared to the Second Basis of Comparison could potentially increase the use of
25 energy by CVP and SWP water users to implement regional and local alternative
26 water supplies, such as increased groundwater pumping and use of recycled water
27 treatment plants and desalination water treatment plants. These facilities would
28 require energy which could indirectly result in increased GHG emissions.

29 **16.5.3.5 Alternative 4**

30 The air quality and GHG emissions under Alternative 4 would be identical to the
31 air quality and GHG emissions under the Second Basis of Comparison; therefore,
32 Alternative 4 is only compared to the No Action Alternative.

33 **16.5.3.5.1 Alternative 4 Compared to the No Action Alternative**

34 The CVP and SWP operations under Alternative 4 is identical to the CVP and
35 SWP operations under the Second Basis of Comparison and Alternative 1.
36 Therefore, changes in air quality and GHG emissions under Alternative 4 as
37 compared to the No Action Alternative would be the same as the impacts
38 described in Section 16.5.3.2.1, Alternative 1 Compared to the No Action
39 Alternative.

1 **16.5.3.6 Alternative 5**

2 As described in Chapter 3, Description of Alternatives, CVP and SWP operations
3 under Alternative 5 are similar to the No Action Alternative with modified Old
4 and Middle River flow criteria and New Melones Reservoir operations. As
5 described in Chapter 4, Approach to Environmental Analysis, Alternative 5 is
6 compared to the No Action Alternative and the Second Basis of Comparison.

7 **16.5.3.6.1 Alternative 5 Compared to the No Action Alternative**

8 *Central Valley Region*

9 *Changes in Emissions of Criteria Air Pollutants and Precursors, and/or*
10 *Exposure of Sensitive Receptors to Substantial Concentrations of Air*
11 *Contaminants Related to Changes in Groundwater Pumping*

12 Groundwater pumping in the San Joaquin Valley portion of the Central Valley
13 Region would be similar under Alternative 5 as compared to the No Action
14 Alternative. Therefore, the emissions of criteria air pollutants and precursors,
15 and/or exposure of sensitive receptors to substantial concentrations of air
16 contaminants would be similar under Alternative 5 as compared to the No
17 Action Alternative.

18 *Effects Related to Cross Delta Water Transfers*

19 Potential effects to air quality could be similar to those identified in a recent
20 environmental analysis conducted by Reclamation for long-term water transfers
21 from the Sacramento to San Joaquin valleys (Reclamation 2014c) as described
22 above under the No Action Alternative compared to the Second Basis of
23 Comparison. For the purposes of this EIS, it is anticipated that similar conditions
24 would occur during implementation of cross Delta water transfers under
25 Alternative 5 and the No Action Alternative, and that impacts on air quality would
26 not be substantial in the seller's service area due to implementation requirements
27 of the transfer programs.

28 Under Alternative 5 and the No Action Alternative, the timing of cross Delta
29 water transfers would be limited to July through September and include annual
30 volumetric limits, in accordance with the 2008 USFWS BO and 2009 NMFS BO.
31 Overall, the potential for cross Delta water transfers would be similar under
32 Alternative 5 and the No Action Alternative.

33 *San Francisco Bay Area, Central Coast, and Southern California Regions*

34 *Changes in Emissions of Criteria Air Pollutants and Precursors, and/or*
35 *Exposure of Sensitive Receptors to Substantial Concentrations of Air*
36 *Contaminants Related to Changes in Groundwater Pumping*

37 It is anticipated that CVP and SWP water supplies and emissions from diesel
38 engines used for groundwater pumping would be similar in the San Francisco Bay
39 Area, Central Coast, and Southern California regions under Alternative 5 as
40 compared to the No Action Alternative.

1 *Overall Study Area*

2 *Changes in GHG Emissions due to Changes in Energy Generation or Use*

3 As described in Chapter 8, Energy, changes in CVP and SWP operations under
4 Alternative 5 as compared to the No Action Alternative would result in similar
5 CVP and SWP water deliveries to areas located south of the Delta except in April
6 and May when exports would decline. Overall, annual CVP and SWP net energy
7 generation would be similar under Alternative 5 and the No Action Alternative.

8 In addition to changes in CVP and SWP energy generation and use, and the
9 associated GHG emissions, CVP and SWP operations under Alternative 5 as
10 compared to the No Action Alternative could potentially increase the use of
11 energy by CVP and SWP water users to implement regional and local alternative
12 water supplies, such as increased groundwater pumping and use of recycled water
13 treatment plants and desalination water treatment plants. These facilities would
14 require energy which could indirectly result in increased GHG emissions.

15 **16.5.3.6.2 Alternative 5 Compared to the Second Basis of Comparison**

16 *Central Valley Region*

17 *Changes in Emissions of Criteria Air Pollutants and Precursors, and/or*
18 *Exposure of Sensitive Receptors to Substantial Concentrations of Air*
19 *Contaminants Related to Changes in Groundwater Pumping*

20 Groundwater pumping in the San Joaquin Valley portion of the Central Valley
21 Region would increase by 8 percent under Alternative 5 as compared to the
22 Second Basis of Comparison. It is not known if the additional groundwater
23 pumping would rely upon electricity or diesel to drive the pump engines. Under
24 the worst case analysis, it is assumed that the increased use of diesel engines
25 would be proportional to the increased use of groundwater. Therefore, under
26 Alternative 5, there would be a potential increase in emissions of criteria air
27 pollutants and precursors, and/or exposure of sensitive receptors to substantial
28 concentrations of air contaminants as compared to the Second Basis of
29 Comparison.

30 *Effects Related to Cross Delta Water Transfers*

31 Potential effects to air quality could be similar to those identified in a recent
32 environmental analysis conducted by Reclamation for long-term water transfers
33 from the Sacramento to San Joaquin valleys (Reclamation 2014c) as described
34 above under the No Action Alternative compared to the Second Basis of
35 Comparison. For the purposes of this EIS, it is anticipated that similar conditions
36 would occur during implementation of cross Delta water transfers under
37 Alternative 5 and the Second Basis of Comparison, and that impacts on air quality
38 would not be substantial in the seller's service area due to implementation
39 requirements of the transfer programs.

40 Under Alternative 5, the timing of cross Delta water transfers would be limited to
41 July through September and include annual volumetric limits, in accordance with
42 the 2008 USFWS BO and 2009 NMFS BO. Under the Second Basis of
43 Comparison, water could be transferred throughout the year without an annual

1 volumetric limit. Overall, the potential for cross Delta water transfers would be
2 reduced under Alternative 5 as compared to the Second Basis of Comparison.

3 *San Francisco Bay Area, Central Coast, and Southern California Regions*
4 *Changes in Emissions of Criteria Air Pollutants and Precursors, and/or*
5 *Exposure of Sensitive Receptors to Substantial Concentrations of Air*
6 *Contaminants Related to Changes in Groundwater Pumping*

7 It is anticipated that CVP and SWP water supplies would be decreased by
8 10 percent and 18 percent, respectively, in the San Francisco Bay Area, Central
9 Coast, and Southern California regions under Alternative 5 as compared to the
10 Second Basis of Comparison. The decrease in surface water supplies could result
11 in increased use of groundwater pumps and emissions of air pollutants and
12 contaminants if the use of diesel engines is also increased.

13 *Overall Study Area*

14 *Changes in GHG Emissions due to Changes in Energy Generation or Use*

15 As described in Chapter 8, Energy, changes in CVP and SWP operations under
16 Alternative 5 as compared to the Second Basis of Comparison would result in a
17 decrease of CVP and SWP water deliveries to areas located south of the Delta;
18 and therefore, annual energy use for conveyance would decrease. CVP annual net
19 generation would be similar; and SWP net energy generation would increase
20 which could result indirectly in less GHG emissions if the hydropower generation
21 replaces fossil fuel generation.

22 In addition to changes in CVP and SWP energy generation and use, and the
23 associated GHG emissions, CVP and SWP operations under Alternative 5 as
24 compared to the Second Basis of Comparison could potentially increase the use of
25 energy by CVP and SWP water users to implement regional and local alternative
26 water supplies, such as increased groundwater pumping and use of recycled water
27 treatment plants and desalination water treatment plants. These facilities would
28 require energy which could indirectly result in increased GHG emissions.

29 **16.5.3.7 Summary of Environmental Consequences**

30 The results of the environmental consequences of implementation of
31 Alternatives 1 through 5 as compared to the No Action Alternative and the
32 Second Basis of Comparison are presented in Tables 16.5 and 16.6.

1 **Table 16.5 Comparison of Alternatives 1 through 5 to No Action Alternative**

Alternative	Potential Change	Consideration for Mitigation Measures
Alternative 1	<p>Decrease potential for emissions of criteria air pollutants and precursors, and/or exposure of sensitive receptors to substantial concentrations of air contaminants by 8 percent in the Central Valley, 11 to 21 percent in the San Francisco Bay Area Region, and by 21 percent in the Central Coast and Southern California regions.</p> <p>Potentially, could indirectly result in an increase of GHG emissions due to a decrease in SWP net energy generation; however, GHG emissions could decrease due to a reduced need for additional energy for alternative water supplies. The overall changes in GHG emissions are not known at this time because the need for energy use by alternative water supplies is not known at this time.</p>	None needed
Alternative 2	No effects on air quality.	None needed
Alternative 3	<p>Decrease potential for emissions of criteria air pollutants and precursors, and/or exposure of sensitive receptors to substantial concentrations of air contaminants by 6 percent in the Central Valley, 9 to 17 percent in the San Francisco Bay Area Region, and by 17 percent in the Central Coast and Southern California regions.</p> <p>Potentially, could indirectly result in an increase of GHG emissions due to a decrease in SWP net energy generation; however, GHG emissions could decrease due to a reduced need for additional energy for alternative water supplies. The overall changes in GHG emissions are not known at this time because the need for energy use by alternative water supplies is not known at this time.</p>	None needed
Alternative 4	Same effects as described for Alternative 1 compared to the No Action Alternative.	None needed

Alternative	Potential Change	Consideration for Mitigation Measures
Alternative 5	<p>Similar potential for emissions of criteria air pollutants and precursors, and/or exposure of sensitive receptors to substantial concentrations of air contaminants in the Central Valley, San Francisco Bay Area, Central Coast, and Southern California regions.</p> <p>Potentially, could indirectly result in an increase of GHG emissions due to the need for additional energy for alternative water supplies. The overall changes in GHG emissions are not known at this time because the need for energy use by alternative water supplies is not known at this time.</p>	None needed

Note: Due to the limitations and uncertainty in the CalSim II monthly model and other analytical tools, incremental differences of 5 percent or less between alternatives and the No Action Alternative are considered to be “similar.”

1 **Table 16.6 Comparison of Alternatives 1 through 5 to Second Basis of Comparison**

Alternative	Potential Change	Consideration for Mitigation Measures
No Action Alternative	<p>Increase potential for emissions of criteria air pollutants and precursors, and/or exposure of sensitive receptors to substantial concentrations of air contaminants by 8 percent in the Central Valley, 10 to 18 percent in the San Francisco Bay Area Region, and by 18 percent in the Central Coast and Southern California regions.</p> <p>Potentially, could indirectly result in a decrease of GHG emissions due to an increase in SWP net energy generation; however, GHG emissions could increase due to the need for additional energy for alternative water supplies. The overall changes in GHG emissions are not known at this time because the need for energy use by alternative water supplies is not known at this time.</p>	Not considered for this comparison.
Alternative 1	No effects on air quality.	Not considered for this comparison.
Alternative 2	Same effects as described for No Action Alternative as compared to the Second Basis of Comparison.	Not considered for this comparison.

Alternative	Potential Change	Consideration for Mitigation Measures
Alternative 3	<p>Similar potential for emissions of criteria air pollutants and precursors, and/or exposure of sensitive receptors to substantial concentrations of air contaminants in the Central Valley, San Francisco Bay Area, Central Coast, and Southern California regions.</p> <p>Potentially, could indirectly result in a decrease of GHG emissions due to an increase in SWP net energy generation; however, GHG emissions could increase due to the need for additional energy for alternative water supplies. The overall changes in GHG emissions are not known at this time because the need for energy use by alternative water supplies is not known at this time.</p>	Not considered for this comparison.
Alternative 4	No effects on air quality.	Not considered for this comparison.
Alternative 5	<p>Increase potential for emissions of criteria air pollutants and precursors, and/or exposure of sensitive receptors to substantial concentrations of air contaminants by 8 percent in the Central Valley, 10 to 18 percent in the San Francisco Bay Area Region, and by 18 percent in the Central Coast and Southern California regions.</p> <p>Potentially, could indirectly result in a decrease of GHG emissions due to an increase in SWP net energy generation; however, GHG emissions could increase due to the need for additional energy for alternative water supplies. The overall changes in GHG emissions are not known at this time because the need for energy use by alternative water supplies is not known at this time.</p>	Not considered for this comparison.

1 Note: Due to the limitations and uncertainty in the CalSim II monthly model and other
 2 analytical tools, incremental differences of 5 percent or less between alternatives and the
 3 No Action Alternative are considered to be "similar."

4 **16.5.3.8 Potential Mitigation Measures**

5 Mitigation measures are presented in this section to avoid, minimize, rectify,
 6 reduce, eliminate, or compensate for adverse environmental effects of
 7 Alternatives 1 through 5 as compared to the No Action Alternative. Mitigation
 8 measures were not included to address adverse impacts under the alternatives as
 9 compared to the Second Basis of Comparison because this analysis was included
 10 in this EIS for information purposes only.

1 Changes in CVP and SWP operations under Alternatives 1 through 5 as compared
2 to the No Action Alternative would not result in changes in air quality. Therefore,
3 there would be no adverse impacts to air quality; and no mitigation measures
4 are required.

5 **16.5.3.9 Cumulative Effects Analysis**

6 As described in Chapter 3, the cumulative effects analysis considers projects,
7 programs, and policies that are not speculative; and are based upon known or
8 reasonably foreseeable long-range plans, regulations, operating agreements, or
9 other information that establishes them as reasonably foreseeable.

10 The cumulative effects analysis considers potential incremental impacts of the
11 alternatives when added to other past and present actions (as described in the
12 Affected Environment section) and reasonably foreseeable future actions (as
13 described in the No Action Alternative section plus cumulative effects) regardless
14 of what agency (federal or non-federal) or person undertakes such actions
15 (40 CFR 1508.7, 1508.25, and 43 CFR 46.115). The quantitative effects of these
16 items are based upon the quantitative comparisons of Alternatives 1 through 5 to
17 the No Action Alternative presented in previous sections of this chapter; and the
18 qualitative cumulative effects of the alternatives are based upon the qualitative
19 comparisons of Alternatives 1 through 5 to the No Action Alternative presented in
20 previous sections of this chapter and the effects of the cumulative actions that are
21 less certain than future actions under the No Action Alternative.

22 The cumulative effects analysis for Alternatives 1 through 5 for Air Quality issues
23 are summarized in Table 16.7.

1
2

Table 16.7 Summary of Cumulative Effects on Air Quality with Implementation of Alternatives 1 through 5 as Compared to the No Action Alternative

Scenarios	Actions	Cumulative Effects of Actions
<p>Past & Present, and Future Actions included in the No Action Alternative and in All Alternatives in Year 2030</p>	<p>Consistent with Affected Environment conditions plus:</p> <p>Actions in the 2008 USFWS BO and 2009 NMFS BO that would have occurred without implementation of the BOs, as described in Section 3.3.1.2 (of Chapter 3, Descriptions of Alternatives), including climate change and sea level rise</p> <p>Actions not included in the 2008 USFWS BO and 2009 NMFS BO that would have occurred without implementation of the BOs, as described in Section 3.3.1.3 (of Chapter 3, Descriptions of Alternatives):</p> <ul style="list-style-type: none"> • Implementation of Federal and state policies and programs, including Clean Water Act (e.g., Total Maximum Daily Loads); Safe Drinking Water Act; Clean Air Act; and flood management programs • General plans for 2030. • Trinity River Restoration Program. • Central Valley Project Improvement Act programs • Folsom Dam Water Control Manual Update • FERC Relicensing for the Middle Fork of the American River Project • San Joaquin River Restoration Program • Future water supply projects, including water recycling, desalination, groundwater banks and wellfields, and conveyance facilities (projects with completed environmental documents) 	<p><u>These effects would be the same under all alternatives.</u></p> <p>Climate change and sea level rise, development under the general plans, FERC relicensing projects, and some future projects to improve water quality and/or habitat are anticipated to reduce carryover storage in reservoirs and changes in stream flow patterns in a manner that could reduce hydroelectric generation in the summer and fall months which could result in increased use of fossil fuels and indirectly increase GHG emissions for fossil fuel generation and increased use of diesel engines for additional groundwater use.</p> <p>Reduced CVP and SWP water deliveries south of the Delta would reduce CVP and SWP electricity use for conveyance; and could reduce the need for electricity generation using fossil fuels and indirectly reduce GHG emissions.</p> <p>Future water supply projects are anticipated to both improve water supply reliability due to reduced surface water supplies and to accommodate planned growth in the general plans. It is anticipated that some of these projects could increase energy use, such as implementation of desalination projects. However, other projects, such as water recycling, would not substantially increase energy use because most of the energy use was previously required for wastewater treatment. It is anticipated that energy required for water treatment of alternative water supplies would be similar as treatment for CVP and SWP water supplies. Increased energy use could increase use of electricity generation by fossil fuels; which could increase air quality issues and indirectly increase GHG emissions.</p> <p>Most of these programs were initiated prior to implementation of the 2008 USFWS BO and 2009 NMFS BO which reduced CVP and SWP water supply reliability.</p>

Scenarios	Actions	Cumulative Effects of Actions
<p>Future Actions considered as Cumulative Effects Actions in All Alternatives in Year 2030</p>	<p>Actions as described in Section 3.5 (of Chapter 3, Descriptions of Alternatives):</p> <ul style="list-style-type: none"> • Bay-Delta Water Quality Control Plan Update • FERC Relicensing Projects • Bay Delta Conservation Plan (including the California WaterFix alternative) • Shasta Lake Water Resources, North-of-the-Delta Offstream Storage, Los Vaqueros Reservoir Expansion Phase 2, and Upper San Joaquin River Basin Storage Investigations • El Dorado Water and Power Authority Supplemental Water Rights Project • Sacramento River Water Reliability Project • Semitropic Water Storage District Delta Wetlands • North Bay Aqueduct Alternative Intake • Irrigated Lands Regulatory Program • San Luis Reservoir Low Point Improvement Project • <i>Westlands Water District v. United States Settlement</i> • Future water supply projects, including water recycling, desalination, groundwater banks and wellfields, and conveyance facilities (projects that did not have completed environmental documents during preparation of the EIS) 	<p><u>These effects would be the same under all alternatives.</u></p> <p>Most of the future reasonably foreseeable actions are anticipated to improve water supplies in California to reduce impacts due to climate change, sea level rise, increased water allocated to improve habitat conditions, and future growth. If CVP and SWP water supply reliability increases, energy use for conveyance of CVP and SWP water supplies also would increase.</p> <p>Some of the future reasonably foreseeable actions are anticipated to potentially reduce CVP and SWP water supply reliability (e.g., Water Quality Control Plan Update and FERC Relicensing Projects).</p> <p>Future water supply projects are anticipated to both improve water supply reliability due to reduced surface water supplies and to accommodate planned growth in the general plans. It is anticipated that some of these projects could increase energy use, such as implementation of desalination projects. However, other projects, such as water recycling, would not substantially increase energy use because most of the energy use was previously required for wastewater treatment. It is anticipated that energy required for water treatment of alternative water supplies would be similar as treatment for CVP and SWP water supplies. Increased use of groundwater pumps would increase energy use.</p>

Scenarios	Actions	Cumulative Effects of Actions
<p>No Action Alternative with Associated Cumulative Effects Actions in Year 2030</p>	<p>Full implementation of the 2008 USFWS BO and 2009 NMFS BO CVP and SWP</p>	<p>Implementation of No Action Alternative would result in changes stream flows and related changes in hydroelectric generation patterns, and reduced CVP and SWP water supplies as compared to conditions prior to the BOs.</p> <p>If CVP and SWP water supply reliability decreases, energy use for conveyance of CVP and SWP water supplies also would decrease and energy use for alternative water supplies could increase.</p> <p>Increased energy use could increase use of electricity generation by fossil fuels; which could increase air quality issues and indirectly increase GHG emissions.</p>
<p>Alternatives 1 and 4 with Associated Cumulative Effects Actions in Year 2030</p>	<p>No implementation of the 2008 USFWS BO and 2009 NMFS BO actions unless the actions would have been implemented without the BO (e.g., Red Bluff Pumping Plant)</p>	<p>Implementation of Alternatives 1 and 4 with reasonably foreseeable actions would result in changes in stream flows and related hydroelectric generation patterns, and increased CVP and SWP water supplies as compared to the No Action Alternative with the added actions.</p> <p>Increased CVP and SWP water supply reliability would increase energy use for conveyance of CVP and SWP water supplies; and it is anticipated that energy use for alternative water supplies would decrease as compared to the No Action Alternative with the added actions.</p> <p>Increased energy use for CVP and SWP conveyance could increase use of electricity generation by fossil fuels; which could increase air quality issues and indirectly increase GHG emissions. However, decreased energy use for alternative water supplies could decrease use of electricity generation by fossil fuels; which could decrease air quality issues and indirectly decrease GHG emissions as compared to for the No Action Alternative with the added actions.</p>
<p>Alternative 2 with Associated Cumulative Effects Actions in Year 2030</p>	<p>Full implementation of the 2008 USFWS BO and 2009 NMFS BO CVP and SWP operational actions No implementation of structural improvements or other actions that require further study to develop a more detailed action description.</p>	<p>Implementation of Alternative 2 with reasonably foreseeable actions for energy resources would be the same as for the No Action Alternative with the added actions.</p>

Scenarios	Actions	Cumulative Effects of Actions
<p>Alternative 3 with Associated Cumulative Effects Actions in Year 2030</p>	<p>No implementation of the 2008 USFWS BO and 2009 NMFS BO actions unless the actions would have been implemented without the BO (e.g., Red Bluff Pumping Plant)</p> <p>Slight increase in positive Old and Middle River flows in the winter and spring months</p>	<p>Implementation of Alternative 3 with reasonably foreseeable actions would result in changes in stream flows and related hydroelectric generation patterns, and increased CVP and SWP water supplies as compared to the No Action Alternative with the added actions.</p> <p>Increased CVP and SWP water supply reliability would increase energy use for conveyance of CVP and SWP water supplies; and it is anticipated that energy use for alternative water supplies would decrease as compared to the No Action Alternative with the added actions.</p> <p>Increased energy use for CVP and SWP conveyance could increase use of electricity generation by fossil fuels; which could increase air quality issues and indirectly increase GHG emissions. However, decreased energy use for alternative water supplies could decrease use of electricity generation by fossil fuels; which could decrease air quality issues and indirectly decrease GHG emissions as compared to for the No Action Alternative with the added actions.</p>
<p>Alternative 5 with Associated Cumulative Effects Actions in Year 20530</p>	<p>Full implementation of the 2008 USFWS BO and 2009 NMFS BO</p> <p>Positive Old and Middle River flows and increased Delta outflow in spring months</p>	<p>Implementation of Alternative 5 with reasonably foreseeable actions would result in similar net CVP and SWP hydroelectric generation, and reduced CVP and SWP water supplies as compared to the No Action Alternative with the added actions.</p> <p>It is anticipated that energy use for alternative water supplies would increase as compared to the No Action Alternative with cumulative effects which could increase air quality issues and indirectly increase GHG emissions as compared to for the No Action Alternative with the added actions.</p>

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Chapter 17

1 Cultural Resources

2 17.1 Introduction

3 Cultural resources are defined as prehistoric and historic archaeological sites,
4 architectural features (e.g., buildings, bridges, flumes, trestles, railroads), and
5 traditional cultural properties. However, the focus of this chapter is more on
6 cultural resources than historic properties.

7 This chapter describes the known existing cultural resources conditions in the
8 study area and the potential changes that could occur as a result of implementing
9 the alternatives evaluated in this Environmental Impact Statement (EIS).

10 Implementation of the alternatives could affect cultural and historic resources
11 through potential changes in the operation of the Central Valley Project (CVP)
12 and State Water Project (SWP). Changes in CVP and SWP operations could
13 increase the frequency and duration of low-elevation reservoir conditions that
14 would increase the time of exposure of inundated cultural resources within
15 reservoirs that store CVP and SWP water. Changes in CVP and SWP operations
16 also could reduce water supply availability to agricultural lands, and those lands
17 could be subject to land use changes that could increase disturbances of cultural
18 resources if present.

19 17.2 Regulatory Environment and Compliance 20 Requirements

21 Potential actions that could be implemented under the alternatives evaluated in
22 this EIS could affect reservoirs, streams, and lands served by CVP and SWP
23 water supplies located on lands with cultural resources. Actions implemented,
24 funded, or approved by Federal and state agencies would need to be compliant
25 with appropriate Federal and state agency policies and regulations, as summarized
26 in Chapter 4, Approach to Environmental Analyses.

27 17.3 Affected Environment

28 This section describes the types of cultural resources that could be potentially
29 affected by the implementation of the alternatives considered in this EIS.
30 Changes in areas with cultural resources due to changes in CVP and SWP
31 operations may occur at reservoirs that store CVP and SWP water and on lands
32 that use CVP and SWP water supplies in the Trinity River, Central Valley, San
33 Francisco Bay Area, and Central Coast and Southern California regions.

1 **17.3.1 Prehistoric Context**

2 **17.3.1.1 Introduction to the Prehistoric Context**

3 The study area has a long and complex cultural history with distinct regional
4 patterns that extend back more than 11,000 years (Reclamation 1997). The first
5 generally agreed upon evidence for the presence of prehistoric peoples in the
6 study area is represented by the distinctive fluted spear points called Clovis
7 points. These artifacts have been found on the margins of extinct lakes in the San
8 Joaquin Valley. The Clovis points are found on the same surface with the bones
9 of animals that are now extinct, such as mammoths, sloths, and camels. The
10 subsequent period from about 10000 to 8000 BP (before present) was
11 characterized by a small number of sites with stemmed spear points instead of
12 fluted spear points. Approximately 8,000 years ago, many California cultures
13 shifted the main focus of their subsistence strategies from hunting to seed
14 gathering as evidenced by the increase in food-grinding implements found in
15 archaeological sites dating to this period. In the last 3,000 years, the
16 archaeological record becomes more complex as specialized adaptations to locally
17 available resources were developed and populations expanded. Many sites dated
18 to this time period contain mortars and pestles or are associated with bedrock
19 mortars, implying that the occupants exploited acorns intensively. The range of
20 subsistence resources that were used increased, exchange systems expanded, and
21 social stratification and craft specialization occurred as indicated by well-made
22 artifacts such as charm stones and beads, which were often found with burials.

23 **17.3.1.2 Prehistory of the Trinity River Region**

24 The Trinity River Region includes portions of Trinity County including Trinity
25 Lake, Lewiston Reservoir, and Trinity River from Lewiston Reservoir to the
26 Humboldt County boundary (near the eastern boundary of Hoopa Valley Indian
27 Reservation); portions of Humboldt County including the Hoopa Valley Indian
28 Reservation, Trinity River from the Humboldt County border to the Del Norte
29 County border (near the confluence of the Trinity and Klamath rivers); and Del
30 Norte County including the Lower Klamath River from the confluence with the
31 Trinity River to the Pacific Ocean.

32 The area surrounding the present Trinity Lake and the Trinity River to its
33 confluence with the Klamath River and along the Klamath River to the Pacific
34 Ocean was inhabited by the Wintu, Chimariko, Yurok, and Hupa Indians at the
35 time of Euroamerican contact.

36 **17.3.1.3 Prehistory of the Central Valley Region**

37 The Central Valley Region extends from above Shasta Lake to the Tehachapi
38 Mountains and includes the Sacramento Valley, San Joaquin Valley, and the
39 Delta and Suisun Marsh areas. The Sacramento Valley and San Joaquin Valley
40 are divided into Eastern and Western subregions.

1 **17.3.1.3.1 Prehistory of the Sacramento Valley**

2 The western Sierra Nevada foothills appear to have been first used by Great Basin
3 people around 8000 BP (Reclamation 1997). By approximately 4000 BP, people
4 possibly from the Great Basin were seasonally hunting and gathering in the Sierra
5 Nevada and the Sacramento Valley.

6 In the northern western portion of Sacramento Valley, between approximately
7 12,000 and 150 years ago (12000 to 100 BP), the prehistoric societies of northern
8 California underwent a series of slow but significant changes in subsistence and
9 economic orientation, population densities and distribution, and social
10 organization. These changes are thought to reflect migrations of various peoples
11 into the area and displacement of earlier populations (Jensen and Reed 1980;
12 Farber 1985; Reclamation 1997). Early archaeological investigations within
13 Nomlaki and Wintu ethnographic territory, particularly the present Redding area
14 and adjacent tracts of the southern Klamath Mountains, appear to indicate that
15 human occupation of this area began approximately 1050 to 950 BP.

16 Little is known of human occupation on the floor of the Sacramento Valley prior
17 to 4500 BP (Reclamation 1997). Because of alluvial and colluvial deposition
18 over the past 10,000 years, ancient cultural deposits have been deeply buried in
19 many areas. Initially, humans appeared to adapt to lakes, marshes, and grasslands
20 environments until approximately 8000 to 7000 BP (Placer County 2007). The
21 earliest evidence of widespread villages and permanent occupation of the lower
22 Sacramento Valley, Delta, and Suisun Marsh areas comes from several sites
23 assigned to the Windmill Pattern (previously, “Early Horizon”), dated circa
24 4500 to 2500 BP (Ragir 1972; Reclamation 1997; Reclamation et al. 2010).

25 From circa 2500 to 1500 BP in the Central Valley area, villages were
26 characterized by deep midden deposits, suggesting intensified occupation and a
27 broadened subsistence base (Reclamation 1997, 2005a; Reclamation et al. 2010;
28 Beardsley 1948; Heizer and Fenenga 1939; Moratto 1984).

29 During the late prehistoric period from 1500 to 100 BP, development may have
30 been initiated due to the southward expansion of Wintuan populations into the
31 Sacramento Valley (Moratto 1984; Reclamation 1997; Reclamation et al. 2010).
32 The period is characterized by intensified hunting, fishing, and gathering
33 subsistence with larger communities, highly developed trade networks, elaborate
34 ceremonial and mortuary practices, and social stratification.

35 **17.3.1.3.2 Prehistory of the San Joaquin Valley**

36 Evidence of prehistoric occupation of the central and southern Sierra Nevada
37 foothills goes back to 9,500 years ago. The vast majority of investigated sites,
38 however, are less than 500 years old, probably representing a relatively recent
39 proliferation of settlements by Yokut Indians (Moratto 1984; Reclamation 1997).
40 The chronological sequence developed in the south-central Sierra Nevada as a
41 result of the Buchanan Reservoir project in present Madera County is still used as
42 a general framework (Reclamation 1997). Similar findings were identified in

1 major settlement sites along the San Joaquin River and in the present New
2 Melones Reservoir area (Reclamation 2010; Reclamation and DWR 2011).

3 During the early Holocene period (10,000 to 12,000 years ago), peoples probably
4 inhabited or passed through the San Joaquin Valley; however, few indications of
5 this period have been discovered, probably due to burial beneath accumulated
6 river sediment (Reclamation 1997, 2012). Examples of early Holocene cultural
7 remains are known primarily from the Tulare Basin in the southern San Joaquin
8 Valley. Evidence along the southern shoreline of the ancient Tulare Lake
9 indicates that human presence may have occurred from 11000 BP (Reclamation
10 and State Parks 2013).

11 From approximately 1650 to 950 BP, there is evidence that the people of the
12 eastern San Joaquin Valley may have interacted with people in the Delta area
13 (Reclamation 1997, 2012).

14 From approximately 450 to 100 BP, the people of the eastern San Joaquin Valley
15 may have interacted with people in the Central Coast and Southern California
16 areas. Material found in Pacheco to Panoche strata indicates a trade relationship
17 with people of the Delta, Central Coast, and Southern California regions (Moratto
18 1984; Reclamation 1997, 2012).

19 **17.3.1.4 Prehistory of the San Francisco Bay Area Region**

20 The San Francisco Bay Area Region only includes portions of the Bay Area that
21 could be affected through implementation of the alternatives considered in this
22 EIS, which includes Contra Costa, Alameda, Santa Clara, and San Benito
23 counties. The prehistory context is different throughout the San Francisco Bay
24 Area Region. Human occupation in the northern valley regions of present San
25 Benito County occurred as described above for the western San Joaquin Valley
26 (San Benito County 2010).

27 Human occupation in the coastal regions of present Contra Costa and Alameda
28 counties occurred as described above for the southern portion of the Sacramento
29 Valley (Reclamation 1997; DWR 2008; Zone 7 2006). From 5000 to 2500 BP,
30 dense settlements extended from the coastal marshes to interior grasslands and
31 woodlands (Zone 7 2006). From about 2500 to 950 BP, coastal communities
32 relied upon shellfish, and major shellmounds were created near these
33 communities, including near the present Alameda County shorelines and some
34 interior valleys.

35 Settlement of the interior valleys of the present Contra Costa, Alameda, and Santa
36 Clara counties occurred during the past 12,000 years. From 6000 to 1700 BP,
37 settlements occurred, as there was less emphasis on nomadic hunting for large
38 animals and increased emphasis on the use of plant materials and hunting, fishing,
39 and shellfish collection (Santa Clara County 2012; CCWD et al. 2009). The
40 communities established economies and traded between the communities.

17.3.1.5 Prehistory of the Central Coast Region

The prehistory of the Central Coast Region for this EIS (present day San Luis Obispo and Santa Barbara counties) is poorly known but may have begun around 11000 BP and probably represents mobile hunter-gatherers (Reclamation 1997; San Luis Obispo County 2010; Santa Barbara 2010). Fishing, intensive shellfish collecting, and hunting began around 9000 BP. Use of milling stones and establishment of communities occurred after about 8500 BP. After about 5000 BP, there was greater reliance on hunting of land and sea mammals, gathering of shellfish, and use of mortars and pestles. Subsequently, larger settlements occurred for ethnographically known peoples, including the Chumash.

17.3.1.6 Prehistory of the Southern California Region

The Southern California Region includes the present Ventura, Los Angeles, Orange, San Diego, Riverside, and San Bernardino counties, which have substantially different prehistory characteristics.

In the coastal areas of the Southern California Region (present Ventura, Los Angeles, Orange, and San Diego counties), early habitation extends over 12,000 years ago (Ventura County 2005; Los Angeles 2005; San Diego County 2011b). Between 12000 and 7500 BP, the inhabitants were hunter-gatherer populations that used land and marine resources. The population along the northern coast of Southern California began expanding between 9000 and 8500 BP. Permanent coastal settlements expanded as plants, shellfish, and marine mammals became a large part of the subsistence (Glassow et al. 2007; Los Angeles 2005). From 5000 to 450 BP, the use of plant materials and exploitation of fish and sea mammals increased sedentism and socioeconomic interaction (Glassow 1999; Los Angeles 2005; San Diego County 2011b).

The interior area within the Southern California Region considered in this EIS includes portions of Riverside and San Bernardino counties that use SWP water supplies, including the Mojave Desert and the Peninsular Ranges.

Clovis (circa 12000 to 10000 BP) is the only cultural complex dating from the Pleistocene that can be consistently identified in the Mojave Desert (Sutton et al. 2007). The Clovis culture characteristics appear to be associated with Paleo-Indian groups as big game hunters. More recently, there have been indications that the people had greater cultural and economic diversity than previously recognized (CDFG 2009). Paleo-Indian groups were likely small, highly mobile populations living in small, temporary camps near permanent water sources (Sutton et al. 2007).

From 10000 and 8000 BP, communities were organized around relatively small social units (Sutton et al. 2007; Riverside County 2000). From 7000 to 4000 BP, hunting continued while foraging subsistence transformed during this period to more collection of plant and animal materials within adjacent ecological zones (CDFG 2009; Riverside County 2000; Sutton et al. 2007). Between 4000 and 1750 BP, permanent seasonally occupied settlements occurred in the lower valley with the use of oak woodlands and mesquite groves (Riverside County 2000; Sutton et al. 2007).

1 From 1750 to 850 BP, communities increased and trade between communities
2 expanded (CDFG 2009; Gardner 2002, 2006; Riverside County 2000;
3 Sutton et al. 2007; Sutton 1988, 1996; Warren and Crabtree 1986). During this
4 period, the lower Coloradan culture became more prevalent along the shoreline of
5 the Lake Cahuilla area (site of the present Salton Sea and Coachella Valley Water
6 District) (Riverside County 2000). The lower Coloradans relied upon shellfish,
7 fish, aquatic birds, marsh and riparian vegetation, and mammals. The culture may
8 have been influenced by the Anasazi settlements of present Southern Nevada,
9 including cultivation of corns, beans, and squash. The Anasazi people also
10 occupied portions of present San Bernardino County where turquoise was mined.
11 Extensive trading occurred between the people in the inland areas and the people
12 along the coast.

13 After about 850 BP, populations appeared to decline, and several cultural
14 complexes emerged (Sutton et al. 2007). Late Prehistoric occupation sites were
15 based on hunting and gathering, especially of plant foods and small game
16 (Riverside County 2000). Villages in Antelope Valley began to disappear in the
17 later prehistoric times, probably due to the disappearance of lakes that were the
18 headwaters of the Mojave River or changes in trade route locations (DWR 2009).
19 Lake Cahuilla declined around 450 BP and the large populations dispersed to the
20 Colorado River, western Peninsular Ranges in present western Riverside County,
21 and the Pacific Ocean coast (Riverside County 2000).

22 **17.3.2 Ethnographic Context**

23 **17.3.2.1 Introduction to Ethnographic Context**

24 This section provides brief ethnographic sketches for each native cultural group
25 whose traditional territories are within the study area. Each ethnographic sketch
26 presents the territorial limits of each respective cultural group and then focuses
27 mainly on those aspects of culture that are potentially represented in the
28 archaeological record.

29 The study area encompasses lands occupied by more than 40 distinct Native
30 American cultural groups. Although most California tribes shared similar
31 elements of social organization and material culture, linguistic affiliation and
32 territorial boundaries primarily distinguish them from each other. Before
33 European settlement of California, an estimated 310,000 native Californians
34 spoke dialects of as many as 80 mutually unintelligible languages representing
35 six major North American language stocks (Cook 1978; Moratto 1984;
36 Reclamation 1997; Shipley 1978).

37 **17.3.2.2 Ethnography of the Trinity River Region**

38 The Trinity River Region includes portions of Shasta, Trinity, Siskiyou,
39 Humboldt, and Del Norte counties. This area is bounded by the Sacramento
40 River on the east, the Pacific Ocean on the west, and the middle and upper
41 Klamath Basin on the north. The ethnography of the Yurok, Hupa, Wintu, and
42 Chimariko is described below.

1 **17.3.2.2.1 Yurok**

2 The Yurok inhabited California's northwestern coastline from Little River to
3 Damnation Creek; along the Klamath River from the confluence with the Pacific
4 Ocean up past the Klamath-Trinity confluence to Slate Creek; and approximately
5 6 miles along the Trinity River upstream of the confluence with the Klamath
6 River (Pilling 1978; USFWS et al. 1999). The Yurok life, communities, society,
7 and ceremonies are deeply connected with the Klamath River (DOI and CDFG
8 2012). Yurok culture and traditional stories describe that the Klamath River was
9 created to facilitate the interaction with two neighboring people, the Hupa and the
10 Karuk, and with the salmon that lived in the Klamath River. Both the Hupa and
11 Karuk culture and traditional stories also describe this close interaction of the
12 peoples, salmon, and Klamath River.

13 Yurok are recognized for their highly stylized art forms and their skills in making
14 redwood canoes, weaving fine baskets, hunting, and especially riverine salmon
15 fishing. The ancient traditions are continued through contemporary times
16 (USFWS et al. 1999). The redwood canoes for ocean conditions can be 30 to
17 40 feet in length, designed to haul large amounts of fish and seal carcasses, and
18 paddled by 5 to 20 paddlers (DOI and CDFG 2012). The canoes are used to
19 gather food and materials, transport people and materials, and for ceremonial
20 aspects of the Yurok culture. The Jump and Deerskin ceremonies are held in late
21 fall to give thanks for abundant food supplies. The Deerskin Ceremony includes a
22 Boat Ceremony in which the participants travel down the Klamath River to thank
23 the river for continuing to flow and provide resources.

24 **17.3.2.2.2 Hupa**

25 The Hupa inhabited the area surrounding the lower reaches of the Trinity River
26 from approximately Salyer to approximately 6 miles upstream from the
27 confluence with the Klamath River (Wallace 1978a; USFWS et al. 1999). Hupa
28 life is defined by extended families affiliated with villages.

29 The Hupa believe that the Klamath and Trinity rivers were created to provide
30 interaction with other peoples (Yurok and Karuk) and with the salmon (DOI and
31 CDFG 2012). Many of the Hupa ceremonies highlight their relationship with the
32 rivers, including world renewal ceremonies and ceremonies for bountiful harvests.
33 The world renewal ceremonies include the White Deerskin and Jump ceremonies
34 to honor the earth and the creator for providing food and other resources. The
35 ceremonies for bountiful harvest of fish and acorns include the First Salmon
36 ceremony and the Acorn Feast.

37 **17.3.2.2.3 Wintu**

38 When the Europeans and Americans first explored California, most of the western
39 side of the Sacramento Valley north of about Suisun Bay was inhabited by
40 Wintun-speaking people (USFWS et al. 1999). Early in the anthropological study
41 of the region, a linguistic and cultural distinction was recognized between the
42 Wintun-speaking people in the southwestern Central Valley (the Patwin) and the

1 people occupying the northwestern Central Valley and Trinity River Valley
2 (LaPena 1978; USFWS et al. 1999).

3 **17.3.2.2.4 Chimariko**

4 The Chimariko lived in a 20-mile-long reach of the Trinity River from
5 approximately Big Bar to the confluence with the South Fork (Silver 1978a;
6 USFWS et al. 1999). Although the Chimariko language is now extinct, early
7 ethnographers recorded some words, and the language is thought to be of Hoka
8 stock.

9 **17.3.2.3 Ethnography of the Central Valley Region**

10 **17.3.2.3.1 Ethnography of the Sacramento Valley**

11 *Maidu, Konkow, and Nisenan*

12 Maidu (also known as northeastern Maidu), Konkow (also known as northwestern
13 Maidu), and Nisenan (also known as southern Maidu) inhabited an area of
14 California from Lassen Peak to the Cosumnes River, and from the Sacramento
15 River to Honey Lake (Reclamation 1997; Shipley 1978). Northeastern Maidu
16 territory extended from Lassen Peak on the west to Honey Lake on the east,
17 Sierra Buttes on the south, and Eagle Lake on the north. The Konkow inhabited
18 the region from the Lower Feather River in the north, to the Sutter Buttes in the
19 south, and to the west beyond the Sacramento River. The Nisenan lived in the
20 area east of the Sacramento River and along the Middle Fork Feather River, Bear
21 River, American River, and Cosumnes River from the Sacramento River
22 almost to Lake Tahoe (Riddell 1978; Wilson and Towne 1978; Reclamation
23 1997, 2005b).

24 *Yana*

25 The Yana of north-central California inhabited an area from Lassen Peak and the
26 southern Cascade foothills on the east, Rock Creek on the south, Pit River on the
27 north, and the eastern bank of the Sacramento River on the west. The western
28 boundary is the most uncertain (J. Johnson 1978a; Reclamation 1997).

29 *Achumawi, Atsugewi, and Shasta*

30 The Achumawi and Atsugewi of northeastern California are two linguistically and
31 culturally distinct but related groups (Reclamation 1997). The Achumawi and
32 Atsugewi languages belong to the Palaihnihan family, or Hoka stock. The
33 territory of the Achumawi extended generally to Mount Lassen, west to Mount
34 Shasta, northeast to Goose Lake, and east to the Warner Range (Kroeber 1925;
35 Olmsted and Stewart 1978; Garth 1978; Reclamation 1997). Overlapping this
36 area to some extent, the Atsugewi territory ranged from Mount Lassen in the
37 southwest, the Pit River in the north, and Horse Lake to the east.

38 The Shasta peoples were originally thought to be associated with the Achumawi
39 and Atsugewi but then were considered as a separate group (Kroeber 1925;
40 Reclamation 1997; Shipley 1978). The Shasta peoples inhabited the area from
41 southern Oregon at the Rogue River, south to the present Cecilville, and the area
42 between the Marble and Salmon mountains to Mount Shasta in the west and the

1 Cascade Range in the east. In California, the core areas of settlement were in
 2 Shasta Valley, Scotts Valley, and along the Klamath River from about Scotts
 3 River to the town of Hornbrook (Silver 1978b).

4 *Plains Miwok*

5 The Plains Miwok established villages along river courses in the foothills located
 6 east of Sacramento and the Delta (Reclamation 2005b).

7 *Nomlaki*

8 Two major divisions existed among the Nomlaki: the River and Hill Nomlaki
 9 (Goldschmidt 1978; DuBois 1935; Reclamation 1997). The River Nomlaki
 10 occupied the Sacramento River Valley in present eastern Tehama County. The
 11 Hill Nomlaki occupied the eastern side of the Coast Ranges in present Tehama
 12 and Glenn counties. The Nomlaki and Wintu conducted trading between the
 13 peoples (Goldschmidt 1978; DuBois 1935; Reclamation 1997).

14 *Patwin*

15 The Patwin lived along the western side of the Sacramento Valley from the
 16 present Princeton to Benicia, including Suisun Marsh (Kroeber 1925;
 17 Reclamation 1997; Reclamation et al. 2010). Within this large area, the Patwin
 18 have traditionally been divided into River, Hill, and Southern Patwin groups.
 19 Settlements generally were located on high ground along the Sacramento River or
 20 tributary streams, or in the eastern Coast Range valleys. The ethnographically
 21 recorded villages of Aguasto and Suisun were located near San Pablo and Suisun
 22 bays (P. Johnson 1978b; Reclamation 1997; Reclamation et al. 2010).

23 **17.3.2.3.2 Ethnography of the San Joaquin Valley**

24 *Eastern Miwok*

25 The Miwok cultures in present California include the Coast Miwok, Lake Miwok,
 26 and Eastern Miwok divisions. The Eastern Miwok included five separate groups
 27 (Bay, Plains, Northern Sierra, Central Sierra, and Southern Sierra) that inhabited
 28 the area from present Walnut Creek in Contra Costa County and the Delta, along
 29 the lower Mokelumne and Cosumnes rivers and along the Sacramento River from
 30 present Rio Vista to Freeport, the foothill and mountain areas of the upper
 31 Mokelumne River and Calaveras River watersheds, the upper Stanislaus River
 32 and Tuolumne River watersheds, and the upper Merced River and Chowchilla
 33 River watersheds, respectively (Levy 1978a; Reclamation 1997; Shipley 1978).
 34 No one Miwok tribal organization encompassed all the peoples speaking
 35 Miwokan languages, nor was there a single tribal organization that encompassed
 36 an entire division.

37 *Yokuts*

38 Yokuts are a large and diverse number of people in the San Joaquin Valley and
 39 Sierra Nevada foothills of central California, including the Southern San Joaquin
 40 Valley Yokuts, Northern San Joaquin Valley Yokuts, and Foothill Yokuts
 41 (Reclamation 1997; Reclamation et al. 2011a; SJRRP 2011). The three
 42 subdivisions of the Yokuts languages belong to the Yokutsan family, or Penutian
 43 stock (Shipley 1978).

1 The Southern Valley Yokuts inhabited the southern San Joaquin Valley from
2 present Fresno to the Tehachapi Mountains (Wallace 1978b). The Northern
3 Valley Yokuts inhabited the northern San Joaquin Valley from Bear Creek to the
4 San Joaquin River near present Mendota, western San Joaquin Valley near present
5 San Luis Reservoir, and eastern present Contra Costa and Alameda counties
6 (ECCCHCPA et al. 2006; Wallace 1978c; Reclamation and State Parks 2012;
7 Reclamation and DWR 2011). The Foothill Yokuts inhabited the western slopes
8 of the Sierra Nevada foothills from the Fresno River to the Kern River (Spier
9 1978b; Reclamation and State Parks 2013). Yokuts were mobile hunters and
10 gatherers with semipermanent villages and seasonal travel corridors to food
11 sources.

12 The Yokuts probably traded with the Costanoan people from the coastal areas
13 based upon the abalone and other mussel shells found in settlement sites
14 (Reclamation and State Parks 2012).

15 *Dumna and Kechayi*

16 The Dumna and Kechayi lived along the San Joaquin River in the Sierra Nevada
17 foothills near the present Millerton Lake (Reclamation and State Parks 2013).

18 **17.3.2.4 Ethnography of the San Francisco Bay Area Region**

19 Native inhabitants of the San Francisco Bay Area Region include the Miwok,
20 Cholvon Northern Valley Yokuts, and the Costanoan Indians (Reclamation 1997;
21 CCWD et al. 2009; ECCCHCPA et al. 2006; EBMUD 2009; Reclamation 2005b;
22 Santa Clara County 2012; San Benito County 2013).

23 **17.3.2.4.1 Miwok**

24 In the San Francisco Bay Area Region, the Coast Miwok people lived along lower
25 San Joaquin River and San Pablo Bay and in the interior of the present Contra
26 Costa and Alameda counties (Reclamation 1997; ECCCHCPA et al. 2006; Kelly
27 1978). The Bay Miwok villages were located in the San Ramon Valley with other
28 settlements on the western slopes of the Diablo Range. The Volvons, speakers of
29 the Bay Miwok language, settled along Marsh Creek and Kellogg Creek on the
30 northern side of the Diablo Range and near the present Los Vaqueros Reservoir
31 (CCWD et al. 2009). The Miwok people may have held lands at the peak of
32 Mount Diablo.

33 **17.3.2.4.2 Costanoan**

34 The Costanoans (also known as Ohlone) are a linguistically defined group with
35 several autonomous tribelets that speak related languages (Levy 1978b;
36 Reclamation 1997; EBMUD 2009; Zone 7 2006; Santa Clara County 2012). The
37 Costanoans inhabited coastal shorelines along San Francisco, San Pablo, and
38 Suisun Bay and along the Pacific Ocean Coast from the Golden Gate to Monterey
39 Bay and interior valleys that extended approximately 60 miles inland, including
40 areas within Santa Clara and San Benito counties (Reclamation 1997;
41 ECCCHCPA et al. 2006; San Benito County 2010).

1 **17.3.2.5 Ethnography of the Central Coast Region**

2 The Central Coast Region considered in this EIS includes the coastal areas of
3 present San Luis Obispo and Ventura counties. This area was home to the
4 Salinan, Chumash, and Tataviam people.

5 The Salinan territory extends from about the present location of Soledad
6 (Monterey County) to San Luis Obispo (Hester 1978). The Chumash are
7 considered to have been one of the most elaborate cultures in California. The
8 Chumash culture is characterized by large villages with social ranking, intensive
9 trade, craft specialization, and well-developed art styles (Grant 1978b;
10 Greenwood 1978; Kroeber 1925; Moratto 1984; Reclamation 1997; San Luis
11 Obispo County 2010; Santa Barbara 2010; Santa Barbara County 2010). The
12 Chumash inhabited the central coastal area of California from approximately
13 present San Luis Obispo to Malibu Canyon and inland to western San Joaquin
14 Valley.

15 **17.3.2.6 Ethnography of the Southern California Region**

16 The coastal portion of the Southern California Region considered in this EIS
17 includes the present Ventura, Los Angeles, Orange, and San Diego counties. The
18 interior portion of the Southern California Region includes the present western
19 and central Riverside County and western San Bernardino County.

20 **17.3.2.6.1 Prehistory of Southern California Region, Coastal Portion**

21 The Chumash and Tataviam people lived in the present Ventura County and
22 northern Los Angeles County areas. The ethnography of the Chumash people is
23 similar to that described above for the Central Coast Region. The Tataviam
24 people lived inland of the Chumash and Gabrielino on the upper reaches of the
25 Santa Clara River drainage east of Piru Creek and extending over the Sawmill
26 Mountains to the edge of the southwestern Antelope Valley (King and
27 Blackburn 1978).

28 The Gabrielino and Juaneño people lived in the present Los Angeles and Orange
29 counties areas. The Gabrielino (also known as Gabrielino Tongva or Gabrieleño)
30 occupied the Southern California coast in the vicinity around Mission San
31 Gabrielal areas. The Juaneño occupied the area around the mission (Bean and
32 Smith 1978; Los Angeles 2005; Riverside County 2000). These people traded
33 with other people in Southern California.

34 The Luiseño and Tipai-Ipai people lived in the present Orange and San Diego
35 counties areas. The Luiseño occupied most of the San Luis Rey and Santa
36 Margarita River drainages near San Luis Rey Mission (Bean and Shipek 1978).
37 The Luiseño shared many cultural traits with the Gabrielino and Chumas people.
38 The Tipai-Ipai (also known as Kumeyaay) occupied extreme Southern California
39 and Northern Baja California in autonomous, seminomadic bands of patrilineal
40 clans (Luomala 1978; San Diego County 2011b; CDFG 2009). The Ipai occupied
41 the areas north of the San Diego River, and the Tipai occupied the area south of
42 the San Diego River (San Diego County 2011b).

1 **17.3.2.6.2 Prehistory of Southern California Region, Interior Portion**

2 The Cahuilla, Serrano, Tubatalabal, Kawaiisu, and Quechan people lived in
3 present Riverside, eastern Los Angeles, southeastern Kern, and western San
4 Bernardino counties. The Tubatalabal also lived in the southeastern San Joaquin
5 Valley in present southeastern Kern County.

6 *Cahuilla*

7 The Cahuilla lived inland within present Riverside County. Villages were located
8 in canyons or on alluvial fans close to food and water sources. The Cahuilla
9 interacted frequently with other people in Southern California (Bean 1978;
10 Riverside County 2000).

11 *Serrano*

12 The Serrano lived in the San Bernardino Mountains within present northeastern
13 Los Angeles County and southwestern San Bernardino County and in the
14 northwestern valleys and mountains of Riverside County. Villages were located
15 close to food and water sources along perennial streams and lakes. The Serrano
16 interacted frequently with other people in Southern California (Riverside County
17 2000; DWR 2009).

18 *Kawaiisu*

19 The Kawaiisu occupied a mountainous area between the Mojave Desert and the
20 southern San Joaquin Valley, mostly in Kern County, and the Tehachapi Valley
21 (Zigmond 1986; California State Parks 2014). The Kawaiisu lived in permanent
22 winter villages and traveled during the warmer months into the Mojave Desert
23 and Antelope Valley. They traded and interacted with neighboring groups,
24 including the Chumash, Yokuts, and Tubatalabal people.

25 *Quechan*

26 The Quechan were Yuman people that occupied areas along the Colorado River
27 and adjacent valleys, including present Coachella and Imperial valleys (Riverside
28 County 2000). The Quechan had a strong tribal identity and traveled extensively
29 for trade.

30 **17.3.3 Historical Context**

31 The historical context presented in this section is focused on historical activities
32 and resources that affected and/or were affected by implementation of water
33 resource actions of CVP and SWP water users. Changes in CVP and SWP
34 operations under implementation of alternatives considered in this EIS could not
35 only affect CVP and SWP facilities. These changes also could affect regional and
36 local water supplies, reservoirs, and associated land uses of those that use CVP
37 and SWP water.

38 **17.3.3.1 Introduction to Historical Context**

39 Initial contact with Europeans and Americans occurred with Spanish missionaries
40 and soldiers, who entered California from the south in 1769, eventually founding
41 21 missions along the California coast (Reclamation 1997). This period is
42 characterized by the establishment of missions and military presidios, the

1 development of large tracts of land owned by the missions, and subjugation of the
2 local Indian population for labor. This way of life began to change in 1822 when
3 Mexico became independent of Spain. The mission lands were divided by
4 government grants into large ranchos often consisting of tens of thousands of
5 acres. The owners of these large *estancias* built homes, often of adobe, and
6 maintained large herds of cattle and horses.

7 During the Spanish and Mexican periods, explorers entered the region. Fort Ross
8 on the Sonoma coast was established by the Russians from 1812 until 1841 to
9 support hunting, fishing, and whaling businesses (Reclamation 1997). American
10 explorer Jedediah Smith and Peter Skene Odgen, Chief Trader for the Hudson
11 Bay Company, with other members of the Hudson Bay Company also came to
12 California during this period.

13 In 1848, the Treaty of Guadalupe Hidalgo transferred the lands of California from
14 the Mexican Republic to the United States and initiated what is called the
15 American Period in California history (Reclamation 1997). During that same
16 year, gold was discovered in the foothills of the Sierra Nevada, and thousands of
17 hopeful miners as well as storekeepers, settlers, and farmers entered the region.
18 Mining in the Trinity River Region was expanded for both gold and copper mines
19 (Placer County 2007).

20 To support this growth, extensive transportation systems were created to support
21 wagon routes, steamboats on the major rivers, and numerous railroads
22 (Reclamation 1997). Many of the supply centers and shipment points along these
23 transportation corridors developed into cities, towns, and settlements. Logging
24 and ranching also expanded to meet the needs of the new settlers. American
25 ranchers found Central California ideally suited for grazing large herds of stock.
26 During the latter part of the 19th century, American ranchers amassed large tracts
27 of former rancho land, and several great cattle empires were formed. As
28 settlements grew, farming increased. A primary constraint to expansion of crop
29 diversity and areas under cultivation was the lack of water. Irrigation was
30 virtually unknown in California until the 1880s, when large-scale irrigation
31 systems were developed to improve agriculture yields. With the development of
32 irrigation and improved transportation, new crops were added to the grains
33 obtained from dry farming, including vegetables, fruits, and nuts.

34 Irrigation capabilities further expanded in the 1950s and 1960s with the
35 implementation of multiple water projects. The availability of water also
36 expanded the agricultural and urban water supplies in the Central Valley,
37 San Francisco Bay Area, Central Coast, and Southern California regions.

38 **17.3.3.2 History of the Trinity River Region**

39 Explorers from the Philippines and Europe may have visited and interacted with
40 the Yurok people as early as the late 1700s. Peter Skene Odgen and Jedediah
41 Smith initially visited the Lower and Middle Klamath River reaches in the 1820s.
42 In 1828, Jedediah Smith and his party of explorers were the first white men
43 known to have visited the Trinity River watershed (USFWS et al. 1999).

1 Although the area was first used extensively by trappers, gold was discovered on
2 the Trinity River in 1848, and by the late 1840s, gold mining was a major activity
3 along the Trinity River (Hoover et al. 1990; Del Norte County 2003; USFWS
4 et al. 1999). Weaverville was the center of gold mining activity after 1849 with
5 numerous mining camps and settlements along the Trinity River. Mining
6 continued along the Trinity River through the early and mid-1900s with
7 large-scale dragline and bucket dredging operations beginning in 1939.
8 Logging has occurred since the 1880s and continues in the Trinity River Region.
9 These activities resulted in significant changes to rivers and may have caused
10 the destruction of many prehistoric or historic archaeological sites (Hoover
11 et al. 1990).

12 Increased activities within the Trinity River Region led to conflicts between the
13 new residents and the Yurok and Hupa people. On November 16, 1855, the
14 Klamath Indian Reservation was established by Executive Order for lands from
15 the mouth of the Klamath River to a location upstream of Tectah Creek that
16 extended 1 mile wide on either side of the river for the approximately 20-mile
17 reach (DOI and CDFG 2012). The Hoopa Valley Reservation was established in
18 1864 and expanded in 1891 to include lands from the mouth of the Klamath River
19 to the Hoopa Valley that extended 1 mile wide on either side of the river
20 including portions of the Klamath Indian Reservation. In 1988, the Hoopa-Yurok
21 Settlement Act (Public Law 100-580) partitioned portions of the previously
22 established reservations into the Yurok Indian Reservation and Hoopa Valley
23 Reservation and established the Resighini Rancheria.

24 **17.3.3.3 History of the Central Valley Region**

25 **17.3.3.3.1 History of the Sacramento Valley**

26 Europeans, Americans, and Canadians may have initially entered the Sacramento
27 Valley in the late 1700s and early 1800s as part of missionary or military
28 expeditions (Reclamation 1997, 2005a; Reclamation et al. 2006; Placer County
29 2007). By 1776, Jose Canizares explored areas located south of the present
30 Sacramento community, and in 1813, there was a major battle between the
31 Spanish and the Miwok people near the confluence of the Cosumnes River along
32 the Sacramento River. Fur trappers moved through this area from the 1820s
33 to 1840s.

34 The first settlements in this area occurred in the 1830s and 1840s on Mexican
35 Land Grants. The New Helvetica Land Grant, which included more than
36 40,000 acres in the Sacramento Valley, was awarded to John Sutter in 1841
37 (DSC 2011).

38 Following the discovery of gold on the New Helvetica Land Grant in 1848 near
39 present-day Coloma, numerous mining-related settlements were established in
40 areas with the Nisenan, Maidu, Konkow, and Atsugewi people in the eastern
41 portion of the Sacramento Valley and in areas with the Nomlaki and Wintu people
42 in the western Sacramento Valley. Many of the Native Americans died after

1 exposure to diseases from the new settlers, including malaria. Numerous other
2 Native American died during battles against the new settlers.

3 Mining activities in the northern Sacramento Valley foothills and mountains near
4 present Redding primarily were related to gold and copper (Reclamation 2013a).
5 Mining activities in the central Sierra Nevada foothills primarily were related to
6 gold. In 1848, mining started along the Trinity River and upper Sacramento River
7 tributaries, primarily for copper and gold (Reclamation 2013a; Reclamation et al.
8 2006). Smelters, mills, and communities grew rapidly near the mining areas,
9 including the town of Keswick, and communities were established within and
10 adjacent to the present day Folsom Lake. The development of hydraulic mining
11 in 1851 required establishment of substantial water diversions, flumes, and
12 ditches to convey the water and displacement of vast amounts of sediment into the
13 streams and along the banks of the waterways.

14 Logging also was a dominant industry in the western Sacramento Valley since the
15 1850s (Reclamation 1997, 2013a). The logging industry grew as the railroads
16 were extended. Establishment of logging in the Sierra Nevada foothills and
17 mountains also led to development of water infrastructure to move and/or mill the
18 logs. One of the first water system infrastructures developed for these purposes
19 was the original Folsom Dam constructed in 1893 (Reclamation et al. 2006).

20 Agricultural activities were successful throughout the Sacramento Valley to serve
21 the mining communities (Reclamation 1997). The completion of the first
22 transcontinental railroad in 1869 increased the number of settlers and allowed
23 transport of crops from the Sacramento Valley to Nevada, Utah, and subsequently
24 to other areas of the nation (Reclamation 2005b). The expanded agricultural
25 markets expanded due to the establishment and development of commercial
26 crops, accessibility to markets, and new farming techniques and irrigation.

27 Construction of hydroelectric power and water storage facilities in the Sacramento
28 Valley foothills started in the early 1900s to provide hydropower and water
29 supplies to local and regional users, as well as export to other portions of the state
30 using CVP, SWP, City and County of San Francisco, and East Bay Municipal
31 Utility District facilities.

32 **17.3.3.3.2 History of the San Joaquin Valley**

33 The San Joaquin Valley area was not widely settled by Europeans or Mexicans
34 when California lands were under Spanish rule (1769 to 1821) or Mexican rule
35 (1821 to 1848). Numerous expeditions travelled through the San Joaquin Valley
36 during this period but did not establish major settlements (Reclamation 2010).
37 During the Spanish rule, several settlements occurred along Fresno Slough
38 (Reclamation and State Parks 2012; Reclamation and DWR 2011). There were
39 several settlements along the San Joaquin River and along the western boundary
40 of the San Joaquin Valley during Mexican rule when ranches were established in
41 the Coast Range foothills, including in Pacheco Pass and along Los Banos Creek.

42 In the latter half of the 19th century, agricultural settlements and mining camps
43 were established in the San Joaquin Valley along the railroad corridors

1 (Reclamation 1997; Reclamation and DWR 2011). The town of Rootville,
2 subsequently renamed Millerton in honor of Major Miller, was established near
3 the present Millerton Lake with a military post, Camp Barbour (later named Fort
4 Miller) to maintain order in the mining camps.

5 Initially, agricultural activities were related to ranching and dry farming.
6 Livestock ranching expanded in the late 1860s (Reclamation et al. 2011b). With
7 the increased availability of electric pumps, groundwater and surface water
8 irrigation was used throughout the valley. Many irrigation districts were formed
9 after the passage of the Wright Act in 1877 that provided methods to finance
10 major irrigation projects. One of the first irrigation systems constructed in the
11 eastern San Joaquin Valley was the “Main Canal” as part of the Miller and Lux’s
12 San Joaquin and Kings River Canal and Irrigation Company (Reclamation and
13 State Parks 2013).

14 Historic resources are related to the settlement of the valley and include
15 homesteads, transportation infrastructure (such as ship landings, ferry ports, and
16 bridges), food processing and other industrial facilities, residential properties,
17 commercial establishments, mining features (in the eastern portion), and
18 government facilities (Reclamation 1997, 2010; Reclamation and DWR 2011).

19 **17.3.3.3 History of the Delta and Suisun Marsh**

20 Communities were not established in the Delta and Suisun Marsh areas until the
21 mid-1800s. There were numerous Spanish expeditions under Spanish rule. In the
22 1830s and 1840s, Mexico established land grants, including Rancho Suisun
23 located west of present City of Fairfield (Reclamation et al. 2010).

24 Following the discovery of gold in the Sacramento Valley, settlements occurred in
25 the Delta to provide support services and agricultural products for those traveling
26 to the gold fields and the Sacramento and San Francisco areas. Passage of the
27 Swamp and Overflow Act in 1850 led to the transfer of lands from the U.S.
28 Government in the Delta to the State of California, which subsequently sold the
29 land to individuals. The new settlers in the Delta constructed levees to protect the
30 lands from periodic flooding and drained other lands to reduce the potential for
31 mosquito-borne diseases. By the 1920s, numerous communities were established
32 around food processing and packing houses that supported a wide range of crops
33 such as asparagus, barley, celery, corn, winter grain, sugar beets, onions, and
34 alfalfa for local dairy farms were introduced to the area (DSC 2011; Reclamation
35 et al. 2010). By the 1950s, major food packers and processors moved from the
36 Delta, and many communities became smaller. Recreational opportunities were
37 established in the 1850s with duck hunting opportunities in the Suisun Marsh
38 area.

39 **17.3.3.4 History of the San Francisco Bay Area Region**

40 In 1579, Sir Francis Drake and other Spanish explorers led expeditions into the
41 San Francisco Bay Area. However, in general, the Spanish did not settle Northern
42 California until the 1700s when other Europeans established trading settlements
43 for fur, mining, and other products. Initially, the Spanish confined their

1 settlement to the coastline to establish military bases, or presidios (Hoover et al.
 2 1990). Father Junipero Serra and other Franciscans worked with the Spanish
 3 explorers to establish missions along the Alta California coastal areas between
 4 present Sonoma County (San Francisco Solano established in 1823) to present
 5 Ventura County (San Buenaventura established in 1782), including three missions
 6 in areas that use CVP and SWP water (Mission San Jose established in 1797,
 7 Mission Santa Clara established in 1777, and Mission San Juan Bautista
 8 established in 1797).

9 San Jose was one the first towns established in Alta California as Pueblo de San
 10 José de Guadalupe (Santa Clara County 2012). The Spanish government awarded
 11 land grants in the San Francisco Bay Area Region (DWR 2008; EBMUD 2009;
 12 Hoover et al. 1990; Reclamation 2005b; San Benito County 2010; Zone 7 2006).
 13 In 1821, Mexico won independence from Spain, began to establish more secular
 14 communities around the missions, and divided many of the ranchos into smaller
 15 pueblos (Santa Clara County 2012). These actions supported growth in the
 16 present California coastal areas.

17 Following California statehood in 1849, ranching and farming communities were
 18 established in the interior valleys of the San Francisco Bay Area Region (Santa
 19 Clara County 2012; CCWD et al. 2009; ECCCHCPA et al. 2006). Starting in the
 20 late 1800s, expansion of the railroads in the area and use of improved irrigation
 21 systems led to the expansion of agriculture throughout the area. In mid-1900s,
 22 industrial expansion occurred in Contra Costa, Alameda, and Santa Clara
 23 counties.

24 **17.3.3.5 History of the Central Coast Region**

25 In 1542, Portuguese explorer Juan Rodríguez Cabrillo entered Santa Barbara
 26 Harbor (Puerto de Santa Bárbara). In 1587, Pedro de Unamuno brought his ship
 27 into Morro Bay, explored inland to the present site of the City of San Luis
 28 Obispo, and claimed the area for Spain. In 1595, Sebastián Rodríguez Cermeño
 29 entered San Luis Obispo Bay (Hoover et al. 1990). The explorations laid the
 30 foundation for the founding of five missions in the Central Coast Region
 31 considered in this EIS. Ranchos were granted throughout the region in the 1830s
 32 and 1840s.

33 Following the California statehood, ranching and farming continued to be the
 34 main economic activity of the Central Coast Region to the present.

35 **17.3.3.6 History of the Southern California Region**

36 In 1540, Hernando de Alarcón explored the inland areas of the Southern
 37 California Region with an expedition that had explored the Colorado River. In
 38 1542, Cabrillo apparently became the first European to sight the coast of Southern
 39 California, including the Los Angeles area and Santa Catalina Island, although he
 40 did not make landfall (Hoover et al. 1990).

41 In 1769, Gaspar de Portolá explored a trail by land from present San Diego
 42 through present San Diego, Orange, and Los Angeles counties (Hoover et al.
 43 1990). He camped near the Los Angeles River and the Indian Village of Yang-Na

1 (within the present City of Los Angeles). In 1772, Pedro Fages made an inland
2 journey from present San Diego through western Riverside County to San Luis
3 Obispo (Hoover et al. 1990; Riverside County 2000). In 1776, friar Francisco
4 Garcés explored from present San Gabriel Valley to the Antelope Valley. More
5 than 20 missions were established along the Southern California coastline (Los
6 Angeles 2005). Pueblos were established near the missions, including the Pueblo
7 of Los Angeles in 1781.

8 The first known discovery of gold in California was made between 1775 and 1780
9 in the Potholes district of southeastern California in present Imperial County
10 (Clark 1970). Other placer deposits were found in 1828 at San Ysidro in present
11 San Diego County, and in 1835 and 1842 at San Francisquito Canyon and
12 Placerita Canyon, respectively, in present Los Angeles County (Clark 1970;
13 Vredenburg 1991). Some of the mines continued to produce gold through the
14 early 1990s.

15 Following the end of Spanish Rule, the Mexican Government deeded the
16 extensive land holdings to ranchos to develop ranches and orchards (Riverside
17 County 2000). Oranges and lemons became major agricultural crops between the
18 1850s and 1880s, and railroads were built to transport the products.

19 Water supply systems were constructed to provide water to missions and pueblo
20 villages. One of the first systems was the Zanja Madre that was constructed in
21 1781 to convey water to the pueblo in the present City of Los Angeles (Los
22 Angeles 2005; DWR 2009). The system was expanded in the 1850s and 1860s to
23 convey water to vineyards and fruit orchards. During the late 1800s and early
24 1900s, numerous dams and conveyance facilities were constructed in the area to
25 support the communities and agriculture.

26 **17.3.4 Known Cultural Resources**

27 The following subsections describe known cultural resources in the counties
28 within the study area as determined through review of reports prepared for other
29 projects in the study area. No physical or record surveys were conducted for this
30 EIS because no site-specific construction actions were considered in this EIS.

31 The EIS evaluates alternatives to continue the coordinated long-term operation of
32 the CVP and SWP. The resources described in this subsection indicate the types
33 of resources that occur in areas served by CVP and SWP water and adjacent
34 areas. Therefore, some of the known resources presented in this chapter are
35 located in portions of the counties that are not within the CVP and SWP water
36 service areas.

37 **17.3.4.1 Known Cultural Resources of the Trinity River Region**

38 Within Trinity County, a cultural resources records search of the Trinity River
39 Region was conducted for the Trinity River Mainstem Fishery Restoration
40 EIS/Environmental Impact Report (EIR) (USFWS et al. 1999). The area covered
41 included 660 feet on either side of the Trinity River from Trinity Lake to the
42 eastern boundary of Hoopa Valley Indian Reservation and the inundation areas of
43 the Trinity Lake and Lewiston Reservoir. More than 150 recorded cultural

1 resources were identified along the mainstem of Trinity River within Trinity
 2 County, including 20 types of prehistoric and historic sites. Among these were
 3 Native American villages, camps, and lithic scatters; historic Indian sites; mines;
 4 ditches; cabins; structures; a school; USFWS stations and campgrounds;
 5 cemeteries; a rock wall; trails; a wagon road; and a bridge. Fifty-one sites are
 6 inundated within Trinity Lake and Lewiston Reservoir. Few of these sites have
 7 been evaluated for eligibility to be included in the National Register of Historic
 8 Places (NRHP). With respect to more recent historic sites in Trinity County, none
 9 of the sites listed in the NRHP, California State Historical Landmarks, California
 10 Register of Historical Resources (CRHR), and/or Points of Interest is located
 11 within or along banks of the Trinity River (CSPOHP 2014a).

12 Within Humboldt County, numerous culturally sensitive areas are located along
 13 the Lower Klamath and Lower Trinity rivers. The culturally sensitive areas
 14 include the areas along the riverbanks associated with religious and/or resource-
 15 producing important sites, in addition to specific known cultural resources. Many
 16 cultural resource locations are in the Hoopa Valley Indian Reservation and Yurok
 17 Reservation, including villages, cemeteries, ceremonial and gathering areas, and
 18 along ridgeline corridors that were used for traveling between villages (Humboldt
 19 County 2012). With respect to more recent historic sites in Humboldt County,
 20 none of the sites listed in the NRHP, California State Historical Landmarks,
 21 CRHR, and/or Points of Interest is located within or along banks of the Trinity or
 22 Klamath rivers (CSPOHP 2014b).

23 Within Del Norte County, numerous culturally sensitive areas are located along
 24 the Lower Klamath River, including areas within the Yurok Reservation and the
 25 Resighini Rancheria along the southern shoreline of the mouth of the Klamath
 26 River at the Pacific Ocean (Del Norte County 2003). The mouth of the Klamath
 27 River is of great spiritual significance for the Yurok people (Yurok Tribe 2005).
 28 The Yurok Tribe has suggested that the entire Klamath River, including the
 29 Lower Klamath River, be designated as a Cultural Riverscape and be submitted
 30 for consideration as a NRHP (Yurok Tribe 2005). With respect to more recent
 31 historic sites in Del Norte County, none of the sites listed in the NRHP, California
 32 State Historical Landmarks, CRHR, and/or Points of Interest is located within or
 33 along banks of the Klamath River (CSPOHP 2014c).

34 **17.3.4.2 Previously Recorded Cultural Resources in the Central Valley** 35 **Region**

36 The Central Valley Region is rich in both historic- and prehistoric-period
 37 resources (Reclamation 1997), including large, deep midden sites (which
 38 generally contains waste materials that indicate human inhabitation) that provide
 39 information on prehistoric culture extending over thousands of years.

40 As described above, implementation of the alternatives considered in this EIS
 41 could affect cultural resources at CVP and SWP reservoir facilities and in areas
 42 that use CVP and SWP water that could experience land uses because of changes
 43 in CVP and SWP water supply availability.

1 **17.3.4.2.1 Cultural Resources at CVP and SWP Reservoir Facilities in the**
2 **Sacramento Valley**

3 Previous cultural resource studies were conducted at and/or near Shasta Lake,
4 Lake Oroville, and Folsom Lake.

5 The studies near Shasta Lake surveyed approximately 8 percent of the study area
6 and identified 261 cultural resources, including 190 prehistoric properties,
7 45 historic resources, and 26 properties with prehistoric and historic resources
8 (Reclamation 2013a). The prehistoric sites include habitation sites, artifact and
9 lithic scatters, caves used as shelter, and cemeteries. The historic sites included
10 bridges, railways, a dam, buildings, ranches, orchards, mines, towns, and
11 cemeteries. Several prehistoric and historic cemeteries located within the
12 inundation area were moved prior to completion of the Shasta Lake complex. The
13 Dog Creek Bridge is the only resource in this area that is listed on the NRHP.
14 The Shasta and Keswick dams were determined to be NRHP-eligible.

15 The studies near Lake Oroville identified 261 cultural resources areas, including
16 234 prehistoric properties, 462 historic resources, and 91 properties with
17 prehistoric and historic resources (DWR 2004, 2007). Within the Lake Oroville
18 inundation area, 93 prehistoric properties and 19 historic sites were identified
19 prior to the completion of the reservoir. The prehistoric sites include habitation
20 sites, milling sites, quarries, artifact and lithic scatters, caves used as shelter, rock
21 art, fishing and hunting grounds, battle sites, trails, and cemeteries. The historic
22 sites included bridges, railways, a dam, buildings, ranches, orchards, mines,
23 towns, and cemeteries.

24 Oroville Dam and peripheral dams, Thermalito Diversion Dam, Thermalito
25 Forebay and Afterbay, Fish Barrier Dam, Hyatt Pumping-Generating Plant and
26 Intake Structure, Thermalito Power Plant and Power Canal, Lake Oroville Visitor
27 Center and Visitor Viewing Platform, and Feather River Fish Hatchery were
28 determined to be NRHP-eligible.

29 The studies near Folsom Lake identified 185 prehistoric properties and 59 historic
30 sites (Reclamation 2005b; Reclamation et al. 2006). The prehistoric sites include
31 habitation sites, middens, groundstones, and artifact and lithic scatters. The
32 historic sites included buildings, mining areas, and refuse dumps. Folsom Dam
33 was determined to be NRHP-eligible.

34 **17.3.4.2.2 Cultural Resources at CVP and SWP Reservoir and Pumping**
35 **Plant Facilities in the San Joaquin Valley**

36 Previous cultural resource studies were conducted at and/or near New Melones
37 Reservoir, San Luis Reservoir, and Millerton Lake and San Joaquin River
38 downstream of Friant Dam.

39 The studies near New Melones Reservoir surveyed approximately 78 percent of
40 the study area and identified 725 cultural resources within the New Melones
41 Reservoir area or within 0.25 mile of this area (Reclamation 2010). The
42 prehistoric sites include habitation sites, artifact and lithic scatters, mortars, caves,
43 rock art, and cemeteries. The historic sites included bridges, buildings, ranches,

1 orchards, towns, water and power systems, transportation infrastructure, and
 2 cemeteries. Many of the sites are located within the inundation area. However,
 3 substantial surveys were conducted prior to construction of New Melones
 4 Reservoir in the 1980s.

5 The studies near San Luis Reservoir identified 51 prehistoric and historic cultural
 6 resources (Reclamation and State Parks 2012). The prehistoric sites include
 7 habitation sites and artifact and lithic scatters. The historic sites included bridges,
 8 water infrastructure, buildings, ranches, orchards, towns, and cemeteries. One of
 9 the major historic sites in this area is the remnant locations of Rancho San Luis
 10 Gonzaga. Many portions of the ranch are located within the inundation area.
 11 However, many of the structures were moved to a site near Pacheco Pass. The
 12 remaining portions of the ranch were deeded to the State of California in 1992 to
 13 become part of the Pacheco State Park. Rancho San Luis Gonzaga, a historic
 14 stock ranch landscape, has been designated by the state to be a Historic
 15 District/Cultural Landscape that is potentially NRHP-eligible and CRHR-eligible.

16 Recent studies along the San Joaquin River identified 19 prehistoric sites within
 17 the seasonal inundation area of Millerton Lake (Reclamation and DWR 2011;
 18 Reclamation and State Parks 2013). Additional sites are located within the area of
 19 the lake that is constantly inundated. Some of the known sites include the
 20 remains of Kuyu Illik; the Dumna “head” village; the Kechaye/”Dumna” village
 21 of Sanwo Kianu; remains of Fort Miller, Millerton, and Collins Sulphur Springs;
 22 and prehistoric sites with housepits, mortars, grinding sticks, and rock alignments
 23 (Reclamation and State Parks 2013).

24 Along the San Joaquin River downstream of Friant Dam (which forms Millerton
 25 Lake) to the confluence of the Merced River, 84 prehistoric sites, 18 historic sites,
 26 and 7 sites with both prehistoric and historic resources were identified as part of
 27 the San Joaquin River Restoration Program. The prehistoric sites include
 28 habitation sites, artifact and lithic scatters, and bedrock milling features. The
 29 historic sites included bridges, buildings, ranches, orchards, towns, water and
 30 power systems, and transportation infrastructure.

31 The Friant Dam, Friant-Kern Canal, associated features (berms, siphons, control
 32 structures, inlets, outlets, and check structures), approximately 40 bridges that
 33 cross the canal, and Little Dry Creek Wasteway Facility are considered historic
 34 resources (Reclamation and State Parks 2013; Reclamation et al. 2011b). The
 35 Friant Dam and Friant-Kern Canal was determined to be NRHP-eligible.

36 **17.3.4.2.3 Cultural Resources in the areas that use CVP and SWP Water** 37 **Supplies in the Central Valley**

38 Numerous cultural and historical resources are in the Central Valley, as
 39 summarized in Table 17.1. Most of the cultural resources are located within areas
 40 that would not be affected by land use changes that could result from changes in
 41 CVP and SWP water supplies. The resources listed in Table 17.1 also include the
 42 sites described above near CVP and SWP facilities.

1 **Table 17.1 Previously Recorded Cultural and Historical Resources of the Central**
 2 **Valley Region**

County	Historic Site Types	Prehistoric Site Types
Butte	26 NRHP properties, 8 California Historical Landmarks, and 21 California Points of Historical Interest (Reclamation 1997; CSPOHP 2014e).	1,198 Known Prehistoric Site Types (Reclamation 1997).
Colusa	7 NRHP properties, 3 California Historical Landmarks, and 3 California Points of Historical Interest (Reclamation 1997; CSPOHP 2014g).	115 Known Prehistoric Site Types (Reclamation 1997).
El Dorado	18 NRHP properties, 30 California Historical Landmarks, 8 California Points of Historical Interest; numerous historic sites, such as mining features, building foundations, trash scatters, and bridges, were inundated by Folsom Lake (Reclamation 1997; CSPOHP 2014h).	595 Known Prehistoric Site Types (Reclamation 1997).
Fresno	38 NRHP properties, 8 California Historic Landmarks, and 13 of which are California Points of Historical Interest (Reclamation 1997; CSPOHP 2014i).	2,603 Known Prehistoric Site Types (Reclamation 1997).
Glenn	2 NRHP properties, 2 California Historical Landmarks, and 17 California Points of Historical Interest (Reclamation 1997; CSPOHP 2014j).	373 Known Prehistoric Site Types (Reclamation 1997).
Kern	20 NRHP properties, 47 California Historic Landmarks, and 11 California Points of Historical Interest (Reclamation 1997; CSPOHP 2014k).	3,850 Known Prehistoric and Historic Site Types (Reclamation 1997).
Kings	4 NRHP properties, 3 California Historic Landmarks; the San Luis Canal, the only CVP facility in Kings County, has no historic or architectural resources in its vicinity (Reclamation 1997; CSPOHP 2014l).	56 Known Prehistoric Site Types (Reclamation 1997).
Madera	2 NRHP property, 1 California Historic Landmarks, and 9 California Points of Historical Interest (Reclamation 1997; CSPOHP 2014n).	2,043 Known Prehistoric Site Types (Reclamation 1997).
Merced	14 NRHP properties, 5 California Historic Landmarks, 1 CRHR properties, and 8 California Points of Historical Interest (Reclamation 1997; CSPOHP 2014p).	316 Known Prehistoric Site Types (Reclamation 1997).

County	Historic Site Types	Prehistoric Site Types
Napa	76 NRHP properties, 17 California Historical Landmarks, and 13 California Points of Historical Interest (Reclamation 1997; CSPOHP 2014q).	700 Known Prehistoric Site Types (Reclamation 1997).
Placer	18 NRHP properties, 20 California Historical Landmarks, 21 California Points of Historical Interest; numerous historic sites, such as mining features, building foundations, trash scatters, and bridges, were inundated by Folsom Lake, which is a CVP facility (Reclamation 1997; CSPOHP 2014s).	627 Known Prehistoric Site Types (Reclamation 1997).
Plumas	6 NRHP properties, 13 California Historical Landmarks, and 5 California Points of Historical Interest (Reclamation 1997; CSPOHP 2014t).	1,639 prehistoric sites in Plumas County (Plumas County 2012).
Sacramento	<p>90 NRHP properties, 56 California Historical Landmarks, 4 CRHR properties, 20 California Points of Historical Interest; numerous historic sites, such as mining features, building foundations, trash scatters, and bridges, were inundated by Folsom Lake; the Folsom Mining District surrounds Lake Natoma (Reclamation 1997; CSPOHP 2014u).</p> <p>There are over 40 historic sites along the Sacramento River between Sutter County boundary and Freeport (Reclamation 2005b); including Natomas Main Drainage Canal, Town of Freeport, Sacramento Weir, Yolo Bypass, homes and farms, and a church.</p> <p>There are 14 historic sites along the American River between Folsom Dam and the confluence with the Sacramento River (Reclamation 2005b).</p>	<p>407 Known Prehistoric Site Types (Reclamation 1997). There are 24 prehistoric sites along the Sacramento River between Sutter County boundary and Freeport (Reclamation 2005b). There are 22 prehistoric sites along the American River between Folsom Dam and the confluence with the Sacramento River (Reclamation 2005b).</p>
San Joaquin	31 NRHP properties, 25 California Historical Landmarks, 3 CRHR properties, and 7 are California Points of Historical Interest (Reclamation 1997; CSPOHP 2014v).	189 Known Prehistoric Site Types (Reclamation 1997).

County	Historic Site Types	Prehistoric Site Types
Shasta	26 NRHP properties, 19 California Historical Landmarks, 1 CRHR properties, 15 California Points of Historical Interest (Reclamation 1997; CSPOHP 2014w). The Anderson-Cottonwood Irrigation District Diversion Dam has been determined to be eligible for NRHP listing (Reclamation 2013a).	1,419 Known Prehistoric Site Types. Many of these sites occur along the Sacramento River near Redding and between Battle Creek and Table Mountain (Reclamation 2013a).
Solano	23 NRHP properties, 14 California Historical Landmarks, and 9 California Points of Historical Interest (Reclamation 1997; CSPOHP 2014x).	300 Known Prehistoric Site Types (Reclamation 1997).
Stanislaus	21 NRHP properties, 5 California Historic Landmarks, and 7 are California Points of Historical Interest; the former right-of-way for the Patterson and Western Railroad, which was constructed in 1916, bisects the Delta-Mendota Canal (Reclamation 1997; CSPOHP 2014y).	280 Known Prehistoric Site Types (Reclamation 1997).
Sutter	7 NRHP properties, 2 California Historical Landmarks, and 22 California Points of Historical Interest (Reclamation 1997; CSPOHP 2014z).	62 Known Prehistoric Site Types (Reclamation 1997).
Tehama	10 NRHP properties, 3 California Historical Landmarks, and 1 California Point of Historical Interest (Reclamation 1997; CSPOHP 2014aa).	1,415 Known Prehistoric Site Types (Reclamation 1997).
Tulare	34 NRHP properties, 8 California Historic Landmarks, and no California Points of Historical Interest (Reclamation 1997; CSPOHP 2014ab).	1,857 Known Prehistoric Site Types (Reclamation 1997).
Yolo	21 NRHP properties, 2 California Historical Landmarks, 1 CRHR properties, and 8 California Points of Historical Interest (Reclamation 1997; CSPOHP 2014ad).	175 Known Prehistoric Site Types (Reclamation 1997). Includes possible fishing stations along Putah and Cache Creeks, the Sacramento, and ephemeral tributaries to these watercourses.
Yuba	10 NRHP properties, 6 California Historical Landmarks, and 14 California Points of Historical Interest (Reclamation 1997; CSPOHP 2014ae).	1,112 Known Prehistoric Site Types (Reclamation 1997).

17.3.4.3 Previously Recorded Cultural Resources in the San Francisco Bay Area Region

The San Francisco Bay Area Region includes Alameda, Contra Costa, Santa Clara, and San Benito counties. Much of this region is highly urbanized and that development has affected archaeological resources. Numerous cultural and historical resources are in the San Francisco Bay Area Region, as summarized in Table 17.2. Most of the cultural resources are located within areas that would not be affected by land use changes that could result from changes in CVP and SWP water supplies.

Table 17.2 Previously Recorded Cultural Resources of the San Francisco Bay Area Region

County	Historic Site Types	Prehistoric Site Types
Alameda	141 NRHP properties, 34 California Historical Landmarks, 2 CRHR properties, and 4 California Points of Historical Interest (CSPOHP 2014af).	No comprehensive inventory of prehistoric sites in Alameda County (Zone 7 2006).
Contra Costa	40 NRHP properties, 13 California Historical Landmarks, 1 CRHR property, and 12 California Points of Historical Interest (CSPOHP 2014ag).	No comprehensive inventory of prehistoric sites in Contra Costa County (Contra Costa County 2005). Up to 41 sites were identified in the Kellogg Creek Historic District near Los Vaqueros Reservoir (CCWD et al. 2009).
San Benito	12 NRHP properties, 5 California Historic Landmarks, and 2 California Points of Historical Interest (Reclamation 1997; CSPOHP 2014ah).	180 Known Prehistoric Site Types (Reclamation 1997).
Santa Clara	101 NRHP properties, 41 California Historical Landmarks, and 58 California Points of Historical Interest (CSPOHP 2014ai; Santa Clara County 1994).	Between 1912 and 1960, 43 sites were recorded in the Santa Clara Valley portion of Santa Clara County (Santa Clara 2012).

17.3.4.4 Previously Recorded Cultural Resources in the Central Coast and Southern California Regions

The Central Coast Region includes San Luis Obispo and Santa Barbara counties. Within the Central Coast Region, the SWP provides water supplies to portions of San Luis Obispo and Santa Barbara counties. Within the Southern California Region, the SWP provides water supplies to portions of Ventura, Los Angeles, Orange, Riverside, San Bernardino, and San Diego counties. Numerous cultural and historical resources are in the Central Coast and Southern California regions, as summarized in Table 17.3. Most of the cultural resources are located within areas that would not be affected by land use changes that could result from changes in SWP water supplies.

1 **Table 17.3 Previously Recorded Cultural and Historical Resources of the Central**
 2 **Coast and Southern California Regions**

County	Historic Site Types	Prehistoric Site Types
San Luis Obispo	34 NRHP properties, 2 California Historical Landmarks, and 4 California Points of Historical Interest (CSPOHP 2014ao).	The San Luis Obispo County General Plan discusses several hundred prehistoric resources throughout San Luis Obispo County related to the Chumash people (San Luis Obispo County 2010).
Santa Barbara	43 NRHP properties, 16 California Historical Landmarks, and 7 California Points of Historical Interest (CSPOHP 2014ap).	The 2010 Santa Barbara Conservation Element of the Comprehensive Plan noted prehistoric resources throughout Santa Barbara County related to the Chumash people (Santa Barbara County 2010).
Los Angeles	431 NRHP properties, 90 California Historical Landmarks, 6 CRHR property, and 65 California Points of Historical Interest (CSPOHP 2014aj).	Over 4,196 prehistoric sites in Los Angeles County (SCAG 2011).
Orange	108 NRHP properties, 24 California Historical Landmarks, and 20 California Points of Historical Interest (CSPOHP 2014ak).	Over 1,710 prehistoric sites in Orange County (SCAG 2011; Orange County 2005).
Riverside	52 NRHP properties, 23 California Historical Landmarks, and 72 California Points of Historical Interest (CSPOHP 2014al).	Over 19,858 prehistoric sites in Orange County (SCAG 2011). Some of the Cahuilla, Serrano, and Luiseño communities were inundated within Lake Perris (Reclamation and DWR 2003).
San Bernardino	56 NRHP properties, 39 California Historical Landmarks, 2 CRHR property, and 119 California Points of Historical Interest (CSPOHP 2014am).	Over 29,480 prehistoric sites in San Bernardino County, including the Calico “Early Man” Site (SCAG 2011).
San Diego	130 NRHP properties, 63 California Historical Landmarks, 3 CRHR property, and 16 California Points of Historical Interest (CSPOHP 2014an).	The San Diego County General Plan discussed that there are many prehistoric sites within San Diego County; however, the number and locations are not identified to protect the resources (San Diego County 2011a).

County	Historic Site Types	Prehistoric Site Types
Ventura	34 NRHP properties, 11 California Historical Landmarks, and 4 California Points of Historical Interest (CSPOHP 2014aq).	Over 1,806 prehistoric sites in San Bernardino County (SCAG 2011).

1 **17.4 Impact Analysis**

2 This section describes the potential mechanisms for change in cultural resources
 3 and analytical methods, results of the impact analysis, potential mitigation
 4 measures, and potential cumulative effects.

5 **17.4.1 Potential Mechanisms for Change and Analytical Tools**

6 As described in Chapter 4, Approach to Environmental Analysis, the
 7 environmental consequences assessment considers changes in cultural resources
 8 conditions related to changes in CVP and SWP operations under the alternatives
 9 as compared to the No Action Alternative and Second Basis of Comparison that
 10 could result in land disturbance or increased exposure of cultural resources sites.

11 **17.4.1.1 Changes in the Potential for Land Disturbance**

12 Under Alternatives 1 through 5, No Action Alternative, and Second Basis of
 13 Comparison, CVP and SWP water supplies would continue to be provided within
 14 the currently designated service areas. Implementation of the alternatives does
 15 not include expansion of designated service areas or increased water contract
 16 amounts. Land use in 2030 would be consistent with existing general plan
 17 projections under all alternatives and the Second Basis of Comparison. The CVP
 18 and SWP water contract amounts would be the same under all alternatives and the
 19 Second Basis of Comparison. The alternatives would not result in expansion of
 20 municipal or agricultural lands, or associated disturbances of cultural resources
 21 because of expansion of development or cultivated lands in addition to the
 22 conditions projected under existing general plans. Therefore, changes in CVP and
 23 SWP water supply availability that would result in changes in land use and
 24 associated potential for disturbance of cultural resources are not analyzed in
 25 this EIS.

26 **17.4.1.2 Changes in Potential Exposure of Cultural Resources at
 27 Reservoirs that Store CVP and SWP Water**

28 Changes in CVP and SWP operations under the alternatives as compared to the
 29 No Action Alternative and Second Basis of Comparison could result in increased
 30 periods of time when low water elevations occur in reservoirs that store CVP and
 31 SWP water, including the CVP and SWP reservoirs. The lowest reservoir
 32 elevations generally occur in September in dry and critical dry years, as described
 33 in Chapter 5, Surface Water Resources and Water Supplies. The minimum and
 34 maximum elevations of the reservoir surface water under Alternatives 1

1 through 5, No Action Alternative, and Second Basis of Comparison would be
2 the same as under current conditions.

3 **17.4.1.3 Effects Related to Cross Delta Water Transfers**

4 Water transfer programs have been used to provide water to existing agricultural
5 and municipal service areas when other water supplies are not available. It is
6 anticipated that water transfers under all alternatives and the Second Basis of
7 Comparison would continue in this manner to provide water supplies to land uses
8 projected under existing general plans which would not result in expansion of
9 municipal or agricultural lands, or associated disturbances of cultural resources
10 because of expansion of development or cultivated lands in addition to conditions
11 projected under existing general plans. Therefore, effects related to cross Delta
12 water transfers and associated potential for disturbance of cultural resources are
13 not analyzed in this EIS.

14 **17.4.2 Conditions in Year 2030 without Implementation of**
15 **Alternatives 1 through 5**

16 The impact analysis in this EIS is based upon the comparison of the alternatives to
17 the No Action Alternative and the Second Basis of Comparison in the Year 2030.
18 Many of the changed conditions would occur in the same manner under both the
19 No Action Alternative and the Second Basis of Comparison (e.g., climate change,
20 sea level rise, general plan development, and implementation of reasonable and
21 foreseeable projects). Because of these changes, especially climate change and
22 sea level rise, it is anticipated that reservoir elevations at the end of September
23 would be lower, flows patterns in the rivers downstream of the reservoirs would
24 be different than under recent condition, and CVP and SWP water deliveries
25 would be less than under recent condition, as described in Chapter 5, Surface
26 Water Resources and Water Supplies. In all regions, the minimum reservoir
27 elevations under the No Action Alternative and Second Basis of Comparison
28 would be similar to minimum elevations during recent conditions.

29 **17.4.3 Evaluation of Alternatives**

30 As described in Chapter 4, Approach to Environmental Analysis, Alternatives 1
31 through 5 have been compared to the No Action Alternative, and the No Action
32 Alternative and Alternatives 1 through 5 have been compared to the Second Basis
33 of Comparison.

34 During review of the numerical modeling analyses used in this EIS, an error was
35 determined in the CalSim II model assumptions related to the Stanislaus River
36 operations for the Second Basis of Comparison, Alternative 1, and Alternative 4
37 model runs. Appendix 5C includes a comparison of the CalSim II model run
38 results presented in this chapter and CalSim II model run results with the error
39 corrected. Appendix 5C also includes a discussion of changes in the comparison
40 of the following alternatives analyses.

- 41 • No Action Alternative compared to the Second Basis of Comparison
- 42 • Alternative 1 compared to the No Action Alternative

- 1 • Alternative 3 compared to the Second Basis of Comparison
- 2 • Alternative 5 compared to the Second Basis of Comparison

3 **17.4.3.1 No Action Alternative**

4 As described in Chapter 4, Approach to Environmental Analysis, the No Action
5 Alternative is compared to the Second Basis of Comparison.

6 **17.4.3.1.1 Potential Exposure of Cultural Resources at Reservoirs that Store 7 CVP and SWP Water**

8 As described above, the minimum reservoir elevations in all regions under the No
9 Action Alternative and the Second Basis of Comparison would be within historic
10 ranges and would not expose lands that are not currently exposed. Therefore,
11 conditions of cultural resources would be similar under the No Action Alternative
12 and Second Basis of Comparison.

13 **17.4.3.2 Alternative 1**

14 Alternative 1 is identical to the Second Basis of Comparison. Alternative 1 is
15 compared to the No Action Alternative and the Second Basis of Comparison.
16 However, because cultural resource conditions under Alternative 1 are identical to
17 cultural resource conditions under the Second Basis of Comparison, Alternative 1
18 is only compared to the No Action Alternative.

19 **17.4.3.2.1 Alternative 1 Compared to the No Action Alternative**

20 *Potential Exposure of Cultural Resources at Reservoirs that Store CVP and SWP*
21 *Water*

22 As described above, the minimum reservoir elevations in all regions under
23 Alternative 1 as compared to the No Action Alternative would be within historic
24 ranges and would not expose lands that are not currently exposed. Therefore,
25 conditions of cultural resources would be similar under Alternative 1 and the No
26 Action Alternative.

27 **17.4.3.2.2 Alternative 1 Compared to the Second Basis of Comparison**

28 Alternative 1 is identical to the Second Basis of Comparison.

29 **17.4.3.3 Alternative 2**

30 The cultural resources conditions under Alternative 2 would be identical to the
31 conditions under the No Action Alternative; therefore, Alternative 2 is only
32 compared to the Second Basis of Comparison.

33 **17.4.3.3.1 Alternative 2 Compared to the Second Basis of Comparison**

34 Changes to cultural resources conditions under Alternatives 2 as compared to the
35 Second Basis of Comparison would be the same as the impacts described in
36 Section 17.4.3.1, No Action Alternative.

1 **17.4.3.4 Alternative 3**

2 CVP and SWP operations under Alternative 3 are similar to the Second Basis of
3 Comparison with modified Old and Middle River flow criteria and New Melones
4 Reservoir operations.

5 **17.4.3.4.1 Alternative 3 Compared to the No Action Alternative**

6 *Potential Exposure of Cultural Resources at Reservoirs that Store CVP and SWP*
7 *Water*

8 As described above, the minimum reservoir elevations in all regions under
9 Alternative 3 as compared to the No Action Alternative would be within historic
10 ranges and would not expose lands that are not currently exposed. Therefore,
11 conditions of cultural resources would be similar under Alternative 3 as compared
12 to the No Action Alternative.

13 **17.4.3.4.2 Alternative 3 Compared to the Second Basis of Comparison**

14 *Potential Exposure of Cultural Resources at Reservoirs that Store CVP and*
15 *SWP Water*

16 As described above, the minimum reservoir elevations in all regions under
17 Alternative 3 as compared to the Second Basis of Comparison would be within
18 historic ranges and would not expose lands that are not currently exposed.
19 Therefore, conditions of cultural resources would be similar under Alternative 3
20 and Second Basis of Comparison.

21 **17.4.3.5 Alternative 4**

22 The cultural resources conditions under Alternative 4 would be identical to the
23 conditions under the Second Basis of Comparison. Therefore, Alternative 4 is
24 only compared to the No Action Alternative.

25 **17.4.3.5.1 Alternative 4 Compared to the No Action Alternative**

26 Changes in cultural resources conditions under Alternative 4 as compared to the
27 No Action Alternative would be the same as the impacts described in
28 Section 17.4.3.2.1, Alternative 1 Compared to the No Action Alternative.

29 **17.4.3.6 Alternative 5**

30 The CVP and SWP operations under Alternative 5 are similar to the No Action
31 Alternative with modified Old and Middle River flow criteria and New Melones
32 Reservoir operations.

33 **17.4.3.6.1 Alternative 5 Compared to the No Action Alternative**

34 *Potential Exposure of Cultural Resources at Reservoirs that Store CVP and*
35 *SWP Water*

36 As described above, the minimum reservoir elevations in all regions under
37 Alternative 5 as compared to the No Action Alternative would be within historic
38 ranges and would not expose lands that are not currently exposed. Therefore,
39 conditions of cultural resources would be similar under Alternative 5 as compared
40 to the No Action Alternative.

1 **17.4.3.6.2 Alternative 5 Compared to the Second Basis of Comparison**

2 *Potential Exposure of Cultural Resources at Reservoirs that Store CVP and*
 3 *SWP Water*

4 As described above, the minimum reservoir elevations in all regions under
 5 Alternative 5 as compared to the Second Basis of Comparison would be within
 6 historic ranges and would not expose lands that are not currently exposed.
 7 Therefore, conditions of cultural resources would be similar under Alternative 5
 8 and Second Basis of Comparison.

9 **17.4.3.7 Summary of Impact Analysis**

10 The results of the impact analysis of implementation of Alternatives 1 through 5
 11 as compared to the No Action Alternative and the Second Basis of Comparison
 12 are presented in Tables 17.4 and 17.5.

13 **Table 17.4 Comparison of Alternatives 1 through 5 to No Action Alternative**

Alternative	Potential Change	Consideration for Mitigation Measures
Alternative 1	No effects to cultural resources	None needed
Alternative 2	No effects to cultural resources	None needed
Alternative 3	No effects to cultural resources	None needed
Alternative 4	No effects to cultural resources	None needed
Alternative 5	No effects to cultural resources	None needed

14 **Table 17.5 Comparison of No Action Alternative and Alternatives 1 through 5 to**
 15 **Second Basis of Comparison**

Alternative	Potential Change	Consideration for Mitigation Measures
Alternative 1	No effects to cultural resources	None needed
Alternative 2	No effects to cultural resources	None needed
Alternative 3	No effects to cultural resources	None needed
Alternative 4	No effects to cultural resources	None needed
Alternative 5	No effects to cultural resources	None needed

16 **17.4.3.8 Potential Mitigation Measures**

17 Mitigation measures are presented in this section to avoid, minimize, rectify,
 18 reduce, eliminate, or compensate for adverse environmental effects of
 19 Alternatives 1 through 5, as compared to the No Action Alternative. Mitigation
 20 measures were not included to address adverse impacts under the alternatives as
 21 compared to the Second Basis of Comparison because this analysis was included
 22 in this EIS for information purposes only.

1 Implementation of Alternatives 1 through 5 as compared to the No Action
 2 Alternative would not result in increased potential exposure or disturbance of
 3 cultural resources. Therefore, there would be no adverse impacts to cultural
 4 resources because of implementation of the alternatives; and no mitigation
 5 measures are needed.

6 **17.4.3.9 Cumulative Effects Analysis**

7 As described in Chapter 3, the cumulative effects analysis considers projects,
 8 programs, and policies that are not speculative and are based upon known or
 9 reasonably foreseeable long-range plans, regulations, operating agreements, or
 10 other information that establishes them as reasonably foreseeable.

11 The cumulative effects analysis for Alternatives 1 through 5 for Cultural
 12 Resources are summarized in Table 17.6.

13 **Table 17.6 Summary of Cumulative Effects on Cultural Resources with**
 14 **Implementation of Alternatives 1 through 5 as Compared to the No Action**
 15 **Alternative**

Scenarios	Actions	Cumulative Effects of Actions
<p>Past & Present, and Future Actions Included in All Alternatives in Year 2030</p>	<p>Consistent with Affected Environment conditions plus:</p> <p>Actions in the 2008 USFWS BO and 2009 NMFS BO that would have occurred without implementation of the BOs, as described in Section 3.3.1.2 (of Chapter 3, Descriptions of Alternatives), including climate change and sea level rise</p> <p>Actions not included in the 2008 USFWS BO and 2009 NMFS BO that would have occurred without implementation of the BOs, as described in Section 3.3.1.3 (of Chapter 3, Descriptions of Alternatives):</p> <ul style="list-style-type: none"> - Implementation of Federal and state policies and programs, including Clean Water Act (e.g., Total Maximum Daily Loads); Safe Drinking Water Act; Clean Air Act; and flood management programs - General plans for 2030. - Trinity River Restoration Program. - Central Valley Project Improvement Act programs - Iron Mountain Mine Superfund Site 	<p><u>These effects would be the same under all alternatives.</u></p> <p>Community development would occur in accordance with general plan projections for 2030. Development within the Delta would be subject to the requirements of the Delta Protection Commission and Delta Stewardship Council. Future development projects are anticipated to potentially effect cultural resources. However, development of these future programs would include preparation of environmental documentation that would identify methods to minimize adverse impacts to cultural resources.</p> <p>Restoration plans for the ongoing programs would be completed. Development along river corridors in the Central Valley. Future restoration projects are anticipated to potentially affect cultural resources. However, development of these future programs would include preparation of environmental documentation that would identify methods to</p>

Scenarios	Actions	Cumulative Effects of Actions
	<ul style="list-style-type: none"> - Nimbus Fish Hatchery Fish Passage Project - Folsom Dam Water Control Manual Update - FERC Relicensing for the Middle Fork of the American River Project - Lower Mokelumne River Spawning Habitat Improvement Project - Dutch Slough Tidal Marsh Restoration - Suisun Marsh Habitat Management, Preservation, and Restoration Plan Implementation - Tidal Wetland Restoration: Yolo Ranch, Northern Liberty Island Fish Restoration Project, Prospect Island Restoration Project, and Calhoun Cut/Lindsey Slough Tidal Habitat Restoration Project - San Joaquin River Restoration Program - Future water supply projects, including water recycling, desalination, groundwater banks and wellfields, and conveyance facilities (projects with completed environmental documents) 	<p>minimize adverse impacts to cultural resources.</p> <p>Climate change and sea level rise, development under the general plans, FERC relicensing projects, and some future projects to improve water quality and/or habitat are anticipated to reduce availability of CVP and SWP water supplies as compared to past conditions.</p> <p>Future water supply projects are anticipated to both increase water supply reliability due to reduced surface water supplies and to accommodate planned growth in the general plans. Most of these programs were initiated prior to implementation of the 2008 USFWS BO and 2009 NMFS BO which reduced CVP and SWP water supply reliability. Future water supply projects are anticipated to potentially effect cultural resources. However, development of these future programs would include preparation of environmental documentation that would identify methods to minimize adverse impacts to cultural resources.</p>
<p>Future Actions considered as Cumulative Effects Actions in All Alternatives in Year 2030</p>	<p>Actions as described in Section 3.5 (of Chapter 3, Descriptions of Alternatives):</p> <ul style="list-style-type: none"> - Bay-Delta Water Quality Control Plan Update - FERC Relicensing Projects - Bay Delta Conservation Plan (including the California WaterFix alternative) - Shasta Lake Water Resources, North-of-the-Delta Offstream Storage, Los Vaqueros Reservoir Expansion Phase 2, and Upper San Joaquin River Basin Storage Investigations 	<p><u>These effects would be the same under all alternatives.</u></p> <p>Most of the future reasonably foreseeable actions are anticipated to reduce water supply impacts due to climate change, sea level rise, increased water allocated to improve habitat conditions, and future growth.</p> <p>Some of the reasonably foreseeable actions related to improved water quality and habitat conditions (e.g., Water Quality Control Plan Update and FERC Relicensing Projects), could in further</p>

Scenarios	Actions	Cumulative Effects of Actions
	<ul style="list-style-type: none"> - El Dorado Water and Power Authority Supplemental Water Rights Project - Sacramento River Water Reliability Project - Semitropic Water Storage District Delta Wetlands - North Bay Aqueduct Alternative Intake - San Luis Reservoir Low Point Improvement Project - Future water supply projects, including water recycling, desalination, groundwater banks and wellfields, and conveyance facilities (projects that did not have completed environmental documents during preparation of the EIS) 	<p>reductions in CVP and SWP water deliveries.</p> <p>Future development of the cumulative projects are anticipated to potentially affect cultural resources. However, development of these future programs would include preparation of environmental documentation that would identify methods to minimize adverse impacts to cultural resources.</p>
<p>No Action Alternative with Associated Cumulative Effects Actions in Year 2030</p>	<p>Full implementation of the 2008 USFWS BO and 2009 NMFS BO</p>	<p>Community development and restoration projects for the ongoing programs would be completed.</p> <p>Climate change and sea level rise, FERC relicensing projects, and some future projects to improve water quality and/or habitat are anticipated to reduce availability of CVP and SWP water supplies as compared to past conditions.</p> <p>Future water supply projects are anticipated to both increase water supply reliability due to reduced surface water supplies and to accommodate planned growth in the general plans.</p> <p>Future development projects are anticipated to potentially affect cultural resources. However, development of these future programs would include preparation of environmental documentation that would identify methods to minimize adverse impacts to cultural resources.</p>

Scenarios	Actions	Cumulative Effects of Actions
Alternative 1 with Associated Cumulative Effects Actions in Year 2030	No implementation of the 2008 USFWS BO and 2009 NMFS BO actions unless the actions would have been implemented without the BO (e.g., Red Bluff Pumping Plant)	Implementation of Alternative 1 with reasonably foreseeable actions would result in similar changes as under the No Action Alternative with the added actions.
Alternative 2 with Associated Cumulative Effects Actions in Year 2030	Full implementation of the 2008 USFWS BO and 2009 NMFS BO CVP and SWP operational actions No implementation of structural improvements or other actions that require further study to develop a more detailed action description.	Implementation of Alternative 2 with reasonably foreseeable actions would result in similar changes as under the No Action Alternative with the added actions.
Alternative 3 with Associated Cumulative Effects Actions in Year 2030	No implementation of the 2008 USFWS BO and 2009 NMFS BO actions unless the actions would have been implemented without the BO (e.g., Red Bluff Pumping Plant) Slight increase in positive Old and Middle River flows in the winter and spring months	Implementation of Alternative 3 with reasonably foreseeable actions would result in similar changes as under the No Action Alternative with the added actions.
Alternative 4 with Associated Cumulative Effects Actions in Year 2030	No implementation of the 2008 USFWS BO and 2009 NMFS BO actions unless the actions would have been implemented without the BO (e.g., Red Bluff Pumping Plant)	Implementation of Alternative 4 with reasonably foreseeable actions would result in similar changes as under the No Action Alternative with the added actions.
Alternative 5 with Associated Cumulative Effects Actions in Year 20530	Full implementation of the 2008 USFWS BO and 2009 NMFS BO Positive Old and Middle River flows and increased Delta outflow in spring months	Implementation of Alternative 5 with reasonably foreseeable actions would result in similar changes as under the No Action Alternative with the added actions.

1

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Chapter 18**1 Public Health****2 18.1 Introduction**

3 This chapter describes public health hazards in the study area related to changes
4 in the environment that could occur as a result of implementing the alternatives
5 evaluated in this Environmental Impact Statement (EIS). Implementation of the
6 alternatives considered in this EIS could affect public health through changes in
7 available water supplies from the Central Valley Project (CVP) and State Water
8 Project (SWP); changes in irrigated crop acreage related to potential changes in
9 operation of the CVP and SWP; changes in wetlands acreage related to potential
10 changes in ecosystem restoration; and changes in water quality related to potential
11 changes in operation of the CVP and SWP.

12 Changes in available water supplies, agricultural resources, wetlands, and water
13 quality are described in more detail in Chapter 5, Surface Water Resources and
14 Water Supplies; Chapter 12, Agricultural Resources; and Chapter 6, Water
15 Quality, respectively.

16 18.2 Regulatory Environment and Compliance
17 Requirements

18 Potential actions that could be implemented under the alternatives evaluated in
19 this EIS could affect public health throughout the study area. Some of the actions
20 considered in the alternatives evaluated in this EIS could include facilities located
21 on public agency lands; or actions implemented, funded, or approved by Federal
22 and state agencies. These actions would need to be compliant with appropriate
23 Federal and state agency policies and regulations, as summarized in Chapter 4,
24 Approach to Environmental Analyses.

25 18.3 Affected Environment

26 This section describes the following public health factors that could be potentially
27 affected by the implementation of the alternatives considered in this EIS.

- 28 • Changes in available water supplies.
- 29 • Increases in the potential for mosquito-borne diseases due to an increase in
30 wetlands.
- 31 • Changes in the potential for Valley Fever from disturbed soils when irrigation
32 water supplies change.
- 33 • Changes in the potential for bioaccumulation of mercury in fish and shellfish.

1 Changes in the potential of direct or indirect exposure to high water quality
2 concentrations of various constituents also may occur due to implementation of
3 the alternatives. These direct changes to water quality and the related changes to
4 drinking water safety and consumption of fish or shellfish exposed to high
5 concentrations of constituents of concern are described in Chapter 6, Water
6 Quality.

7 Public health effects that could occur due to construction activities are not
8 discussed in this chapter, including increased exposure to naturally occurring
9 asbestos, methane production from disturbance of peat soils, disturbance of oil
10 and gas production fields, use and transport of hazardous wastes, and changes in
11 wastewater or stormwater discharges. Although several of the alternatives
12 include assumptions of constructed facilities, those actions will require
13 subsequent planning and environmental documentation prior to implementation.
14 The subsequent environmental documentation and related permits will evaluate
15 public health effects associated with construction and implementation of those
16 facilities.

17 **18.3.1 Public Health Issues Related to Available Water Supplies**

18 Water supply availability can affect public health in several ways. Potential direct
19 effects to public health are related to reduction of municipal water supplies.
20 Potential indirect effects to public health are related to reduction of industrial and
21 irrigation water supplies which could affect the ability to earn an income to fund
22 food, shelter, and other critical factors necessary for public health. Effects related
23 to loss of jobs.

24 Availability of water supplies substantially decreased for CVP and SWP water
25 users during recent droughts in 1976-1977, 1987-1992, and 2012-2014. In
26 addition, as described in Chapter 5, Surface Water Resources and Water Supplies,
27 the frequency of substantially reduced water supplies provided by the CVP and
28 SWP have increased since the 1976-1977 drought due to changes in regulations
29 and increased water demands by users with higher priorities for water use.

30 During the 2014 drought, CVP and SWP water supply allocations have been
31 reduced substantially to protect future water supplies and the ability to meet
32 existing regulations, as described in Chapter 5, Surface Water Resources and
33 Water Supplies. The allocations were modified throughout the 2013-2014 winter
34 with the allocations that are the most stringent in the history of the CVP and/or
35 SWP operations, as summarized below (Reclamation 2014a, 2014b; DWR 2013,
36 2014).

- 37 • CVP North of Delta Water Users.
 - 38 – Sacramento River Settlement Contractors – allocated 40 percent of total
 - 39 contracted water supply.
 - 40 – Sacramento Valley Refuges that use CVP water supplies – allocated
 - 41 40 percent of total contracted water supply.

- 1 – Agricultural Water Service Contractors – allocated 0 percent of total
- 2 contracted water supply.
- 3 – Municipal and Industrial Water Service Contractors – allocated 50 percent
- 4 of historic water use.
- 5 • CVP In-Delta Water Service Contractor: Contra Costa Water District –
- 6 allocated 50 percent of historic water use.
- 7 • CVP South of Delta Water Users.
- 8 – San Joaquin River Exchange and Settlement Contractors – allocated
- 9 65 percent of total contracted water supply.
- 10 – San Joaquin Valley Refuges that use CVP water supplies – allocated
- 11 65 percent of total contracted water supply.
- 12 – Agricultural Water Service Contractors – allocated 0 percent of total
- 13 contracted water supply.
- 14 – Municipal and Industrial Water Service Contractors – allocated 50 percent
- 15 of historic water use.
- 16 • CVP Friant Division Contractors – allocated 0 percent of total contracted
- 17 water supply.
- 18 • CVP Eastside Water Service Contractors: Water supplies delivered from New
- 19 Melones Reservoir – allocated 55 percent of total contracted water supply.
- 20 • SWP Water Service Contractors – 5 percent of total contracted water supply.

21 Another potential indirect effect to public health is related to reduction of stored
 22 water in the CVP and SWP reservoirs which could affect the ability to provide
 23 enough water for firefighting,

24 **18.3.1.1 Public Health and Safety Related to Available Municipal and**
 25 **Industrial Water Supplies**

26 The Department of the Interior, Bureau of Reclamation (Reclamation) current
 27 *Draft Municipal and Industrial Shortage Policy* (Reclamation 2005) describes
 28 that the CVP water service contractors should develop public health and safety
 29 volumes based California’s public health and safety criteria or criteria developed
 30 in coordination with Reclamation. Currently, California does not have a uniform
 31 set of public health and safety criteria for municipal and industrial water supplies.
 32 At this time, most of the urban communities have not adopted specific public
 33 health and safety criteria. However, in some of the recently completed Urban
 34 Water Management Plans, criteria have been identified to protect public health
 35 and safety that range from 25 to 50 percent of the total water demand, as
 36 described in Chapter 5, Surface Water Resources and Water Supplies (CCWD
 37 2011; City of Folsom 2011; Metropolitan 2010). The Urban Water Management
 38 Plans indicate that during the critical periods with reductions in water supplies,
 39 municipal and industrial water uses will be focused on inside water uses with little
 40 or no outside irrigation water.

1 At this time, no specific volumes have been identified for public health and safety
2 quantities for the CVP and/or SWP water users. During the 2014 drought, the
3 Department of Water Resources (DWR) and Reclamation identified 1,500 cubic
4 feet per second as a minimum amount of CVP and SWP Delta exports for public
5 health and safety uses for municipal and industrial water supplies. This amount is
6 also defined by the limitations of the CVP and SWP conveyance facilities, as
7 described in Chapter 5, Surface Water Resources and Water Supplies.

8 As described above, in 2014, CVP and SWP water supply allocations are at
9 historically low values. However, it is difficult to identify local public health and
10 safety issues, non-agricultural related industrial job losses, and economic losses
11 associated with reductions in CVP and/or SWP water supplies. The potential
12 economic losses, socioeconomic effects, and environmental justice effects are
13 described in Chapter 19, Socioeconomics, and Chapter 21, Environmental Justice.

14 **18.3.1.2 Public Health and Safety Related to Available Agricultural Water**
15 **Supplies**

16 Agricultural water suppliers have developed responses to the reductions in
17 agricultural water supplies from the CVP and SWP, as described in Chapter 12,
18 Agricultural Resources. Historically, the number of employment opportunities
19 that rely directly or indirectly on the availability of CVP and/or SWP water
20 supplies for irrigation have declined in the areas where the water supplies have
21 declined, communities within the Central Valley Region and Southern California
22 Region, as described in Chapter 19, Socioeconomics.

23 **18.3.1.3 Public Health and Safety Related to Water Supply Availability for**
24 **Wildland Firefighting**

25 Complex terrain, Mediterranean climate, productive natural plant communities,
26 and ample natural and aboriginal ignition sources has caused California to be a
27 complex wildfire-prone and fire-adapted landscape. While natural wildfires
28 support ecosystem health and are critical to maintaining the structure and function
29 of ecosystems, wildfires pose a significant threat to life, public health,
30 infrastructure, properties, and natural resources.

31 In accordance with Public Resources Code sections 4201 to 4204 and
32 Government Code sections 51175 to 51189, the California Department of
33 Forestry and Fire Prevention (CAL FIRE) has mapped areas of significant fire
34 hazards based on fuels, terrain, weather, and other relevant factors. The zones are
35 referred to as Fire Hazard Severity Zones and represent the risks associated with
36 wildland fires. Under CAL FIRE regulations, areas within very high fire-hazard
37 risk zones must comply with specific building and vegetation requirements
38 intended to reduce property damage and loss of life within these areas.

39 According to CAL FIRE, there is an increasing trend of acres burned statewide,
40 with particular increase in conifer vegetation types (CAL FIRE FRAP 2010).
41 Statewide, there are 21.3 million acres of land designated as high priority
42 landscape. The high priority landscape areas include locations with high value
43 water supplies and high threats of fire and large communities which should be
44 protected to prevent wildfire threats to maintain ecosystem health, water supplies,

1 and large communities. These areas include the upper Trinity River watershed in
 2 the Trinity River Region; the upper Shasta Lake, Lake Oroville, Folsom Lake,
 3 New Melones Reservoir, and Millerton Lake watersheds in the Central Valley
 4 Region; and communities in throughout the Southern California Region. Areas
 5 designated as high priority landscape occur within 46 of 58 counties. Many rural
 6 counties have significant numbers of communities and acreage in medium priority
 7 landscape, including 508 communities with some high priority landscape areas.

8 CAL FIRE manages the State Responsibility Areas, and local fire districts
 9 manage Local Responsibility Areas. First responders are typically the local fire
 10 districts. The U.S. Forest Service provides wildland fire protection both
 11 independently and cooperatively with the California Department of Forestry and
 12 Fire Protection. In addition, the U.S. Department of the Interior National Park
 13 Service and Bureau of Land Management provide resource management and fire
 14 protection on portions of Federal lands.

15 Firefighting actions frequently involve use of water from reservoirs located close
 16 to wildland fires in the Trinity River, Central Valley, Central Coast, and Southern
 17 California regions, including reservoirs owned by Reclamation and DWR.

18 **18.3.2 Public Health Issues Related to Mosquito-Borne Diseases**

19 There are more than 50 species of mosquitos in California, including members of
 20 the four major genera: 24 species of *Aedes*, 5 species of *Anopheles*, 11 species of
 21 *Culex*, and 4 species of *Culiseta* (CDPH et al. 2012). Not all of these species are
 22 known to transmit mosquito-borne viruses, as described below. There are
 23 approximately 15 mosquito-borne viruses that occur in California; however, the
 24 most significant viruses that cause human disease are St. Louis encephalitis virus
 25 (SLEV), western equine encephalomyelitis (WEEV), and West Nile virus (WNV)
 26 (CDPH et al. 2014). No cases of SLEV or WEEV have been reported in humans
 27 over the past few years in California. Malaria also is a mosquito-borne disease
 28 that is caused by a parasite instead of a virus.

29 The *Culex tarsalis* has been identified as part of transmission of SLEV, WEEV,
 30 and WNV, especially in rural areas. The *Culex pipiens* and *Culex*
 31 *quinquefasciatus* have been identified as part of the transmission of WNV and
 32 SLEV. The *Culex stigmatosoma* has been identified as part of the transmission of
 33 WNV and SLEV, especially among birds. The *Aedes melanimon*, *Aedes vexans*,
 34 and *Culex erythrothorax* have been identified as species involved in transmitting
 35 the virus between birds and mammals or between mammals.

36 Mosquitoes, especially *Culex tarsalis*, live in every area of California, and can be
 37 a threat to the health of humans and domestic animals throughout the state. The
 38 mosquito life cycle requires water for the egg, larva, and pupa stages. Some of
 39 the species are more associated with irrigated agriculture, and others are more
 40 associated with urban communities (CDPH et al. 2014). Most of the diseases are
 41 not treatable and vaccines are not available for humans. Methods to prevent
 42 mosquitoes from becoming adults and methods to prevent mosquitos from biting
 43 humans are the only available and practical methods to protect public health.

1 California Health and Safety Code (Sections 2001 – 4(d); 2002; and 2060(b))
2 describes that landowners are legally responsible to eliminate public nuisances
3 from their properties, including mosquito breeding habitat (CDPH 2008; CDPH
4 et al. 2012). Federal, state, and local agencies supplement the preventive
5 activities of individual landowners toward protecting humans and domestic
6 animals from mosquito-borne diseases. The California Department of Public
7 Health (CDPH) monitors mosquito populations throughout the state. In 1915, the
8 state legislature enacted the Mosquito Abatement Act to allow local mosquito
9 abatement special districts. The local mosquito and vector control districts
10 monitor mosquito populations and take actions such as eliminating breeding sites,
11 using biological control (predators such as mosquitofish), and using chemical
12 control, to reduce mosquito population size (CDPH 2013a).

13 **18.3.2.1 St. Louis Encephalitis Virus**

14 The SLEV is a mosquito-borne virus that circulates among birds and is
15 transmitted to humans via mosquito bites (CALSURV 2013a; CDPH 2007).
16 Human infection with SLE can cause mild to severe fever and headaches due to
17 inflammation of the brain. In severe cases, the illness can cause disorientation
18 and comas and possibly cause death. Elderly can become more severely ill than
19 young children with SLEV as compared to WEEV.

20 Since the SLEV was first recognized in 1933 in St. Louis, Missouri, outbreaks
21 have been reported throughout the United States, Canada, and northern Mexico,
22 generally between August and October (CALSURV 2013a). In 1984 and 1989,
23 29 human cases were reported in the San Joaquin Valley of the Central Valley
24 Region. During the same time periods, 26 human cases were reported in the Los
25 Angeles area of the Southern California Region. The last human case reported in
26 California occurred in 1997 in Los Angeles County.

27 **18.3.2.2 Western Equine Encephalitis**

28 The WEEV is another mosquito-borne virus that circulates among birds and is
29 transmitted to horses and humans by mosquitoes (CDPH 2007). Symptoms are
30 similar to SLEV. Infants and small children are most severely afflicted with
31 WEEV as compared to SLEV. There is a vaccine for horses, but not for humans.
32 Historically, substantial number of horses died due to this disease as well as
33 humans. Recently, there has not been a recorded case of WEEV in humans in
34 California (CDPH et al. 2014).

35 **18.3.2.3 West Nile Virus**

36 West Nile virus (WNV) can cause mild to severe illness in human, other
37 mammals, and birds.

38 The virus circulates among birds and is transmitted to humans primarily by *Culex*
39 mosquitoes (CDPH et al. 2014). The WNV was first detected in North America
40 in New York in 1999, and has subsequently spread to 48 states, Canada, and
41 Mexico.

42 The WNV first appeared in humans in California in 2002 with the identification
43 of one human case (CALSURV 2013b). In 2003, three human cases and one

1 equine case were reported with numerous verified findings of WNV activity
 2 among dead birds and mosquitoes. In 2004, the WNV was reported in
 3 58 counties, with 779 human cases, including 29 WNV-associated deaths
 4 (CALSURV 2013b). From 2003 through 2013, there were 4,004 reported human
 5 cases of WNV with 145 deaths; 16,299 reported bird deaths; and 1,202 reported
 6 cases involving horses (CDPH 2014a). In 2007, 2008, and between 2010 and
 7 2013, the majority of reported human cases occurred in the six counties in
 8 Southern California Region, with most of the cases reported in Los Angeles
 9 County. Between 2007 and 2013, numerous human cases were reported in Butte,
 10 Sutter, Sacramento, Stanislaus, Fresno, Tulare, and Kern counties in the Central
 11 Valley Region. During this same period, no human cases were reported in the
 12 Trinity River Region; Lassen, Plumas, and Nevada counties in the Central Valley
 13 Region; San Benito County in the San Francisco Bay Area Region; and San Luis
 14 Obispo County in the Central Coast Region.

15 In humans, WNV may not result in any symptoms or only mild viral symptoms,
 16 including mild fever, headache, body aches, skin rash, and swollen lymph glands.
 17 Symptoms in less than 1 percent of people that are infected can include headache,
 18 high fever, neck stiffness, stupor, disorientation, coma, tremors, convulsions,
 19 muscle weakness, and paralysis that are associated with meningitis or
 20 encephalitis.

21 **18.3.2.4 Malaria**

22 Malaria also is a mosquito-borne disease caused by a parasite that destroys the red
 23 blood cells of its host. People with malaria often experience fever, chills, and flu-
 24 like illness which can lead to death (CDPH et al. 2012). Malaria is no longer
 25 endemic in California, as well as the rest of the United States, due to intense
 26 mosquito control efforts and anti-malarial drugs. However, the disease is
 27 diagnosed every year, especially in people who have traveled outside the United
 28 States. In 2012, 92 human cases were reported in California (CDPH 2013). Of
 29 the 92 cases, 90 patients had traveled to countries characterized as endemic with
 30 malaria during the previous three years. The *Anopheles* mosquitoes can transmit
 31 the parasite to humans and are prevalent in California (CDPH et al. 2012).

32 **18.3.3 Public Health Issues Related to Valley Fever**

33 Valley fever is an illness that is caused by inhaling the spores of a fungus
 34 *Coccidioides immitis* (CDPH 2013c). This fungus lives in the top layers of some
 35 soils within 2 to 12 inches from the ground surface. When the soil is disturbed by
 36 digging, vehicles, cultivation, or wind, the fungal spores can be inhaled by
 37 persons within the area. Irrigated soils are less likely to contain the fungus than
 38 dry, previously undisturbed soils.

39 In most cases, symptoms in humans include mild cough and flu-like symptoms
 40 (CDPH 2013c). However, in about 40 percent of the reported cases, the illness
 41 can last for more than a month, make the person susceptible to pneumonia, and
 42 include cough, fever, chest pain, headache, muscle ache, rash, joint pain, and/or
 43 fatigue. In about 5 percent of the reported cases, the disease becomes

1 “disseminated Valley Fever” and can cause meningitis and/or affect bones, joints,
2 skin, or other organs. There are no vaccines to prevent Valley Fever.

3 The *Coccidioides immitis* is endemic in many areas of the southwestern United
4 States, Mexico, Central America, and South America. In California, the fungus is
5 found in many areas of the San Joaquin Valley and Southern California
6 (CDPH 2011, 2014b). In California between 2001 and 2012, there were over
7 35,000 reported cases of Valley Fever. The number of incidences increased from
8 1,483 cases in 2001 to 4,094 cases in 2012. The highest number of cases reported
9 during this period occurred in Kings, Kern, Fresno, Tulare, and Madera counties
10 in the San Joaquin Valley within the Central Valley Region; San Luis Obispo
11 County in the Central Coast Region; and Los Angeles County in the Southern
12 California Region.

13 In general, the people who have the highest risk of exposure to the fungus include
14 construction workers, archeologists, geologists, wildland fighters, military
15 personnel, mining or gas/oil extraction workers, and agricultural workers in
16 non-irrigated areas (CDPH 2013c). Other employees also may be at risk. For
17 example, members of the cast and crew of a television film became ill with Valley
18 Fever after working on an outdoor set in Ventura County (CDCP 2014).

19 In 2011, Fresno, Kern, Kings, San Joaquin, San Luis Obispo, and Tulare counties
20 conducted an analysis of information related to Valley Fever incidences (Fresno
21 County et al. 2011). The observations included:

- 22 • More incidences were reported in the western parts of Kern, Kings, Fresno,
23 and San Joaquin counties than in other portions of the counties.
- 24 • More incidences were reported in northern San Luis Obispo County and
25 southern Tulare County than other portions of the counties.
- 26 • In recent years, there was increased reporting of Valley Fever in the prison
27 populations in Fresno and Kings counties. In Kern County, 8 percent of the
28 reported cases between 2005 and 2008 were prison inmates. In Fresno
29 County, incidences at Pleasant Valley State Prison were 43 percent of the total
30 cases in the county between 2004 and 2010. In Kings County, incidences at
31 state prisons were 58 percent of the total cases in the county between 2007
32 and 2010.

33 In 2012, the San Joaquin Valley Air Pollution Control District (SJVAPCD)
34 evaluated causes for Valley Fever and options to reduce social and economic
35 effects of Valley Fever in the San Joaquin Valley (SJVAPCD 2012). The analysis
36 described that Valley Fever appears to be related to a fungus that forms in subsoil
37 strata that are dry through a portion of the year. The analysis referred to other
38 studies that correlated weather patterns with outbreaks of Valley Fever during dry
39 periods following periods of heavy rainfall. The study also indicated that airborne
40 *Coccidioides* spores do not generally come from irrigated agriculture. It appears
41 that it is more likely that the spores are from non-irrigated lands, including
42 undisturbed natural lands, undeveloped land, and grazing areas. The study
43 indicated that additional monitoring or reduction of particulate matter of

1 10 microns, or PM₁₀, did not appear to be useful in reduction of the potential for
 2 Valley Fever. The study recommended additional funding to develop a vaccine
 3 for Valley Fever.

4 **18.3.4 Public Health Issues Related to High Concentrations of**
 5 **Mercury in Fish and Shellfish**

6 As described in Chapter 6, Water Quality, high concentrations of certain
 7 substances accumulate in fish and shellfish based upon the water quality. The
 8 California Environmental Protection Agency, Office of Environmental Health
 9 Hazard Assessment (OEHHA) evaluates concentrations of potentially toxic
 10 substances in edible tissues of fish and shellfish harvested in water bodies in
 11 California (OEHHA 2014a). Based upon the evaluation, general and specific safe
 12 eating guidelines are developed for the fish and shellfish, as summarized in
 13 Table 18.1. For the water bodies in the study area, the primary constituents that
 14 have triggered the development of safe eating guidelines are mercury, dieldrin,
 15 and/or polychlorinated biphenyl (PCB). Other constituents are present, including
 16 selenium; however, the concentrations do not exceed thresholds that would trigger
 17 safe eating guidelines. The OEHHA develops two separate guidelines:
 18 (1) Guidelines for Children from 1 to 17 years and Women from 18 to 45 years;
 19 and (2) Guidelines for Women over 45 years old and Men over 17 years old. The
 20 guidelines recommend the number of servings per week by fish or shellfish
 21 harvested from specific waters. A “serving size” is defined as “about the size and
 22 thickness of your hand” (OEHHA 2014a).

23 **Table 18.1 Summary of Safe Eating Guidelines for Fish and Shellfish from Water**
 24 **Bodies in the Study Area Based on Mercury and PCB (servings per week)**

Region	Water Body	Fish and Shellfisha	Guidelines for Children and Women up to 45 Years Oldb	Guidelines for Men and Women over 45 Years Oldb
Trinity River	Trinity Lake	Rainbow Trout, Brown Trout, White Catfish	2	5
		Largemouth Bass, Smallmouth Bass	Do not eat	1
	Lewiston Lake	Trout	5	7
Central Valley	Sacramento River and Northern Delta	American Shad, Chinook Salmon, Rainbow Trout, Steelhead Trout	2 to 3	7
		Clams	7	7
		Bluegill, other sunfish, carp or goldfish, catfish, crappie, Crayfish, Hardhead, Hitch, sucker	1	3

Region	Water Body	Fish and Shellfisha	Guidelines for Children and Women up to 45 Years Oldb	Guidelines for Men and Women over 45 Years Oldb
Central Valley (continued)		Bass, Pikeminnow, White Sturgeon	Do not eat	1
		Striped Bass	Do not eat	2
	Lake Oroville	Bluegill and Green Sunfish	2	5
		Carp, Coho salmon	1	2
		Largemouth Bass, Smallmouth Bass, Redeye, or Spotted Bass; Channel Catfish; White Catfish	Do not eat	1
	Lower Feather River	American Shad, Chinook Salmon, Steelhead Trout	2 to 3	7
		Carp, sucker	1	2
		Redear, other sunfish	1	3
		Black Bass, catfish, Pikeminnow, Striped Bass, White Sturgeon	Do not eat	1
	Englebright Lake	Rainbow Trout	2	7
		Bluegill, other sunfish	1	2
		Largemouth Bass, Smallmouth Bass, Spotted Bass	Do not eat	1
	Rollins Reservoir	Catfish	1	2
	Camp Far West Reservoir	Bluegill, other sunfish	1	3
		Largemouth Bass, Smallmouth Bass, Spotted Bass, catfish	Do not eat	1
	Folsom Lake	Bluegill, Green Sunfish, or other sunfish; Rout: 16 inches or less	2	5

Region	Water Body	Fish and Shellfisha	Guidelines for Children and Women up to 45 Years Oldb	Guidelines for Men and Women over 45 Years Oldb
Central Valley (continued)		Catfish; Chinook Salmon; Largemouth Bass, Smallmouth Bass, Spotted Bass, trout: over 16 inches	Do not eat	1
	Lake Natoma	Bluegill, Green Sunfish, or other sunfish; trout: 16 inches or less	2	5
		Chinook Salmon; Largemouth Bass, Smallmouth Bass, Spotted Bass, trout: over 16 inches	Do not eat	1
		Catfish	Do not eat	Do not eat
		Lower American River	American Shad, Chinook Salmon, steelhead trout	2 to 3
		Redear or other sunfish, sucker, white catfish	1	2
		Striped Bass	Do not eat	2
		Bass, Pikeminnow	Do not eat	1
	Lower Mokelumne River	American Shad, Chinook Salmon, steelhead trout	2 to 3	7
		Clams	7	7
		Bluegill or other sunfish, Crayfish, catfish	1	2
		Striped Bass	Do not eat	2
		Bass, Pikeminnow, White Sturgeon	Do not eat	1
	San Joaquin River (Friant Dam to Port of Stockton)	Chinook Salmon, steelhead trout	2	7
		Bluegill or other sunfish	2	5
		American Shad	3	7
		Carp, catfish, sucker	1	2

Region	Water Body	Fish and Shellfisha	Guidelines for Children and Women up to 45 Years Oldb	Guidelines for Men and Women over 45 Years Oldb
Central Valley (continued)		Striped Bass	Do not eat	2
		Bass, white sturgeon	Do not eat	1
	Central and South Delta	American Shad, Chinook Salmon, Bluegill or other sunfish, steelhead trout	2	7
		Catfish, Crayfish	2	5
		Clams	7	7
		Bass, carp, crappie, sucker	1	2
		Striped Bass	Do not eat	2
		White Sturgeon	Do not eat	1
San Francisco Bay Area	San Francisco Bay	Chinook Salmon	2	7
		Brown Rockfish, Red Rock Crab	2	5
		Jacksmelt	2	2
		California Halibut	1	2
		White Croaker	1	1
		Sharks, Striped Bass, White Sturgeon	Do not eat	1
		Surfperches	Do not eat	Do not eat
	San Pablo Reservoir	Crappie	2	5
		Trout	5	5
		Largemouth Bass, Smallmouth Bass, Spotted Bass	Do not eat	1
		Carp, catfish	Do not eat	Do not eat
	Lafayette Reservoir	Crappie	4	7
		Bass	1	2
		Carp or Goldfish	Do not eat	1

Region	Water Body	Fish and Shellfisha	Guidelines for Children and Women up to 45 Years Oldb	Guidelines for Men and Women over 45 Years Oldb
San Francisco Bay Area (continued)	Lake Chabot	Redear or other sunfish	2	4
		Channel Catfish	1	1
		Bass	Do not eat	1
		Carp	Do not eat	Do not eat
Southern California Region	Pyramid Lake	Rainbow Trout	7	7
		Channel Catfish	1	2
		Largemouth Bass, Smallmouth Bass	Do not eat	1
		Bullhead	Do not eat	Do not eat
	Silverwood Lake	Rainbow Trout	7	7
		Tule Perch	1	1
		Largemouth Bass, Bluegill, Channel Catfish	Do not eat	1
		Striped Bass, Blackfish, Tui Chub	Do not eat	Do not eat
Statewide	All Lakes and Reservoirs without Site-Specific Advice	Rainbow trout	2	6
		Bullhead, catfish, Bluegill or other sunfish, Brown Trout: 16 inches or less	1	2
		Bass, carp, Brown Trout: over 16 inches	Do not eat	1
	All Rivers, Estuaries, and Coastal Waters without Site-Specific Advice	American Shad, Chinook Salmon, steelhead trout	2 to 3	7

Region	Water Body	Fish and Shellfisha	Guidelines for Children and Women up to 45 Years Oldb	Guidelines for Men and Women over 45 Years Oldb
Statewide (continued)		Striped Bass	Do not eat	2
		White Sturgeon	Do not eat	1

1 Sources: OEHHA 2014b, 2014c, 2014d, 2014e, 2014f, 2014g, 2014h, 2014i, 2014j,
 2 2014k, 2014l, 2014m, 2014n, 2014o, 2014p, 2014q, 2014r, 2014s, 2014t, 2014u, 2014v,
 3 2014w

4 Notes:

- 5 a. All fish and shellfish names are as appears in the OEHHA guidelines.
- 6 b. The OEHHA guidelines refer to the total number of servings of fish per week for one
- 7 water body, not just the total for a specific species. For example, OEHHA guidelines for
- 8 Men eating fish from Trinity Lake would include no more than 5 servings of Rainbow
- 9 Trout, Brown Trout, or White Catfish; OR 1 serving of Largemouth Bass or Smallmouth
- 10 Bass.

11 Resident Delta fish accumulate mercury primarily through dietary exposure;
 12 larger, piscivorous (fish-eating) fish show the greatest levels of tissue mercury. In
 13 contrast to anadromous fish (migratory species), the resident fish experience
 14 constant exposure to local mercury sources. Resident species include larger fish
 15 with human health exposure (such as Largemouth Bass) and smaller, forage fish
 16 (such as Inland Silversides). Fish tissues are the ultimate route of exposure to
 17 mercury for humans who consume locally caught fish.

18 Historically, substantial levels of mercury contamination have occurred in fish
 19 throughout the Delta. Mercury concentrations in tissue of the larger piscivorous
 20 fish are lower in for fish in the central Delta as compared to fish from the
 21 Mokelumne, Cosumnes, Sacramento, and San Joaquin rivers (CVRWQCB 2010a,
 22 2010b). Larger, piscivorous resident fish, in general, provide a good record of
 23 fish tissue mercury as a baseline condition for the Delta. Largemouth Bass were
 24 chosen because they are popular sport fish, top predators, live for several years,
 25 and tend to stay in the same area (exhibit high site fidelity). Consequently, they
 26 are excellent indicators of long-term average mercury exposure, risk, and spatial
 27 pattern for ecological and human health. Mercury in sport fish from the Delta
 28 region was reported for Largemouth Bass as a median tissue mercury
 29 concentration of 0.53 mg mercury per kilogram (Hg/kg) wet weight (Davis et al.
 30 2003). Current fish tissue concentrations thus exceed both adopted regulatory
 31 standards and guidance from the U.S. Environmental Protection Agency
 32 (USEPA). In the 2010 Delta TMDL for methylmercury, the Central Valley
 33 Regional Water Quality Control Board (Central Valley RWQCB) established a
 34 fish tissue threshold (fillet concentrations, wet weight mercury) of 0.24 mg Hg/kg
 35 wet weight in trophic level 4 fish (adult, top predatory sport fish, such as
 36 Largemouth Bass) (Central Valley Water Board 2010a). These values are slightly
 37 lower than USEPA’s national recommended water quality criterion for fish tissue
 38 of 0.3 mg Hg/kg wet weight for protection of human health and wildlife (USEPA

1 2001). Therefore, the Delta average for Largemouth Bass fillet concentrations in
 2 the study by Davis et al. exceeds both recommended safe consumption guidelines.

3 **18.4 Impact Analysis**

4 This section describes the potential mechanisms for change in conditions and
 5 analytical methods; results of impact analyses; potential mitigation measures; and
 6 cumulative effects.

7 **18.4.1 Potential Mechanisms for Change and Analytical Methods**

8 As described in Chapter 4, Approach to Environmental Analysis, the impact
 9 analysis considers changes in public health factors related to changes in CVP and
 10 SWP operations under the alternatives as compared to the No Action Alternative
 11 and Second Basis of Comparison.

12 Changes in CVP and SWP operations under the alternatives as compared to the
 13 No Action Alternative and Second Basis of Comparison could change public
 14 health factors affected by CVP and SWP operations.

15 **18.4.1.1 Changes in Public Health Factors Related to Available CVP and** 16 **SWP Agricultural Water Supplies**

17 Changes in water supply availability to agricultural water users could result in
 18 reductions of irrigated acreage and related jobs. The availability of jobs can affect
 19 public health, as described in Section 18.3.2, Public Health Issues Related to
 20 Available Water Supplies. As described in Chapter 12, Agricultural Resources,
 21 agricultural acreage would be similar under Alternatives 1 through 5, No Action
 22 Alternative, and Second Basis of Comparison. Therefore, the change in public
 23 health conditions would be the same under all of the alternatives and the Second
 24 Basis of Comparison; and is not analyzed in this EIS.

25 **18.4.1.2 Changes in Public Health Factors Related to Available Municipal** 26 **Water Supplies**

27 As described in Section 18.3.2, Public Health Issues Related to Available Water
 28 Supplies, water supply availability can affect public health related to direct use
 29 within the household and indirect effects related to adequate water supplies for
 30 industrial and commercial water users that provide employment. As described in
 31 Chapter 5, Surface Water Resources and Water Supplies, and Chapter 18,
 32 Socioeconomics, municipal and industrial water users would rely upon alternate
 33 water supplies to meet water demands in 2030. Therefore, public health
 34 conditions related to availability of municipal and industrial water supplies would
 35 be the same under all of the alternatives and the Second Basis of Comparison; and
 36 is not analyzed in this EIS.

37 **18.4.1.3 Changes in Public Health Factors Related to Wildland** 38 **Firefighting and CVP and SWP Reservoir Storage**

39 Stored water in water supply reservoirs is used for wildland firefighting in the
 40 California foothills and mountains, including water stored in CVP and SWP

1 reservoirs. During drier periods, reduced storage levels could affect the
2 availability of water for wildlife firefighting, as indicated in changes in CVP and
3 SWP reservoir at the end of September in critical dry water years, as described in
4 Chapter 5, Surface Water Resources and Water Supplies.

5 Reservoirs that store water in the San Francisco Bay Area, Central Coast, and
6 Southern California regions are managed to store water supplies as part of short-
7 term conveyance management or storage for regional and local water supplies
8 using water from numerous sources and water for wildland firefighting is not
9 known; and therefore, are not analyzed in this EIS.

10 **18.4.1.4 Changes in Public Health Factors Related to Wetlands**
11 **Restoration and Mosquito-Borne Diseases**

12 Wetlands provide habitat for mosquito breeding, especially in tidally-influenced
13 wetlands with slow moving water and floodplains after the majority of the water
14 recedes. Management practices (e.g., designing wetlands to provide flushing
15 flows, use of biological controls) can reduce the nuisance and public health
16 aspects of mosquito populations. The extent of seasonal floodplains and tidally-
17 influenced wetlands in Yolo Bypass, Cache Slough, and Suisun Marsh areas
18 would increase in a similar manner under all of the alternatives and the Second
19 Basis of Comparison, as described in Chapter 3, Description of Alternatives.
20 Therefore, the potential for changes in public health conditions related to
21 mosquito populations would be the same under all of the alternatives and the
22 Second Basis of Comparison; and is not analyzed in this EIS.

23 **18.4.1.5 Changes in Public Health Factors Related to Potential**
24 **Valley Fever**

25 As described above, recent studies have indicated that valley fever exposure
26 appears to be related to cultivated lands, including lands that are idled due to
27 agricultural practices or reduced water supply availability. Changes in CVP and
28 SWP operations under the alternatives and the Second Basis of Comparison
29 would not affect the extent of non-irrigated lands. Therefore, the potential for
30 changes in public health conditions related to Valley Fever would be the same
31 under all of the alternatives and the Second Basis of Comparison; and is not
32 analyzed in this EIS.

33 **18.4.1.6 Changes in Public Health Factors Related to Mercury in Fish**
34 **used for Human Consumption**

35 As described above, fish used for human consumption in the Delta have mercury
36 levels that exceed OEHHA guidelines. Changes in CVP and SWP operations
37 under the alternatives and the Second Basis of Comparison would change the
38 accumulated mercury concentrations in fish in the Delta. As described in Chapter
39 6, Surface Water Quality, the bioavailability and toxicity of mercury is enhanced
40 through the natural, bacterial conversion of mercury to methylmercury in
41 marshlands or wetlands. These stagnant locations with reduced oxygen
42 concentrations promote chemical reduction processes that make methylation
43 possible. The methylmercury model is based upon the Total Maximum Daily
44 Load translation equation for mercury developed by the Central Valley Regional

1 Water Quality Control Board. The model estimates fish tissue concentrations
 2 from waterborne concentrations of mercury in the Delta and evaluates the
 3 potential to cause exceedances of water quality or tissue benchmarks. The tissue
 4 concentrations associated with the Alternatives 1 through 5 were compared to the
 5 No Action Alternative and the Second Basis of Comparison.

6 **18.4.2 Conditions in Year 2030 without Implementation of**
 7 **Alternatives 1 through 5**

8 This EIS includes two bases of comparison, as described in Chapter 3,
 9 Description of Alternatives: the No Action Alternative and the Second Basis of
 10 Comparison. Both of these bases are evaluated at 2030 conditions. Changes that
 11 would occur over the next 15 years without implementation of the alternatives are
 12 not analyzed in this EIS. However, the changes to public health that are assumed
 13 to occur by 2030 under the No Action Alternative and the Second Basis of
 14 Comparison are summarized in this section. Many of the changed conditions
 15 would occur in the same manner under both the No Action Alternative and the
 16 Second Basis of Comparison.

17 **18.4.2.1 Common Changes in Conditions under the No Action Alternative**
 18 **and Second Basis of Comparison**

19 Conditions in 2030 would be different than existing conditions due to:

- 20 • Climate change and sea level rise
- 21 • General plan development throughout California, including increased water
 22 demands in portions of Sacramento Valley
- 23 • Implementation of reasonable and foreseeable water resources management
 24 projects to provide water supplies

25 It is anticipated that climate change would result in more short-duration high-
 26 rainfall events and less snowpack in the winter and early spring months. The
 27 reservoirs would be full more frequently by the end of April or May by 2030 than
 28 in recent historical conditions. However, as the water is released in the spring,
 29 there would be less snowpack to refill the reservoirs. This condition would
 30 reduce reservoir storage and available water supplies to downstream uses in the
 31 summer. The reduced end of September storage also would reduce the ability to
 32 release stored water to downstream regional reservoirs. These conditions would
 33 occur for all reservoirs in the California foothills and mountains, including
 34 non-CVP and SWP reservoirs.

35 These changes would result in a decline of the long-term average CVP and SWP
 36 water supply deliveries by 2030 as compared to recent historical long-term
 37 average deliveries under the No Action Alternative and the Second Basis of
 38 Comparison. However, the CVP and SWP water deliveries would be less under
 39 the No Action Alternative as compared to the Second Basis of Comparison, as
 40 described in Chapter 5, Surface Water Resources and Water Supplies. Due to
 41 climate change and related lower snowfall, end of September low reservoir
 42 storage would be lower in critical dry years by 2030 as compared to recent

1 historical conditions in Shasta Lake, Lake Oroville, Folsom Lake, New Melones
2 Reservoir, and San Luis Reservoir. Therefore, the potential for reduced reservoir
3 water supplies for wildland firefighting would be greater under the No Action
4 Alternative and Second Basis of Comparison as compared to recent historical
5 conditions.

6 Under the No Action Alternative and the Second Basis of Comparison, land uses
7 in 2030 would occur in accordance with adopted general plans.

8 The No Action Alternative and the Second Basis of Comparison assumes
9 completion of water resources management and environmental restoration
10 projects that would have occurred without implementation of Alternatives 1
11 through 5, including regional and local recycling projects, surface water and
12 groundwater storage projects, conveyance improvement projects, and desalination
13 projects, as described in Chapter 3, Description of Alternatives. The No Action
14 Alternative and the Second Basis of Comparison also assumes implementation of
15 actions included in the 2008 U.S. Fish and Wildlife Service (USFWS) Biological
16 Opinion (BO) and 2009 National Marine Fisheries Service (NMFS) BO that
17 would have been implemented without the BOs by 2030, as described in
18 Chapter 3, Description of Alternatives.

19 Under the No Action Alternative and Second Basis of Comparison, it is
20 anticipated that mercury concentrations in fish tissue within the Delta will be
21 either similar or greater than recent historical conditions. Phase 1 of the Delta
22 Mercury Program mandated by the Central Valley RWQCB is currently being
23 completed to protect people eating one meal per week of larger fish from the
24 Delta, including Largemouth Bass. Phase 1 is focused on studies and pilot
25 projects to develop and evaluate management practices to control methylmercury
26 from mercury sources in the Delta and Yolo Bypass; and to reduce total mercury
27 loading to the San Francisco Bay. Following completion of Phase 1 in 2019,
28 Phase 2 will be implemented through 2030. Phase 2 will focus on methylmercury
29 control programs and reduction programs for total inorganic mercury. Due to the
30 extent of these studies, it is not anticipated that changes in methylmercury or total
31 mercury concentrations in fish tissue will be reduced by 2030. Future mercury
32 reduction and control programs will reduce mercury sources and related fish
33 tissue concentrations; however, that will occur after 2030.

34 **18.4.3 Evaluation of Alternatives**

35 As described in Chapter 4, Approach to Environmental Analysis, Alternatives 1
36 through 5 have been compared to the No Action Alternative; and the No Action
37 Alternative and Alternatives 1 through 5 have been compared to the Second Basis
38 of Comparison.

39 During review of the numerical modeling analyses used in this EIS, an error was
40 determined in the CalSim II model assumptions related to the Stanislaus River
41 operations for the Second Basis of Comparison, Alternative 1, and Alternative 4
42 model runs. Appendix 5C includes a comparison of the CalSim II model run
43 results presented in this chapter and CalSim II model run results with the error

1 corrected. Appendix 5C also includes a discussion of changes in the comparison
 2 of groundwater conditions for the following alternative analyses.

- 3 • No Action Alternative compared to the Second Basis of Comparison
- 4 • Alternative 1 compared to the No Action Alternative
- 5 • Alternative 3 compared to the Second Basis of Comparison
- 6 • Alternative 5 compared to the Second Basis of Comparison

7 **18.4.3.1 No Action Alternative**

8 The No Action Alternative is compared to the Second Basis of Comparison.

9 **18.4.3.1.1 Trinity River Region**

10 *Changes in Public Health Factors Related to Wildland Firefighting and CVP and*
 11 *SWP Reservoir Storage*

12 Changes in CVP water supplies and operations under the No Action Alternative
 13 as compared to the Second Basis of Comparison would result in similar end of
 14 September reservoir elevations in critical dry years (changes within 5 percent) at
 15 Trinity Lake, as described in Chapter 5, Surface Water Resources and Water
 16 Supplies. Therefore, the potential for water availability for wildland firefighting
 17 would be similar under the No Action Alternative as compared to the Second
 18 Basis of Comparison.

19 **18.4.3.1.2 Central Valley Region**

20 *Changes in Public Health Factors Related to Wildland Firefighting and CVP and*
 21 *SWP Reservoir Storage*

22 Changes in CVP water supplies and operations under the No Action Alternative
 23 as compared to the Second Basis of Comparison would result in similar end of
 24 September reservoir elevations in critical dry years (changes within 5 percent) at
 25 Shasta Lake, Lake Oroville, Folsom Lake, and New Melones Reservoir, as
 26 described in Chapter 5, Surface Water Resources and Water Supplies. Therefore,
 27 the potential for water availability for wildland firefighting would be similar
 28 under the No Action Alternative as compared to the Second Basis of Comparison.

29 End of September surface water elevations at San Luis Reservoir in critical dry
 30 years would be 6 percent lower under the No Action Alternative as compared to
 31 the Second Basis of Comparison. Therefore, the potential for water availability
 32 for wildland firefighting would be reduced at San Luis Reservoir under the No
 33 Action Alternative as compared to the Second Basis of Comparison.

34 *Changes in Public Health Factors Related to Mercury in Fish used for Human*
 35 *Consumption*

36 Mercury concentrations in Largemouth Bass would be similar (within 5 percent
 37 change) in most locations in the Delta, except for Rock Slough, San Joaquin River
 38 near Antioch, and Montezuma Slough in Suisun Marsh. In these areas, the
 39 mercury concentrations would increase by 7 percent over long-term conditions
 40 under the No Action Alternative as compared to the Second Basis of Comparison.

1 Under dry and critical dry years, mercury concentrations would increase by 7 to
2 8 percent at Rock Slough, intakes of the Banks and Jones pumping plants, and
3 Victoria Canal. All values exceed the threshold of 0.24 mg/kg ww for mercury.

4 **18.4.3.2 Alternative 1**

5 Alternative 1 is identical to the Second Basis of Comparison. Alternative 1 is
6 compared to the No Action Alternative and the Second Basis of Comparison.
7 However, because CVP and SWP operations under Alternative 1 are identical to
8 conditions under the Second Basis of Comparison; Alternative 1 is only compared
9 to the No Action Alternative.

10 **18.4.3.2.1 Alternative 1 Compared to the No Action Alternative**

11 *Trinity River Region*

12 *Changes in Public Health Factors Related to Wildland Firefighting and CVP* 13 *and SWP Reservoir Storage*

14 Changes in CVP water supplies and operations under Alternative 1 as compared
15 to the No Action Alternative would result in similar end of September reservoir
16 elevations in critical dry years at Trinity Lake, as described in Chapter 5, Surface
17 Water Resources and Water Supplies. Therefore, the potential for water
18 availability for wildland firefighting would be similar under Alternative 1 as
19 compared to the No Action Alternative.

20 *Central Valley Region*

21 *Changes in Public Health Factors Related to Wildland Firefighting and CVP* 22 *and SWP Reservoir Storage*

23 Changes in CVP water supplies and operations under Alternative 1 as compared
24 to the No Action Alternative would result in similar end of September reservoir
25 elevations in critical dry years at Shasta Lake, Lake Oroville, Folsom Lake, and
26 New Melones Reservoir, as described in Chapter 5, Surface Water Resources and
27 Water Supplies. Therefore, the potential for water availability for wildland
28 firefighting would be similar under Alternative 1 as compared to the No Action
29 Alternative.

30 End of September surface water elevations at San Luis Reservoir in critical dry
31 years would be 7 percent higher under Alternative 1 as compared to the No
32 Action Alternative. Therefore, the potential for water availability for wildland
33 firefighting would be increased at San Luis Reservoir under Alternative 1 as
34 compared to the No Action Alternative.

35 *Changes in Public Health Factors Related to Mercury in Fish used for Human* 36 *Consumption*

37 Mercury concentrations in Largemouth Bass would be similar in most locations in
38 the Delta, except for Rock Slough, San Joaquin River near Antioch, and
39 Montezuma Slough in Suisun Marsh. In these areas, the mercury concentrations
40 would decrease by 6 percent over the long-term conditions under Alternative 1 as
41 compared to the No Action Alternative. Under dry and critical dry years, mercury
42 concentrations would decrease by 6 to 8 percent at Rock Slough, intakes of the

1 Banks and Jones pumping plants, and Victoria Canal. All values exceed the
2 threshold of 0.24 mg/kg ww for mercury.

3 **18.4.3.2.2 Alternative 1 Compared to the Second Basis of Comparison**

4 Alternative 1 is identical to the Second Basis of Comparison.

5 **18.4.3.3 Alternative 2**

6 The CVP and SWP operations under Alternative 2 are identical to the CVP and
7 SWP operations under the No Action Alternative; therefore, Alternative 2 is only
8 compared to the Second Basis of Comparison.

9 **18.4.3.3.1 Alternative 2 Compared to the Second Basis of Comparison**

10 The CVP and SWP operations under Alternative 2 are identical to the CVP and
11 SWP operations under the No Action Alternative. Therefore, changes to public
12 health conditions under Alternatives 2 as compared to the Second Basis of
13 Comparison would be the same as the impacts described in Section 18.4.3.1,
14 No Action Alternative.

15 **18.4.3.4 Alternative 3**

16 As described in Chapter 3, Description of Alternatives, CVP and SWP operations
17 under Alternative 3 are similar to the Second Basis of Comparison with modified
18 Old and Middle River flow criteria and New Melones Reservoir operations.

19 As described in Chapter 4, Approach to Environmental Analysis, Alternative 3 is
20 compared to the No Action Alternative and the Second Basis of Comparison.

21 **18.4.3.4.1 Alternative 3 Compared to the No Action Alternative**

22 *Trinity River Region*

23 *Changes in Public Health Factors Related to Wildland Firefighting and CVP* 24 *and SWP Reservoir Storage*

25 Changes in CVP water supplies and operations under Alternative 3 as compared
26 to the No Action Alternative would result in similar end of September reservoir
27 elevations in critical dry years at Trinity Lake, as described in Chapter 5, Surface
28 Water Resources and Water Supplies. Therefore, the potential for water
29 availability for wildland firefighting would be similar under Alternative 3 as
30 compared to the No Action Alternative.

31 *Central Valley Region*

32 *Changes in Public Health Factors Related to Wildland Firefighting and CVP* 33 *and SWP Reservoir Storage*

34 Changes in CVP water supplies and operations under Alternative 3 as compared
35 to the No Action Alternative would result in similar end of September reservoir
36 elevations in critical dry years at Shasta Lake, Lake Oroville, Folsom Lake, New
37 Melones Reservoir, and San Luis Reservoir, as described in Chapter 5, Surface
38 Water Resources and Water Supplies. Therefore, the potential for water
39 availability for wildland firefighting would be similar under Alternative 3 as
40 compared to the No Action Alternative.

1 *Changes in Public Health Factors Related to Mercury in Fish used for Human*
2 *Consumption*

3 Mercury concentrations in Largemouth Bass would be similar (within 5 percent
4 change) in most locations in the Delta, except for San Joaquin River near Antioch
5 and Montezuma Slough in Suisun Marsh. In these areas, the mercury
6 concentrations would decrease by 6 percent over the long-term conditions under
7 Alternative 3 as compared to the No Action Alternative. Mercury concentrations
8 under the dry and critical dry years would be similar throughout the Delta. All
9 values exceed the threshold of 0.24 mg/kg ww for mercury.

10 **18.4.3.4.2 Alternative 3 Compared to the Second Basis of Comparison**

11 *Trinity River Region*

12 *Changes in Public Health Factors Related to Wildland Firefighting and CVP*
13 *and SWP Reservoir Storage*

14 Changes in CVP water supplies and operations under Alternative 3 as compared
15 to the Second Basis of Comparison would result in similar end of September
16 reservoir elevations in critical dry years at Trinity Lake, as described in Chapter 5,
17 Surface Water Resources and Water Supplies. Therefore, the potential for water
18 availability for wildland firefighting would be similar under Alternative 3 as
19 compared to the Second Basis of Comparison.

20 *Central Valley Region*

21 *Changes in Public Health Factors Related to Wildland Firefighting and CVP*
22 *and SWP Reservoir Storage*

23 Changes in CVP water supplies and operations under Alternative 3 as compared
24 to the Second Basis of Comparison would result in similar end of September
25 reservoir elevations in critical dry years at Shasta Lake, Lake Oroville, Folsom
26 Lake, New Melones Reservoir, and San Luis Reservoir, as described in Chapter 5,
27 Surface Water Resources and Water Supplies. Therefore, the potential for water
28 availability for wildland firefighting would be similar under Alternative 3 as
29 compared to the Second Basis of Comparison.

30 *Changes in Public Health Factors Related to Mercury in Fish used for Human*
31 *Consumption*

32 Mercury concentrations in Largemouth Bass would be similar throughout the
33 Delta under Alternative 3 as compared to the Second Basis of Comparison, as
34 summarized in Chapter 6, Surface Water Quality. All values exceed the threshold
35 of 0.24 mg/kg ww for mercury.

36 **18.4.3.5 Alternative 4**

37 The public health conditions under Alternative 4 would be identical to the
38 conditions under the Second Basis of Comparison; therefore, Alternative 4 is only
39 compared to the No Action Alternative.

1 **18.4.3.5.1 Alternative 4 Compared to the No Action Alternative**

2 The CVP and SWP operations under Alternative 4 are identical to the CVP and
 3 SWP operations under the Second Basis of Comparison and Alternative 1.
 4 Therefore, changes in public health conditions under Alternative 4 as compared to
 5 the No Action Alternative would be the same as the impacts described in
 6 Section 12.4.4.2.1, Alternative 1 Compared to the No Action Alternative.

7 **18.4.3.6 Alternative 5**

8 As described in Chapter 3, Description of Alternatives, CVP and SWP operations
 9 under Alternative 5 are similar to the No Action Alternative with modified Old
 10 and Middle River flow criteria and New Melones Reservoir operations. As
 11 described in Chapter 4, Approach to Environmental Analysis, Alternative 5 is
 12 compared to the No Action Alternative and the Second Basis of Comparison.

13 **18.4.3.6.1 Alternative 5 Compared to the No Action Alternative**

14 *Trinity River Region*

15 *Changes in Public Health Factors Related to Wildland Firefighting and CVP*
 16 *and SWP Reservoir Storage*

17 Changes in CVP water supplies and operations under Alternative 5 as compared
 18 to the No Action Alternative would result in similar end of September reservoir
 19 elevations in critical dry years at Trinity Lake, as described in Chapter 5, Surface
 20 Water Resources and Water Supplies. Therefore, the potential for water
 21 availability for wildland firefighting would be similar under Alternative 5 as
 22 compared to the No Action Alternative.

23 *Central Valley Region*

24 *Changes in Public Health Factors Related to Wildland Firefighting and CVP*
 25 *and SWP Reservoir Storage*

26 Changes in CVP water supplies and operations under Alternative 5 as compared
 27 to the No Action Alternative would result in similar end of September reservoir
 28 elevations in critical dry years at Shasta Lake, Lake Oroville, Folsom Lake, New
 29 Melones Reservoir, and San Luis Reservoir, as described in Chapter 5, Surface
 30 Water Resources and Water Supplies. Therefore, the potential for water
 31 availability for wildland firefighting would be similar under Alternative 5 as
 32 compared to the No Action Alternative.

33 *Changes in Public Health Factors Related to Mercury in Fish used for Human*
 34 *Consumption*

35 Mercury concentrations in Largemouth Bass would be similar throughout the
 36 Delta under Alternative 5 as compared to the No Action Alternative, as
 37 summarized in Chapter 6, Surface Water Quality. All values exceed the threshold
 38 of 0.24 mg/kg ww for mercury.

1 **18.4.3.6.2 Alternative 5 Compared to the Second Basis of Comparison**

2 *Trinity River Region*

3 *Changes in Public Health Factors Related to Wildland Firefighting and CVP*
4 *and SWP Reservoir Storage*

5 Changes in CVP water supplies and operations under Alternative 5 as compared
6 to the Second Basis of Comparison would result in similar end of September
7 reservoir elevations in critical dry years at Trinity Lake, as described in Chapter 5,
8 Surface Water Resources and Water Supplies. Therefore, the potential for water
9 availability for wildland firefighting would be similar under Alternative 5 as
10 compared to the Second Basis of Comparison.

11 *Central Valley Region*

12 *Changes in Public Health Factors Related to Wildland Firefighting and CVP*
13 *and SWP Reservoir Storage*

14 Changes in CVP water supplies and operations under Alternative 5 as compared
15 to the Second Basis of Comparison would result in similar end of September
16 reservoir elevations in critical dry years at Shasta Lake, Lake Oroville, Folsom
17 Lake, and New Melones Reservoir, as described in Chapter 5, Surface Water
18 Resources and Water Supplies. Therefore, the potential for water availability for
19 wildland firefighting would be similar under Alternative 5 as compared to the
20 Second Basis of Comparison.

21 End of September surface water elevations at San Luis Reservoir in critical dry
22 years would be 9 percent lower under Alternative 5 as compared to the Second
23 Basis of Comparison. Therefore, the potential for water availability for wildland
24 firefighting would be reduced at San Luis Reservoir under Alternative 5 as
25 compared to the Second Basis of Comparison.

26 *Changes in Public Health Factors Related to Mercury in Fish used for*
27 *Human Consumption*

28 Mercury concentrations in Largemouth Bass would be similar in most locations in
29 the Delta, except for Rock Slough, San Joaquin River near Antioch, and
30 Montezuma Slough in Suisun Marsh. In these areas, the mercury concentrations
31 would increase by 7 to 8 percent over long-term conditions under Alternative 5 as
32 compared to the Second Basis of Comparison. During dry and critical dry years,
33 mercury concentrations also would increase by 7 percent at intakes to Banks
34 Pumping Plant and Jones Pumping Plant; and 13 percent at Rock Slough. All
35 values exceed the threshold of 0.24 mg/kg ww for mercury.

36 **18.4.3.7 Summary of Environmental Consequences**

37 The results of the environmental consequences of implementation of
38 Alternatives 1 through 5 as compared to the No Action Alternative and the
39 Second Basis of Comparison are presented in Tables 18.2 and 18.3, respectively.

1 **Table 18.2 Comparison of Alternatives 1 through 5 to No Action Alternative**

Alternative	Potential Change	Consideration for Mitigation Measures
Alternative 1	<p>Similar water supply availability for wildland firefighting at Trinity Lake, Shasta Lake, Lake Oroville, Folsom Lake, and New Melones Reservoir; and a 7 percent increase at San Luis Reservoir.</p> <p>Similar mercury concentrations in Largemouth Bass in the most of the Delta; and a 6 percent decrease near Rock Slough, San Joaquin River at Antioch, and Montezuma Slough over the long-term conditions.</p>	None needed
Alternative 2	No effects on public health issues.	None needed
Alternative 3	<p>Similar water supply availability for wildland firefighting at Trinity Lake, Shasta Lake, Lake Oroville, Folsom Lake, New Melones Reservoir, and San Luis Reservoir.</p> <p>Similar mercury concentrations in Largemouth Bass in the most of the Delta; and a 6 percent decrease near San Joaquin River at Antioch and Montezuma Slough over the long-term conditions.</p>	None needed
Alternative 4	Same effects as described for Alternative 1 compared to the No Action Alternative.	None needed
Alternative 5	<p>Similar water supply availability for wildland firefighting at Trinity Lake, Shasta Lake, Lake Oroville, Folsom Lake, New Melones Reservoir, and San Luis Reservoir.</p> <p>Similar mercury concentrations in Largemouth Bass throughout the Delta.</p>	None needed

2 Note: Due to the limitations and uncertainty in the CalSim II monthly model and other
 3 analytical tools, incremental differences of 5 percent or less between alternatives and the
 4 Second Basis of Comparison are considered to be “similar.”

5

1 **Table 18.3 Comparison of No Action Alternative and Alternatives 1 through 5 to**
 2 **Second Basis of Comparison**

Alternative	Potential Change	Consideration for Mitigation Measures
No Action Alternative	Similar water supply availability for wildland firefighting at Trinity Lake, Shasta Lake, Lake Oroville, Folsom Lake, and New Melones Reservoir; and a 6 percent decrease at San Luis Reservoir. Similar mercury concentrations in Largemouth Bass in the most of the Delta; and a 7 percent increase near Rock Slough, San Joaquin River at Antioch, and Montezuma Slough over the long-term conditions.	Not considered for this comparison.
Alternative 1	No effects on public health issues.	Not considered for this comparison.
Alternative 2	Same effects as described for No Action Alternative as compared to the Second Basis of Comparison.	Not considered for this comparison.
Alternative 3	Similar water supply availability for wildland firefighting at Trinity Lake, Shasta Lake, Lake Oroville, Folsom Lake, New Melones Reservoir, and San Luis Reservoir. Similar mercury concentrations in Largemouth Bass throughout the Delta.	Not considered for this comparison.
Alternative 4	No effects on public health issues.	Not considered for this comparison.
Alternative 5	Similar water supply availability for wildland firefighting at Trinity Lake, Shasta Lake, Lake Oroville, Folsom Lake, and New Melones Reservoir; and a 9 percent decrease at San Luis Reservoir. Similar mercury concentrations in Largemouth Bass in the most of the Delta; and a 7 percent increase near Rock Slough, San Joaquin River at Antioch, and Montezuma Slough over the long-term conditions.	Not considered for this comparison.

3 Note: Due to the limitations and uncertainty in the CalSim II monthly model and other
 4 analytical tools, incremental differences of 5 percent or less between alternatives and the
 5 Second Basis of Comparison are considered to be “similar.”

6 **18.4.3.8 Potential Mitigation Measures**

7 Mitigation measures are presented in this section to avoid, minimize, rectify,
 8 reduce, eliminate, or compensate for adverse environmental effects of
 9 Alternatives 1 through 5 as compared to the No Action Alternative. Mitigation

1 measures were not included to address adverse impacts under the alternatives as
 2 compared to the Second Basis of Comparison because this analysis was included
 3 in this EIS for information purposes only.

4 Changes in CVP and SWP operations under Alternatives 1 through 5 as compared
 5 to the No Action Alternative would not result in changes in public health factors.
 6 Therefore, there would be no adverse impacts to public health factors; and no
 7 mitigation measures are required.

8 **18.4.3.9 Cumulative Effects Analysis**

9 As described in Chapter 3, the cumulative effects analysis considers projects,
 10 programs, and policies that are not speculative; and are based upon known or
 11 reasonably foreseeable long-range plans, regulations, operating agreements, or
 12 other information that establishes them as reasonably foreseeable.

13 The cumulative effects analyses for Alternatives 1 through 5 for Public Health are
 14 summarized in Table 18.4.

15 **Table 18.4 Summary of Cumulative Effects on Public Health with Implementation of**
 16 **Alternatives 1 through 5 as Compared to the No Action Alternative**

Scenarios	Actions	Cumulative Effects of Actions
Past & Present, and Future Actions included in the No Action Alternative in All Alternatives in Year 2030	Consistent with Affected Environment conditions plus: Actions in the 2008 USFWS BO and 2009 NMFS BO that would have occurred without implementation of the BOs, as described in Section 3.3.1.2 (of Chapter 3, Descriptions of Alternatives), including climate change and sea level rise Actions not included in the 2008 USFWS BO and 2009 NMFS BO that would have occurred without implementation of the BOs, as described in Section 3.3.1.3 (of Chapter 3, Descriptions of Alternatives): - Implementation of Federal and state policies and programs, including Clean Water Act (e.g., Total Maximum Daily Loads); Safe Drinking Water Act; Clean Air Act; and flood management programs - General plans for 2030. - Trinity River Restoration Program. - Central Valley Project Improvement Act programs	These effects would be the same under all alternatives. Climate change and sea level rise, development under the general plans, FERC relicensing projects, and some future projects to improve water quality and/or habitat are anticipated to reduce end of September storage in CVP and SWP reservoirs. Mercury concentrations in fish tissue within the Delta will be either similar or greater than recent historical conditions because Phases 1 and 2 of the Delta Mercury Program would be completed by 2030, as mandated by the Central Valley RWQCB, including methylmercury control programs and reduction programs for total inorganic mercury. Due to the extent of these programs, it is anticipated that the programs would be initiated; however, future reductions in mercury sources and related reductions of mercury and

Scenarios	Actions	Cumulative Effects of Actions
	<ul style="list-style-type: none"> - Folsom Dam Water Control Manual Update - FERC Relicensing for the Middle Fork of the American River Project - Lower Mokelumne River Spawning Habitat Improvement Project - Dutch Slough Tidal Marsh Restoration - Suisun Marsh Habitat Management, Preservation, and Restoration Plan Implementation - Tidal Wetland Restoration: Yolo Ranch, Northern Liberty Island Fish Restoration Project, Prospect Island Restoration Project, and Calhoun Cut/Lindsey Slough Tidal Habitat Restoration Project - San Joaquin River Restoration Program - Future water supply projects, including water recycling, desalination, groundwater banks and wellfields, and conveyance facilities (projects with completed environmental documents) 	<p>methylmercury concentrations in fish tissue would actually occur after 2030.</p>
<p>Future Actions considered as Cumulative Effects Actions in All Alternatives in Year 2030</p>	<p>Actions as described in Section 3.5 (of Chapter 3, Descriptions of Alternatives):</p> <ul style="list-style-type: none"> - Bay-Delta Water Quality Control Plan Update - FERC Relicensing Projects - Bay Delta Conservation Plan (including the California WaterFix alternative) - Shasta Lake Water Resources, North-of-the-Delta Offstream Storage, Los Vaqueros Reservoir Expansion Phase 2, and Upper San Joaquin River Basin Storage Investigations - El Dorado Water and Power Authority Supplemental Water Rights Project - Sacramento River Water Reliability Project - Semitropic Water Storage District Delta Wetlands 	<p>These effects would be the same under all alternatives. Reasonably foreseeable storage projects would increase reservoir storage at Shasta Lake and Los Vaqueros Reservoir, and provide new reservoir storage at North-of-the-Delta Offstream Storage, Upper San Joaquin River Basin Storage, and Delta Wetlands.</p>

Scenarios	Actions	Cumulative Effects of Actions
	<ul style="list-style-type: none"> - North Bay Aqueduct Alternative Intake - San Luis Reservoir Low Point Improvement Project - Future water supply projects, including water recycling, desalination, groundwater banks and wellfields, and conveyance facilities (projects that did not have completed environmental documents during preparation of the EIS) 	
No Action Alternative with Associated Cumulative Effects Actions in Year 2030	Full implementation of the 2008 USFWS BO and 2009 NMFS BO	Climate change and sea level rise, FERC relicensing projects, and some future projects to improve water quality and/or habitat are anticipated to reduce end of September CVP and SWP reservoir storage as compared to past conditions. Mercury and methylmercury concentrations in fish tissue would be similar or greater than past conditions.
Alternative 1 with Associated Cumulative Effects Actions in Year 2030	No implementation of the 2008 USFWS BO and 2009 NMFS BO actions unless the actions would have been implemented without the BO (e.g., Red Bluff Pumping Plant)	Implementation of Alternative 1 with future reasonably foreseeable actions would result in similar changes as under the No Action Alternative with the added actions.
Alternative 2 with Associated Cumulative Effects Actions in Year 2030	<p>Full implementation of the 2008 USFWS BO and 2009 NMFS BO CVP and SWP operational actions</p> <p>No implementation of structural improvements or other actions that require further study to develop a more detailed action description.</p>	Implementation of Alternative 2 with reasonably foreseeable actions would result in similar changes as under the No Action Alternative with the added actions.
Alternative 3 with Associated Cumulative Effects Actions in Year 2030	<p>No implementation of the 2008 USFWS BO and 2009 NMFS BO actions unless the actions would have been implemented without the BO (e.g., Red Bluff Pumping Plant)</p> <p>Slight increase in positive Old and Middle River flows in the winter and spring months</p>	Implementation of Alternative 3 with reasonably foreseeable actions would result in similar changes as under the No Action Alternative with the added actions.

Scenarios	Actions	Cumulative Effects of Actions
Alternative 4 with Associated Cumulative Effects Actions in Year 2030	No implementation of the 2008 USFWS BO and 2009 NMFS BO actions unless the actions would have been implemented without the BO (e.g., Red Bluff Pumping Plant)	Implementation of Alternative 4 with reasonably foreseeable actions would result in similar changes as under the No Action Alternative with the added actions.
Alternative 5 with Associated Cumulative Effects Actions in Year 20530	Full implementation of the 2008 USFWS BO and 2009 NMFS BO Positive Old and Middle River flows and increased Delta outflow in spring months	Implementation of Alternative 5 with reasonably foreseeable actions would result in similar changes as under the No Action Alternative with the added actions.

1

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Chapter 19**1 Socioeconomics****2 19.1 Introduction**

3 This Chapter describes socioeconomic conditions in the Study Area; and potential
4 changes that could occur as a result of implementing the alternatives evaluated in
5 this Environmental Impact Statement (EIS). Implementation of the alternatives
6 could affect socioeconomic conditions through potential changes in operation of
7 the Central Valley Project (CVP) and State Water Project (SWP) that would
8 change CVP and SWP water supply availability to agricultural water users and
9 municipal and industrial (M&I) water users. Changes in CVP and SWP
10 operations also would result in changes to recreational resources at reservoirs that
11 store CVP and SWP water.

12 Changes in agricultural production, including costs to provide Alternative water
13 supplies when CVP and SWP water supplies are not available, are presented in
14 Chapter 12, Agricultural Resources. Changes in reservoir recreational
15 opportunities that would occur due to reduction in reservoir storage elevations are
16 presented in Chapter 15, Recreational Resources. The results of these analyses
17 are summarized in Section 19.4, Environmental Consequences, of this
18 Chapter and considered in the determination of regional socioeconomics effects.

**19 19.2 Regulatory Environment and Compliance
20 Requirements**

21 Potential actions that could be implemented under the alternatives evaluated in
22 this EIS could affect socioeconomic conditions in portions of the Study Area
23 affected by or served by CVP and SWP water supplies. Actions located on public
24 agency lands; or implemented, funded, or approved by Federal and state agencies
25 would need to be compliant with appropriate Federal and state agency policies
26 and regulations, as summarized in Chapter 4, Approach to Environmental
27 Analyses.

28 19.3 Affected Environment

29 This section describes socioeconomic conditions that could be potentially affected
30 by implementation of the alternatives considered in this EIS. The socioeconomic
31 conditions described in this Chapter are related to population, employment,
32 income, and taxes.

33 Housing information is not described in this Chapter because implementation of
34 the No Action Alternative, Second Basis of Comparison, and Alternatives 1
35 through 5 would not result in changes to land use that would displace or relocate

1 housing stocks. Land use would be the same under the No Action Alternative,
2 Second Basis of Comparison, and Alternatives 1 through 5, as described in
3 Chapter 13, Land Use. The only changes in land use between recent historical
4 conditions and conditions in 2030 for the No Action Alternative, Second Basis of
5 Comparison, and Alternatives 1 through 5 would occur due to ecosystem
6 restoration on agricultural lands, open space, and public lands that do not support
7 housing units.

8 **19.3.1 Characterization of Socioeconomic Conditions**

9 Characterization of the socioeconomic conditions within the Study Area is based
10 upon publically available data sources. The data sources used include the U.S.
11 Census Bureau, U.S. Bureau of Economic Analysis, U.S. Bureau of Labor
12 Statistics, California Department of Finance, California Employment
13 Development Department, and California Board of Equalization. The data were
14 summarized and used to compare historical and current trends in the
15 socioeconomic conditions in the Study Area.

16 Population and income data used to characterize the socioeconomic conditions are
17 reported from 2000 to 2012 by the California Department of Finance.

18 The employment data presented in this Chapter are reported from 2001 to 2008
19 and from 2008 to 2012 (the latest values from consistent data sources). The first
20 period from 2001 to 2008 represents a period of time prior to implementation of
21 the 2008 U.S. Fish and Wildlife Service (USFWS) Biological Opinion (BO) and
22 the 2009 National Marine Fisheries Service (NMFS) BO. The second period
23 from 2008 to 2012 represents a period of time following implementation of the
24 2008 USFWS BO and 2009 NMFS BO.

25 There are two estimates of employment that are typically used to describe
26 employment. The civilian labor force employment data compiled by the Bureau
27 of Labor Statistics reflect the employment status of individuals that are covered
28 by unemployment insurance by “place of residence,” and includes the self-
29 employed, employees on unpaid leave of absence, unpaid family workers, and
30 household workers. These data do not include sole proprietors, some self-
31 employed, and some farm workers and domestic workers. Employment by
32 industry data compiled by the Bureau of Economic Analysis, including farm
33 employment, reflect jobs by “place of work” and include sole proprietors and
34 active partners, self-employed, farm workers, and domestic workers. Individuals
35 with more than one job are counted only once in civilian labor force data and
36 counted in each job in the employment by industry data. Therefore, the
37 employment by industry data are greater than the civilian labor force data.

38 **19.3.2 Trinity River Region**

39 The Trinity River Region includes the area in Trinity County along the Trinity
40 River from Trinity Lake to the confluence with the Klamath River; and in
41 Humboldt and Del Norte counties along the lower Klamath River from the
42 confluence with the Trinity River to the Pacific Ocean. Tribal lands along the
43 Trinity or lower Klamath River within the Trinity River Region include the

1 Hoopa Valley Indian Reservation, Yurok Indian Reservation, and Resighini
2 Rancheria.

3 Trinity County includes extensive trails, lakes, and the Trinity River Scenic
4 Byway, providing several venues for outdoor enthusiasts and travelers. The
5 recreation and tourism industries are major contributors to the local economy of
6 Trinity County (EDD 2013).

7 Humboldt County is the largest and most populous of the north coast counties. Its
8 2012 population of 134,728 ranked 35th among the 58 counties in California
9 (EDD 2014a). Humboldt County encompasses 2.3 million acres, 80 percent of
10 which is forestlands, protected redwoods and recreation areas (Humboldt County
11 2014). Humboldt County is the leading timber producing county in the state
12 (CDFA 2014). As described in Chapter 13, Land Use, the portion of Humboldt
13 County in the Trinity River Region evaluated in this EIS is located along the
14 Trinity and Klamath rivers. This portion of the county includes the communities
15 of Willow Creek and Orleans within Humboldt County; Hoopa in the Hoopa
16 Valley Indian Reservation; and the communities of Weitchpec, Cappell, Pecwan,
17 and Johnson's in the Yurok Tribe Indian Reservation (Humboldt County 2012).

18 Del Norte County is the northernmost county in California. The county includes
19 Redwood National Park and other state parks making tourism a natural industry in
20 the county (EDD 2014b). As described in Chapter 13, Land Use, the portion of
21 Del Norte County in the Trinity River Region evaluated in this EIS is located
22 along the lower Klamath River. Most of this area is located within the Yurok
23 Indian Reservation, and includes the communities of Requa and Klamath (Del
24 Norte County 2003).

25 **19.3.2.1 Population**

26 Population in the Trinity River Region, by county and for the region as a whole, is
27 presented in Table 19.1. The population of Trinity River Region has increased,
28 although at a small average annual growth rate for the period shown.

29 **Table 19.1 Population Characteristics in Trinity River Region**

Area	Population 2000	Population 2012	Average Annual Growth Rate (percent) 2000-2012
Trinity County	13,022	13,471	0.3
Humboldt County	126,518	134,728	0.5
Del Norte County	27,507	28,527	0.3
Total Trinity River Region	167,047	176,726	0.5
STATE OF CALIFORNIA	33,873,086	37,427,946	0.9

30 Sources: DOF 2013a, 2013b, 2014

31 Tribal enrollment for the Hoopa Valley Tribe, Yurok Tribe, Karuk Tribe, and
32 Resighini Rancheria as reported by the Bureau of Indian Affairs is presented in
33 Table 19.2. These values do not necessarily include all members that live within
34 the area, and should be considered as representative of trends. Values were only
35 available for the years of 2001, 2003, 2005, and 2013.

1 **Table 19.2 Tribal Enrollment in Trinity River Region**

Tribe	2001	2003	2005	2013
Hoopa Valley Tribe	1,893	1,893	1,893	1,719 ^a
Yurok Tribe	4,466	4,466	4,912	Not available
Karuk Tribe	3,165	3,165	3,427	Not available
Resighini Rancheria	90	175	111	Not available
TOTAL	9,614	9,699	10,343	–

2 Sources: BIA 2003, 2006, 2008, 2014

3 Note:

4 a. Value is reported as population, not enrollment, for Hoopa Valley Tribe in 2013.

5 **19.3.2.2 Employment**

6 Civilian labor force characteristics for the Trinity River Region are presented in
 7 Table 19.3. The civilian labor force (composed of employment and
 8 unemployment) in the Trinity River Region increased between 2001 and 2008 and
 9 between 2008 and 2012 (BLS 2014).

10 **Table 19.3 Civilian Labor Force and Unemployment Rates in Trinity River Region**

Area	Civilian Labor Force (subject to unemployment insurance)			Unemployment Rate (percent)		
	2001	2008	2012	2001	2008	2012
Trinity County	5,394	4,855	5,019	9.3	12.7	15.8
Humboldt County	60,443	60,039	60,144	6.0	7.2	10.5
Del Norte County	10,221	11,376	11,381	8.0	8.8	13.4
Total Trinity River Region	76,058	76,270	76,544	6.5	7.8	11.2
STATE OF CALIFORNIA	17,152,106	18,392,000	18,494,881	5.4	7.2	10.5

11 Source: BLS 2014

12 Available labor force and unemployment rates for members of the tribes in the
 13 Trinity River Region are presented in Table 19.4. These individuals may or may
 14 not be included in the values presented in Table 19.3 because different sources are
 15 used for each table.

16 **Table 19.4 Available Labor Force and Unemployment Rates Related to the Tribes in**
 17 **Trinity River Region**

Area	Civilian Labor Force				Unemployment Rate (percent)			
	2001	2003	2005	2013	2001	2003	2005	2013
Hoopa Valley Tribe	1,043	1,043	1,043	NA	40	40	40	42
Yurok Tribe	2,151	2,151	1,096	NA	74	74	74	38
Karuk Tribe	3,307	3,307	915	NA	14	14	63	29
Resighini Rancheria	37	44	45	NA	57	59	60	NA

18 Sources: BIA 2003, 2006, 2008, 2014

19 Note:

20 NA = Not Available

1 Total employment and the farm employment in 2001, 2008 and 2012 in the
 2 Trinity River Region counties are presented in Table 19.5. The Trinity River
 3 Region farm employment represents less than 1 percent of farm employment in
 4 the state and the lowest amount of farm employment in counties within the Study
 5 Area, as indicated in Figure 19.1.

6 **Table 19.5 Employment in Trinity River Region**

Area	Total Employment			Farm Employment ^a		
	2001	2008	2012	2001	2008	2012
Trinity County	4,878	4,930	4,788	155	161	165
Humboldt County	68,596	71,552	68,861	1,662	1,383	1,227
Del Norte County	10,266	11,531	10,720	384	309	231
Total Trinity River Region	83,740	88,013	84,369	2,201	1,853	1,623
STATE OF CALIFORNIA	19,411,367	20,820,306	20,653,860	479,283	438,013	443,764

7 Source: BEA 2014a.

8 Note:

9 a. Farm employment includes employment numbers in forestry, fishing, and related activities.

10 **19.3.2.3 Income**

11 Per capita personal income for the Trinity River Region counties for 2000, 2008,
 12 and 2012 is presented in Table 19.6. Humboldt County had the highest per capita
 13 income, and Del Norte County had the lowest.

14 **Table 19.6 Per Capita Personal Income in Trinity River Region**

Area	Per Capita Personal Income			Average Annual Growth Rate (percent)	
	2000	2008	2012	2000-2008	2008-2012
Trinity County	\$20,489	\$28,861	\$34,027	4.4	4.2
Humboldt County	\$23,980	\$32,859	\$35,681	4.0	2.1
Del Norte County	\$18,563	\$26,420	\$30,016	4.5	3.2
Total Trinity River Region	\$22,818	\$31,497	\$34,647	4.1	2.4
STATE OF CALIFORNIA	\$33,404	\$44,003	\$43,647	3.5	1.4

15 Source: BEA 2014e

16 **19.3.2.4 Local Government Finances**

17 The sales tax rates, as of April 1, 2014, were 7.5 percent in all three counties in
 18 the Trinity River Region (BOE 2014). Total annual taxable sales within the
 19 Trinity River Region in 2000, 2008, and 2012 are presented in Table 19.7. The
 20 region's total taxable sales represents less than one tenth of one percent of total
 21 annual state taxable sales.

1 **Table 19.7 Total Taxable Sales in Trinity River Region**

Area	Total Taxable Sales (millions)			Average Annual Growth Rate (percent)	
	2000	2008	2012	2000-2008	2008-2012
Trinity County	\$61	\$74	\$87	2.6	3.9
Humboldt County	\$1,293	\$1,693	\$1,768	3.4	1.1
Del Norte County	\$176	\$232	\$226	3.5	-0.6
Total Trinity River Region	\$1,530	\$1,999	\$2,081	3.4	1.0
STATE OF CALIFORNIA	\$441,854	\$531,654	\$407,714	2.3	-6.4

2 Sources: BOE 2000, 2008, 2012

3 Total property tax charges (secured and unsecured) within the Trinity River
 4 Region in Fiscal Year 2011-2012 were \$160.2 million (California State Controller
 5 2012). The Humboldt County share of the total property tax revenues was the
 6 largest at \$126 million. The Del Norte and Trinity counties contributions to the
 7 total were \$19 million and \$13 million, respectively.

8 **19.3.3 Central Valley Region**

9 The Central Valley Region extends from above Shasta Lake to the Tehachapi
 10 Mountains, and includes the Sacramento Valley, San Joaquin Valley, and Delta
 11 and Suisun Marsh subregions.

12 **19.3.3.1 Sacramento Valley**

13 The Sacramento Valley includes the counties of Shasta, Plumas, Tehama, Glenn,
 14 Colusa, Butte, Sutter, Yuba, Nevada, Placer, and El Dorado counties.
 15 Sacramento, Yolo, and Solano counties also are located within the Sacramento
 16 Valley; however, these counties are discussed below as part of the Delta and
 17 Suisun Marsh subsection. Other counties in Sacramento Valley are not
 18 anticipated to be affected by changes in CVP and SWP operations, and are not
 19 discussed here, including: Alpine, Sierra, Lassen, and Amador counties.

20 The Sacramento Valley includes major agricultural counties, including Glenn,
 21 Colusa, Sutter and Placer counties, as described in Chapter 12, Agricultural
 22 Resources. The region also includes some of the leading major timber producing
 23 counties of the state. Shasta County is the second and Plumas County is the fifth
 24 among the leading timber producing counties in the state.

25 **19.3.3.1.1 Population**

26 Population characteristics in the Sacramento Valley portion of the Central Valley
 27 Region are presented in Table 19.8. Among the counties evaluated in the
 28 Sacramento Valley portion of the Central Valley Region, Placer County had the
 29 highest average annual population growth rate between 2000 and 2012; and
 30 Plumas County was the only county with a reduction in population.

1 **Table 19.8 Population Characteristics in Central Valley Region – Sacramento Valley**

Area	Population		Average Annual Growth Rate (percent)
	2000	2012	2000-2012
Shasta County	163,256	177,516	0.8
Plumas County	20,824	19,901	-0.4
Tehama County	56,039	62,985	1.1
Glenn County	26,453	28,105	0.6
Colusa County	18,804	21,552	1.2
Butte County	203,171	220,465	0.7
Yuba County	60,219	72,642	1.6
Nevada County	92,033	97,366	0.5
Sutter County	78,930	94,620	1.7
Placer County	248,399	351,463	3.2
El Dorado County	156,299	180,483	1.3
Sacramento Valley Subtotal	1,124,427	1,333,615	1.4
Total Central Valley Region	6,214,316	7,408,750	1.5
STATE OF CALIFORNIA	33,873,086	37,668,804	0.9

2 Sources: DOF 2013a, 2013b, 2014

3 **19.3.3.1.2 Employment**

4 Civilian labor force characteristics for the counties in the Sacramento Valley
5 portion of the Central Valley Region are presented in Table 19.9. The civilian
6 labor force increased between 2001 and 2012. The data for 2008 represents the
7 employment situation immediately following the recent economic recession that
8 started in 2007. The average unemployment rate in the civilian labor force
9 increased from 2001 to 2012. The average unemployment rate in the Sacramento
10 Valley portion of the Central Valley Region between 2001 and 2012 has been
11 higher than the state unemployment rate; and lower than for the counties in the
12 Central Valley Region.

1 **Table 19.9 Civilian Labor Force and Unemployment Rates in Central Valley**
 2 **Region – Sacramento Valley**

Area	Civilian Labor Force (subject to unemployment insurance)			Unemployment Rate (percent)		
	2001	2008	2012	2001	2008	2012
Shasta County	77,647	82,675	81,245	6.3	10.0	13.4
Plumas County	9,958	9,824	9,478	7.6	10.5	14.7
Tehama County	24,574	25,185	25,251	6.5	9.2	13.9
Glenn County	11,239	12,196	12,841	8.8	10.4	14.7
Colusa County	9,130	10,505	11,860	12.8	13.7	20.0
Butte County	95,216	102,952	102,063	6.6	8.4	12.2
Yuba County	24,862	27,729	27,772	8.5	11.8	16.9
Nevada County	46,947	50,428	50,742	4.4	6.5	9.4
Sutter County	38,457	41,100	42,810	9.7	12.3	17.6
Placer County	139,106	177,243	178,818	4.0	6.4	9.4
El Dorado County	84,064	90,732	90,525	4.3	6.9	10.4
Sacramento Valley Subtotal	561,200	630,569	633,405	5.8	8.3	12.0
Total Central Valley Region	3,519,870	3,885,435	3,990,083	6.8	8.7	12.6
STATE OF CALIFORNIA	17,152,106	18,392,000	18,494,881	4.9	7.2	10.5

3 Source: BLS 2014

4 Total employment and farm employment in 2001, 2008, and 2012 in the
 5 Sacramento Valley portion of the Central Valley Region are presented in
 6 Table 19.10. The contribution of farm employment to the total employment in the
 7 Sacramento Valley portion of the Central Valley Region declined between 2001
 8 and 2008 and increased slightly by 2012.

1 **Table 19.10 Employment in Central Valley Region – Sacramento Valley**

Area	Total Employment			Farm Employment		
	2001	2008	2012	2001	2008	2012
Shasta County	85,937	91,883	86,696	1,821	1,781	1,751
Plumas County	10,813	10,524	9,493	288	140	138
Tehama County	23,760	24,284	22,669	2,716	2,332	3,042
Glenn County	11,526	11,987	11,856	2,873	1,927	2,049
Colusa County	9,770	10,863	11,266	2,943	1,954	1,831
Butte County	99,757	105,703	101,805	5,293	4,618	4,527
Yuba County	26,162	26,473	26,861	2,494	1,722	1,623
Nevada County	51,323	57,968	55,898	1,161	1,153	1,089
Sutter County	39,489	43,764	43,329	5,454	4,165	4,427
Placer County	158,070	192,171	188,729	2,064	1,925	1,844
El Dorado County	78,052	95,608	90,435	1,937	1,849	1,737
Sacramento Valley Subtotal	594,659	671,228	649,037	29,044	23,566	24,058
Total Central Valley Region	3,616,241	3,997,557	3,923,230	256,672	226,321	230,832
STATE OF CALIFORNIA	19,411,367	20,820,306	20,653,860	479,283	438,013	443,764

2 Source: BEA 2014a

3 Note:

4 Farm employment includes employment numbers in forestry, fishing, and related activities.

5 The annual farm employment for the Sacramento Valley portion of the Central
6 Valley Region declined in 2004 and remained relatively stable through 2012, as
7 shown in Figure 19.2. The overall trend in farm employment is influenced by the
8 farm employment trends in Butte, Sutter, Tehama, Colusa, and Glenn counties, as
9 shown in Figure 19.3. The decrease in farm employment is related to the
10 reduction in cultivated acreage during this period, as described in Chapter 12,
11 Agricultural Resources.

12 The farm employment numbers presented in Table 19.10 include only workers
13 directly involved in farming, forestry, and fishing activities. However, farming is
14 one of the most important basic industries in the Central Valley Region; and
15 supports many other businesses including farm inputs (e.g., fertilizer, seed,
16 machinery, and fuel) and processing of food and fiber grown on farms. As a
17 result, employment both directly on farm and indirectly dependent on farming is
18 higher than the values displayed in Table 19.10.

1 **19.3.3.1.3 Income**

2 The average per capita personal incomes for the counties in the Sacramento
 3 Valley portion of the Central Valley Region are presented in Table 19.11. Per
 4 capita personal incomes increased by an average annual rate of between 3 and
 5 6 percent from 2000 to 2008. Following the economic downturn that started in
 6 2007, the average annual growth in per capita personal income slowed between
 7 2008 and 2012, except in Tehama County.

8 **Table 19.11 Per Capita Personal Income in Central Valley Region –**
 9 **Sacramento Valley**

Area	Per Capita Personal Income			Average Annual Growth Rate (percent)	
	2000	2008	2012	2000-2008	2008-2012
Shasta County	\$25,385	\$34,995	\$37,593	4.1	1.8
Plumas County	\$26,415	\$38,401	\$43,085	4.8	2.9
Tehama County	\$19,461	\$25,805	\$30,094	3.6	3.9
Glenn County	\$20,210	\$32,054	\$38,568	5.9	4.7
Colusa County	\$24,656	\$39,568	\$45,800	6.1	3.7
Butte County	\$23,143	\$32,379	\$35,696	4.3	2.5
Yuba County	\$19,537	\$27,655	\$32,835	4.4	4.4
Nevada County	\$32,253	\$44,960	\$47,924	4.2	1.6
Sutter County	\$25,581	\$33,117	\$36,243	3.3	2.3
Placer County	\$38,034	\$49,436	\$52,544	3.3	1.5
El Dorado County	\$37,397	\$50,052	\$54,533	3.7	2.2
Average in Sacramento Valley Counties	\$29,317	\$40,177	\$43,873	4.0	2.2
Central Valley Region	\$28,163	\$37,207	\$40,619	3.5	2.2
STATE OF CALIFORNIA	\$33,404	\$44,003	\$46,477	3.5	1.4

10 Source: BEA 2014e

11 **19.3.3.1.4 Local Government Finances**

12 As of April 1, 2014, the county sales tax rates in the counties within the
 13 Sacramento Valley portion of the Central Valley Region was 7.5 percent for all
 14 counties except Nevada County (BOE 2014). The Nevada County sales tax rate
 15 was 7.625 percent. These rates include the state, county, local and district taxes.

16 The total annual taxable sales in the Sacramento Valley portion of the Central
 17 Valley Region in 2000, 2008, and 2012 are presented in Table 19.12. The total
 18 taxable sales represent about 3 percent of total annual state taxable sales. The
 19 lower rates of growth for the period 2008 to 2012 may be attributable to the
 20 effects of the recession that started in 2007 and a decline in employment, as
 21 discussed above.

1 **Table 19.12 Total Taxable Sales in Central Valley Region – Sacramento Valley**

Area	Total Taxable Sales (millions)			Average Annual Growth Rate	
	2000	2008	2012	2000-2008	2008-2012
Shasta County	\$2,055	\$2,641	\$2,642	3.2	0.0
Plumas County	\$187	\$222	\$197	2.1	-2.9
Tehama County	\$470	\$684	\$748	4.8	2.3
Glenn County	\$231	\$318	\$327	4.1	0.7
Colusa County	\$223	\$329	\$337	5.0	0.6
Butte County	\$2,039	\$2,678	\$2,714	3.5	0.3
Yuba County	\$392	\$515	\$486	3.5	-1.4
Nevada County	\$997	\$1,187	\$1,105	2.2	-1.8
Sutter County	\$1,021	\$1,287	\$1,367	2.9	1.5
Placer County	\$4,742	\$6,635	\$7,066	4.3	1.6
El Dorado County	\$1,324	\$1,788	\$1,740	3.8	-0.7
Sacramento Valley Subtotal	\$13,680	\$18,283	\$18,729	3.7	0.6
Central Valley Region	\$83,363	\$109,401	\$114,959	3.5	1.2
STATE OF CALIFORNIA	\$441,854	\$531,654	\$407,714	2.3	-6.4

2 Sources: BOE 2000, 2008, 2012

3 Combined (secured and unsecured) property tax revenues in each of the counties
4 in the Sacramento Valley portion of the Central Valley Region for Fiscal Year
5 2011-2012 are presented in Table 19.13. Total property tax revenues from these
6 counties accounted for about 3 percent of the total state property tax revenues.

7 **Table 19.13 Property Tax Revenues, Fiscal Year 2011-2012,**
8 **in Central Valley Region – Sacramento Valley**

Area	Property Tax Revenues (millions)
Shasta County	\$168
Plumas County	\$41
Tehama County	\$48
Glenn County	\$30
Colusa County	\$36
Butte County	\$203
Yuba County	\$62
Nevada County	\$183
Sutter County	\$103
Placer County	\$692
El Dorado County	\$300
Sacramento Valley Subtotal	\$1,866
Central Valley Region	\$9,874
STATE OF CALIFORNIA	\$55,459

9 Source: California State Controller 2012

1 **19.3.3.2 San Joaquin Valley**

2 The San Joaquin Valley includes the counties of Stanislaus, Merced, Madera,
 3 Fresno, Kings, Tulare, and Kern counties. San Joaquin County also is located
 4 within the San Joaquin Valley; however, this county is discussed below as part of
 5 the Delta and Suisun Marsh subsection. Other counties in the San Joaquin Valley
 6 are not anticipated to be affected by changes in CVP and SWP operations, and are
 7 not discussed here, including: Calaveras, Mariposa, and Tuolumne counties.

8 The San Joaquin Valley includes the major agricultural counties, of Fresno, Kern,
 9 Kings and Tulare, as described in Chapter 12, Agricultural Resources.

10 **19.3.3.2.1 Population**

11 Population characteristics in the San Joaquin Valley portion of the Central Valley
 12 Region are presented in Table 19.14. Among the counties in the San Joaquin
 13 Valley portion of the Central Valley Region, Kern County had the highest average
 14 annual population growth rate between 2000 and 2012; and Stanislaus and Kings
 15 counties had the lowest growth rate.

16 **Table 19.14 Population Characteristics in Central Valley – San Joaquin Valley**

Area	Population		Average Annual Growth Rate (percent)
	2000	2012	2000-2012
Stanislaus County	446,997	519,339	1.3
Madera County	123,109	152,325	1.8
Merced County	210,554	260,029	1.8
Fresno County	799,407	943,493	1.4
Tulare County	368,021	451,540	1.7
Kings County	129,461	151,774	1.3
Kern County	661,653	849,977	2.1
San Joaquin Valley Subtotal	2,739,202	3,328,477	1.6
Total Central Valley Region	6,062,064	7,238,742	1.5
STATE OF CALIFORNIA	33,873,086	37,668,804	0.9

17 Sources: DOF 2013a, 2013b, 2014

18 **19.3.3.2.2 Employment**

19 Civilian labor force characteristics for the counties in the San Joaquin Valley
 20 portion of the Central Valley Region are presented in Table 19.15. The civilian
 21 labor force increased between 2001 and 2012. The data for 2008 represents the
 22 employment situation immediately following the recession that started in 2007.
 23 The average unemployment rate in the civilian labor force increased from 2001 to
 24 2012. The average unemployment rates for the San Joaquin Valley portion of the
 25 Central Valley Region between 2001 and 2012 have been higher than for the
 26 entire Central Valley Region and the state.

1 **Table 19.15 Civilian Labor Force and Unemployment Rates in Central Valley**
 2 **Region – San Joaquin Valley**

Area	Civilian Labor Force (subject to unemployment insurance)			Unemployment Rate (percent)		
	2001	2008	2012	2001	2008	2012
Stanislaus County	214,292	231,965	239,461	8.3	11.0	15.2
Madera County	53,956	65,100	68,167	9.6	9.4	13.6
Merced County	91,825	102,251	111,322	10.1	12.5	17.0
Fresno County	389,805	430,163	442,453	10.7	10.5	15.2
Tulare County	175,357	199,124	207,634	11.4	10.8	15.8
Kings County	50,233	58,801	60,886	10.7	10.5	15.3
Kern County	297,982	359,573	396,657	8.6	9.8	13.3
San Joaquin Valley Subtotal	1,273,450	1,446,977	1,526,580	9.8	10.5	14.9
Total Central Valley Region	3,448,061	3,807,278	3,911,569	6.8	8.7	12.6
STATE OF CALIFORNIA	17,152,106	18,392,000	18,494,881	4.9	7.2	10.5

3 Source: BLS 2014

4 Total employment and farm employment in 2001, 2008 and 2012 in the San
 5 Joaquin Valley portion of the Central Valley Region are presented in Table 19.16.
 6 The contribution of farm employment to the total employment declined between
 7 2001 and 2008, and then increased slightly in 2012, except in Tulare County. In
 8 Tulare County, farm employment increased between 2001 and 2008 and
 9 decreased between 2008 and 2012.

10 **Table 19.16 Employment in Central Valley Region – San Joaquin Valley**

Area	Total Employment			Farm Employment		
	2001	2008	2012	2001	2008	2012
Stanislaus County	208,016	221,632	214,446	18,708	16,000	15,784
Madera County	50,975	59,354	59,027	6,296	4,750	5,186
Merced County	82,803	92,891	93,766	14,147	12,029	8,075
Fresno County	401,025	446,939	437,934	56,655	50,798	51,277
Tulare County	168,523	191,195	186,875	42,851	38,080	36,369
Kings County	48,960	57,513	55,008	4,705	4,061	6,620
Kern County	311,946	369,152	386,642	46,307	47,661	52,583
San Joaquin Valley Subtotal	1,272,248	1,438,676	1,433,698	189,669	173,379	175,894
Total Central Valley Region	3,616,241	3,997,557	3,923,230	256,672	226,321	230,832
STATE OF CALIFORNIA	19,411,367	20,820,306	20,653,860	479,283	438,013	443,764

11 Source: BEA 2014a

12 Note:

13 Farm employment includes employment numbers in forestry, fishing, and related activities.

1 Annual farm employment for the San Joaquin Valley portion of the Central
2 Valley Region declined in 2004 and continued to fluctuate through 2012, as
3 shown in Figure 19.2. Farm employment in the San Joaquin Valley portion of the
4 Central Valley Region represents a major portion of the overall farm employment
5 in the Central Valley.

6 Within the counties in the San Joaquin Valley portion of the Central Valley
7 Region, farm employment declined between 2003 and 2006 and remained about
8 the same between 2007 and 2012. The overall trend in farm employment is
9 influenced by the farm employment trends in Fresno, Kern, and Tulare counties,
10 as shown in Figure 19.4. The decrease in farm employment is related to the
11 reduction in cultivated acreage during this period, as described in Chapter 12,
12 Agricultural Resources.

13 The farm employment numbers presented in Table 19.16 include only workers
14 directly involved in farming, forestry, and fishing activities. However, farming is
15 one of the most important basic industries in the Central Valley; and supports
16 many other businesses including farm inputs (e.g., fertilizer, seed, machinery, and
17 fuel) and processing of food and fiber grown on farms. As a result, employment
18 both directly on farm and indirectly dependent on farming is higher than the
19 values displayed in Table 19.16.

20 Total farm-dependent employment is not reported in the U.S. Bureau of
21 Economic Analysis or the U.S. Bureau of Labor Statistics; however, the
22 employment values can be estimated by studies of local economies. A study of
23 the local economy in four counties of the San Joaquin Valley found that, for every
24 on-farm job, about two and one-half additional jobs are supported because of
25 inputs purchased for farming operations (NEA 1997). This estimate includes the
26 associated effects of workers on those farms and businesses spending their
27 incomes on other purchases; however, the estimated values do not include
28 employment in the processing sector. Another study indicated that the
29 employment multiplier of the agricultural production and processing industry is
30 1.92, or that for every 100 agricultural production and processing jobs in the
31 San Joaquin Valley, 92 other jobs were created in the San Joaquin Valley
32 (UCAIC 2009).

33 San Joaquin Valley employment also includes employment associated with adult
34 prison facilities. The San Joaquin Valley portion of the Central Valley Region
35 includes eight (or about 24 percent) of the 33 adult prison facilities operated by
36 the California Department of Corrections and Rehabilitation. These prisons are
37 home to about a quarter of the total prison population in the state and employ
38 about a quarter of the total prison staff in the state. Employment for these prisons
39 is summarized in Table 19.17.

1 **Table 19.17 California State Prisons in Central Valley Region - San Joaquin Valley**

Prison Facility	Location	Staff
Central California Women's Facility	Chowchilla, Madera County	1,064
Valley State Prison	Chowchilla, Madera County	1,021
Pleasant Valley State Prison	Coalinga, Fresno County	1,357
Avenal State Prison	Avenal, Kings County	1,475
California State Prison	Corcoran, Kings County	2,003
Wasco State Prison	Wasco, Kern County	1,523
North Kern State Prison	Delano, Kern County	1,393
Kern Valley State Prison	Delano, Kern County	1,545

2 Sources: CDCR 2014a, 2014b, 2014c, 2014d, 2014e, 2014f, 2014g, 2014h

3 Federal prisons are located at Atwater in Merced County, Mendota in Fresno
4 County, and Taft in Kern County within the San Joaquin Valley portion of the
5 Central Valley Region (BOP 2014).

6 **19.3.3.2.3 Income**

7 The average per capita personal income in the San Joaquin Valley portion of the
8 Central Valley Region was lower than that for the entire Central Valley Region,
9 as presented in Table 19.18. The average per capita personal income in the San
10 Joaquin Valley portion of the Central Valley Region was a little more than two-
11 thirds of the average per capita personal income in the Central Valley Region and
12 the state. With the exception of Stanislaus County, most counties in the San
13 Joaquin Valley portion of the Central Valley Region had higher annual average
14 growth in per capita personal income between 2000 and 2008 than the entire
15 Central Valley Region and the state.

16 **Table 19.18 Per Capita Personal Income in Central Valley Region –**
17 **San Joaquin Valley**

Area	Per Capita Personal Income			Average Annual Growth Rate (percent)	
	2000	2008	2012	2000-2008	2008-2012
Stanislaus County	\$24,284	\$31,093	\$34,138	3.1	2.4
Madera County	\$18,983	\$26,693	\$31,169	4.4	4.0
Merced County	\$19,976	\$26,963	\$30,630	3.8	3.2
Fresno County	\$23,001	\$30,977	\$34,074	3.8	2.4
Tulare County	\$20,070	\$28,035	\$31,307	4.3	2.8
Kings County	\$16,912	\$26,339	\$31,835	5.7	4.9
Kern County	\$21,507	\$29,527	\$34,453	4.0	3.9
Average in San Joaquin Valley Counties	\$21,755	\$29,505	\$33,303	3.9	3.1
Central Valley Region	\$28,183	\$37,198	\$40,601	3.5	2.2
STATE OF CALIFORNIA	\$33,404	\$44,003	\$46,477	3.5	1.4

18 Source: BEA 2014e

1 **19.3.3.2.4 Local Government Finances**

2 As of April 1, 2014, the county sales tax rates in the counties within the San
 3 Joaquin Valley portion of the Central Valley ranged from 7.5 percent in Merced,
 4 Kern, and Kings counties to 8.225 percent in Fresno County (BOE 2014).

5 The total annual taxable sales for the counties in the San Joaquin Valley portion
 6 of the Central Valley Region in 2000, 2008, and 2012 are presented in
 7 Table 19.19. The contribution of the area to California total annual taxable sales
 8 increased between 2000 and 2012. The lower rates of growth for the period 2008
 9 to 2012 may be attributable to the effects of the recession that started in 2007 and
 10 a decline in employment, as discussed above.

11 **Table 19.19 Total Taxable Sales in Central Valley Region – San Joaquin Valley**

Area	Total Taxable Sales (millions)			Average Annual Growth Rate (percent)	
	2000	2008	2012	2000-2008	2008-2012
Stanislaus County	\$5,195	\$6,729	\$7,178	3.3	1.6
Madera County	\$881	\$1,327	\$1,356	5.2	0.5
Merced County	\$1,740	\$2,388	\$2,512	4.0	1.3
Fresno County	\$8,472	\$11,729	\$12,021	4.2	0.6
Tulare County	\$3,222	\$4,755	\$5,499	5.0	3.7
Kings County	\$888	\$1,389	\$1,386	5.8	-0.1
Kern County	\$6,938	\$12,086	\$14,666	7.2	5.0
Total San Joaquin Valley	\$27,337	\$40,403	\$44,619	5.0	2.5
Central Valley Region	\$81,975	\$107,699	\$113,368	3.5	1.3
STATE OF CALIFORNIA	\$441,854	\$531,654	\$407,714	2.3	-6.4

12 Sources: BOE 2000, 2008, 2012

13 The combined (secured and unsecured) property tax revenues in each of the
 14 counties in the San Joaquin Valley portion of the Central Valley Region for Fiscal
 15 Year 2011-2012 are presented in Table 19.20. Total property tax revenues from
 16 these counties accounted for about 6 percent of the total state property tax
 17 revenues.

1 **Table 19.20 Property Tax Revenues, Fiscal Year 2011-2012,**
 2 **in Central Valley Region – San Joaquin Valley**

Area	Property Tax Revenues (millions)
Stanislaus County	\$426
Madera County	\$128
Merced County	\$197
Fresno County	\$755
Tulare County	\$327
Kings County	\$104
Kern County	\$1,102
San Joaquin Valley Subtotal	\$3,039
Central Valley Region	\$9,874
STATE OF CALIFORNIA	\$55,459

3 Source: California State Controller 2012

4 **19.3.3.3 Delta and Suisun Marsh**

5 The Delta and Suisun Marsh portion of the Central Valley Region includes
 6 Sacramento, Yolo, Solano, San Joaquin, and Contra Costa counties. These
 7 counties include some of the leading agricultural areas in the state. In addition to
 8 agriculture, this area includes important transportation infrastructures including
 9 inland shipping ports (Port of West Sacramento and Port of Stockton); major
 10 employment centers (cities of Sacramento, West Sacramento, Fairfield, Stockton,
 11 and Concord); and water-based recreation activities (e.g., boating, fishing, and
 12 water skiing).

13 **19.3.3.3.1 Population**

14 Population characteristics in the counties of the Delta and Suisun Marsh portion
 15 of the Central Valley Region are presented in Table 19.21. San Joaquin County
 16 had the highest average annual population growth rate between 2000 and 2012,
 17 and Solano County had the lowest growth rate.

1 **Table 19.21 Population Characteristics in Central Valley Region – Delta and**
 2 **Suisun Marsh**

Area	Population		Average Annual Growth Rate (percent)
	2000	2012	2000-2012
Sacramento County	1,223,499	1,433,525	1.3
Yolo County	168,660	204,349	1.6
Solano County	394,930	415,787	0.4
San Joaquin County	563,598	692,997	1.7
Contra Costa County	948,816	1,066,602	1.0
Delta and Suisun Marsh Subtotal	3,299,503	3,813,260	1.2
Total Central Valley Region	6,062,064	7,238,742	1.5
STATE OF CALIFORNIA	33,873,086	37,668,804	0.9

3 Sources: DOF 2013a, 2013b, 2014

4 **19.3.3.3.2 Employment**

5 Civilian labor force characteristics for the Sacramento, Yolo, Solano, San
 6 Joaquin, and Contra Costa counties are presented in Table 19.22. The civilian
 7 labor force in these counties increased between 2001 and 2012. The data for 2008
 8 represents the employment situation immediately following the recession in 2007.

9 **Table 19.22 Civilian Labor Force and Unemployment Rates in Central Valley**
 10 **Region – Delta and Suisun Marsh**

Area	Civilian Labor Force (subject to unemployment insurance)			Unemployment Rate (percent)		
	2001	2008	2012	2001	2008	2012
Sacramento County	624,693	680,373	680,349	4.5	7.2	10.6
Yolo County	88,331	98,438	98,475	5.1	7.4	11.5
Solano County	197,178	211,369	217,024	4.6	6.8	10.1
San Joaquin County	266,288	293,190	298,468	7.5	10.4	15.2
Contra Costa County	508,730	524,519	535,782	4.1	6.2	9.0
Delta and Suisun Marsh Subtotal	1,685,220	1,807,889	1,830,098	4.9	7.4	10.8
Total Central Valley Region	3,448,061	3,807,278	3,911,569	6.8	8.7	12.6
STATE OF CALIFORNIA	17,152,106	18,392,000	18,494,881	4.9	7.2	10.5

11 Source: BLS 2014

12 Total employment and farm employment in 2001, 2008, and 2012 in the
 13 Sacramento, Yolo, Solano, San Joaquin, and Contra Costa counties are presented
 14 in Table 19.23. The contribution of farm employment to the total employment
 15 declined slightly between 2001 and 2008, and then increased slightly between
 16 2008 and 2012.

1 **Table 19.23 Employment in Central Valley Region – Delta and Suisun Marsh**

Area	Total Employment			Farm Employment		
	2001	2008	2012	2001	2008	2012
Sacramento County	739,256	806,976	784,386	5,176	4,019	3,924
Yolo County	110,902	122,054	117,609	5,244	5,364	5,745
Solano County	162,874	174,565	169,096	3,321	2,144	2,116
San Joaquin County	260,809	286,171	277,260	21,088	16,939	17,496
Contra Costa County	475,493	497,887	492,144	3,130	910	1,599
Delta and Suisun Marsh Subtotal	1,749,334	1,887,653	1,840,495	37,959	29,376	30,880
Total Central Valley Region	3,616,241	3,997,557	3,923,230	256,672	226,321	230,832
STATE OF CALIFORNIA	19,411,367	20,820,306	20,653,860	479,283	438,013	443,764

2 Source: BEA 2014a

3 Note:

4 Farm employment includes employment numbers in forestry, fishing, and related activities.

5 Annual farm employment for the Sacramento, Yolo, Solano, San Joaquin, and
6 Contra Costa counties declined in 2004, slightly increased in 2006, and continued
7 to fluctuate through 2012, as shown in Figure 19.5. Within these counties, farm
8 employment started to decline in 2004 and began to increase slightly in 2006, as
9 shown in Figure 19.5. The overall trend in farm employment in the Delta and
10 Suisun Marsh portion of the Central Valley Region is influenced by the farm
11 employment trends in San Joaquin County. The decrease in farm employment is
12 related to the reduction in cultivated acreage during this period, as described in
13 Chapter 12, Agricultural Resources.

14 The farm employment numbers presented in Table 19.23 include only workers
15 directly involved in farming, forestry, and fishing activities. However, farming is
16 one of the most important basic industries in many counties in the Central Valley
17 Region; and supports many other businesses including farm inputs (e.g., fertilizer,
18 seed, machinery, and fuel) and processing of food and fiber grown on farms. As a
19 result, employment both directly on farm and indirectly dependent on farming is
20 higher than the values displayed in Table 19.23.

21 **19.3.3.3 Income**

22 The average per capita personal income in the Sacramento, Yolo, Solano, San
23 Joaquin, and Contra Costa counties was about 15 percent higher than the average
24 per capita personal income in the entire Central Valley Region, as presented in
25 Table 19.24. San Joaquin and Contra Costa counties experienced the lowest
26 average annual growth rates in per capita personal income between 2000 and
27 2008. Between 2008 and 2012, Yolo County was the only county with a slightly
28 higher average annual growth rate as compared to the entire Central Valley
29 Region.

1 **Table 19.24 Per Capita Personal Income in Central Valley Region – Delta and**
 2 **Suisun Marsh**

Area	Per Capita Personal Income			Average Annual Growth Rate (percent)	
	2000	2008	2012	2000-2008	2008-2012
Sacramento County	\$29,406	\$38,782	\$41,837	3.5	1.9
Yolo County	\$27,093	\$37,488	\$41,811	4.1	2.8
Solano County	\$28,373	\$39,178	\$42,354	4.1	2.0
San Joaquin County	\$25,147	\$31,250	\$33,024	2.8	1.4
Contra Costa County	\$45,576	\$58,547	\$61,638	3.2	1.3
Average in Delta and Suisun Marsh Counties	\$33,079	\$42,861	\$45,829	3.3	1.7
Central Valley Region	\$28,183	\$37,198	\$40,601	3.5	2.2
STATE OF CALIFORNIA	\$33,404	\$44,003	\$46,477	3.5	1.4

3 Source: BEA 2014e

4 **19.3.3.3.4 Local Government Finances**

5 As of April 1, 2014, the county sales tax rates in the Sacramento, Yolo, Solano,
 6 San Joaquin, and Contra Costa counties ranged between 7.5 percent in Yolo to
 7 8 percent in San Joaquin (BOE 2014).

8 Total annual taxable sales for Sacramento, Yolo, Solano, San Joaquin, and Contra
 9 Costa counties in 2000, 2008, and 2012 are presented in Table 19.25. Between
 10 2000 and 2008 Yolo, Solano, and San Joaquin counties experienced average
 11 annual growth in total taxable sales that were higher than the entire Central Valley
 12 Region and the state. Between 2008 and 2012, Sacramento County experienced
 13 negative average annual growth in total taxable sales.

14 **Table 19.25 Total Taxable Sales in Central Valley Region – Delta and Suisun Marsh**

Area	Total Taxable Sales (millions)			Average Annual Growth Rate (percent)	
	2000	2008	2012	2000-2008	2008-2012
Sacramento County	\$16,594	\$19,332	\$19,090	1.9	-0.3
Yolo County	\$2,416	\$3,347	\$3,475	4.2	0.9
Solano County	\$4,424	\$6,033	\$6,038	4.0	0.0
San Joaquin County	\$6,582	\$8,696	\$9,011	3.5	0.9
Contra Costa County	\$12,331	\$13,308	\$13,997	1.0	1.3
Delta and Suisun Marsh Counties	\$42,347	\$50,715	\$51,611	2.3	0.4
Central Valley Region	\$81,975	\$107,699	\$113,368	3.5	1.3
STATE OF CALIFORNIA	\$441,854	\$531,654	\$407,714	2.3	-6.4

15 Sources: BOE 2000, 2008, 2012

1 The combined (secured and unsecured) property tax revenues in Sacramento,
 2 Yolo, Solano, San Joaquin, and Contra Costa counties for Fiscal Year 2011-2012
 3 are presented in Table 19.26. Total property tax revenues from these counties
 4 accounted for about 9 percent of the total state property tax revenues.

5 **Table 19.26 Property Tax Revenues, Fiscal Year 2011-2012,**
 6 **in Central Valley Region – Delta and Suisun Marsh**

Area	Property Tax Revenues (millions)
Sacramento County	\$1,539
Yolo County	\$270
Solano County	\$497
San Joaquin County	\$684
Contra Costa County	\$1,979
Delta and Suisun Marsh Counties	\$4,969
Central Valley Region	\$9,874
STATE OF CALIFORNIA	\$55,459

7 Source: California State Controller 2012

8 **19.3.4 San Francisco Bay Area Region**

9 The San Francisco Bay Area Region includes portions of Napa, Alameda, Santa
 10 Clara, and San Benito counties that are within the CVP and SWP service areas.
 11 Contra Costa County also is part of the San Francisco Bay Area Region.
 12 However, for this chapter, Contra Costa County is discussed under
 13 Section 19.3.4.3, Delta and Suisun Marsh.

14 **19.3.4.1 Population**

15 Population characteristics in the San Francisco Bay Area Region are presented in
 16 Table 19.27. The population of the San Francisco Bay Area Region grew slightly
 17 less than a quarter million, or at an average annual growth rate of less than one
 18 half of one percent between 2000 and 2012.

19 **Table 19.27 Population Characteristics in San Francisco Bay Area Region**

Area	Population		Average Annual Growth Rate (percent)
	2000	2012	2000-2012
Alameda County	1,443,939	1,530,176	0.5
Santa Clara County	1,682,585	1,813,696	0.6
San Benito County	53,234	56,137	0.4
Napa County	124,279	137,731	0.9
Total San Francisco Bay Area Region	3,304,037	3,537,740	0.6
STATE OF CALIFORNIA	33,873,086	37,668,804	0.9

20 Sources: DOF 2013a, 2013b, 2014

1 **19.3.4.2 Employment**

2 Civilian labor force characteristics for the counties in the San Francisco Bay Area
 3 Region are presented in Table 19.28. The civilian labor force in the counties
 4 within the San Francisco Bay Area Region declined between 2001 and 2008, and
 5 then increased between 2008 and 2012. The data for 2008 represents the
 6 employment situation immediately following the onset of the recession in 2007.

7 **Table 19.28 Civilian Labor Force and Unemployment Rates in San Francisco Bay**
 8 **Area Region**

Area	Civilian Labor Force (subject to unemployment insurance)			Unemployment Rate (percent)		
	2001	2008	2012	2001	2008	2012
Alameda County	778,472	757,566	775,855	4.8	6.2	9.0
Santa Clara County	939,501	870,251	910,983	5.1	6.0	8.4
San Benito County	27,461	24,870	26,611	6.3	9.6	13.9
Napa County	70,447	75,670	77,843	3.6	5.1	7.8
Total San Francisco Bay Area Region	1,815,881	1,728,357	1,791,292	4.9	6.1	8.7
STATE OF CALIFORNIA	17,152,106	18,392,000	18,494,881	4.9	7.2	10.5

9 Source: BLS 2014

10 Total employment and farm employment in 2001, 2008 and 2012 in the San
 11 Francisco Bay Area Region are presented in Table 19.29. The contribution of
 12 farm employment to total employment in the San Francisco Bay Area Region
 13 declined slightly between 2001 and 2008, and remained relatively stable between
 14 2008 and 2012.

15 **Table 19.29 Employment in San Francisco Bay Area Region**

Area	Total Employment			Farm Employment		
	2001	2008	2012	2001	2008	2012
Alameda County	886,316	906,403	894,625	1,704	1,475	1,291
Santa Clara County	1,226,987	1,176,129	1,187,799	5,969	4,436	2,643
San Benito County	21,722	21,827	21,116	1,969	1,244	1,073
Napa County	84,369	91,837	93,050	4,835	5,730	3,148
Total San Francisco Bay Area Region	2,219,394	2,196,196	2,196,590	14,477	12,885	8,155
STATE OF CALIFORNIA	19,411,367	20,820,306	20,653,860	479,283	438,013	443,764

16 Source: BEA 2014a

17 Note:

18 Farm employment includes employment numbers in forestry, fishing, and related activities.

1 As shown in Table 19.29, overall farm employment has declined by 45 percent
 2 between 2001 and 2012, as presented in Figure 19.1. The decrease in farm
 3 employment is related to the reduction in cultivated acreage during this period, as
 4 described in Chapter 12, Agricultural Resources.

5 **19.3.4.3 Income**

6 The average per capita personal incomes for the counties in the San Francisco
 7 Bay Area Region are presented in Table 19.30. Among the four counties in this
 8 region, San Benito County had the lowest per capita personal income. Santa
 9 Clara County had the lowest average annual per capita growth rate between 2000
 10 and 2008. All counties experienced smaller average annual per capita growth
 11 rates between 2008 and 2012 compared to the 2000 to 2008 period.

12 **Table 19.30 Per Capita Personal Income in San Francisco Bay Area Region**

Area	Per Capita Personal Income			Average Annual Growth Rate (percent)	
	2000	2008	2012	2000-2008	2008-2012
Alameda County	\$39,613	\$50,302	\$54,683	3.0	2.1
Santa Clara County	\$55,588	\$59,927	\$66,535	0.9	2.6
San Benito County	\$29,608	\$36,100	\$38,030	2.5	1.3
Napa County	\$38,854	\$51,712	\$54,807	3.6	1.5
Total San Francisco Bay Area Region	\$47,546	\$55,050	\$60,493	1.8	2.4
STATE OF CALIFORNIA	\$33,404	\$44,003	\$46,477	3.5	1.4

13 Source: BEA 2014e

14 **19.3.4.4 Local Government Finances**

15 As of April 1, 2014, the county sales tax rates in the San Francisco Bay Area
 16 region ranged between 7.5 percent in San Benito and 9.0 percent in Alameda
 17 (BOE 2014).

18 Total annual taxable sales for the counties in the San Francisco Bay Area Region
 19 in 2000, 2008, and 2012 are presented in Table 19.31. Between 2000 and 2008
 20 all counties in the region, except Santa Clara County, experienced small increases
 21 in average annual growth in total taxable sales. All counties experienced
 22 increasing growth rates between 2008 and 2012. Santa Clara County had the
 23 highest annual average growth rate in total taxable sales among all the counties in
 24 the region during this period.

1 **Table 19.31 Total Taxable Sales in San Francisco Bay Area Region**

Area	Total Taxable Sales (Millions)			Average Annual Growth Rate (percent)	
	2000	2008	2012	2000-2008	2008-2012
Alameda County	\$23,764	\$23,863	\$25,182	0.1	1.4
Santa Clara County	\$37,304	\$32,274	\$36,220	-1.8	2.9
San Benito County	\$476	\$505	\$530	0.7	1.2
Napa County	\$1,908	\$2,549	\$2,719	3.7	1.6
Total San Francisco Bay Area Region	\$63,451	\$59,191	\$64,651	-0.9	2.2
STATE OF CALIFORNIA	\$441,854	\$531,654	\$407,714	2.3	-6.4

2 Sources: BOE 2000, 2008, 2012

3 The combined (secured and unsecured) property tax revenues in each of the
 4 counties in the San Francisco Bay Area Region for Fiscal Year 2011-2012 are
 5 presented in Table 19.32. Total property tax revenues in the four counties
 6 accounted for about 13 percent of the total state property tax revenues.

7 **Table 19.32 Property Tax Revenues, Fiscal Year 2011-2012,**
 8 **in San Francisco Bay Area Region**

Area	Property Tax Revenues (millions)
Alameda County	\$2,830
Santa Clara County	\$3,973
San Benito County	\$68
Napa County	\$327
Total San Francisco Bay Area Region	\$7,198
STATE OF CALIFORNIA	\$55,459

9 Source: California State Controller 2014

10 **19.3.5 Central Coast Region**

11 The Central Coast Region includes portions of San Luis Obispo and Santa
 12 Barbara counties served by the SWP. San Luis Obispo and Santa Barbara
 13 counties are among the top 15 counties in total agricultural production in the state.

14 **19.3.5.1 Population**

15 Population characteristics in the Central Coast Region are presented in Table
 16 19.33. The population of the Central Coast Region grew by an average annual
 17 growth rate of about one half of one percent between 2000 and 2012.

1 **Table 19.33 Population Characteristics in Central Coast Region**

Area	Population		Average Annual Growth Rate (percent)
	2000	2012	2000-2012
San Luis Obispo County	246,681	271,502	0.8
Santa Barbara County	399,347	426,351	0.5
Total Central Coast Region	646,028	697,853	0.6
STATE OF CALIFORNIA	33,873,086	37,668,804	0.9

2 Sources: DOF 2013a, 2013b, 2014

3 **19.3.5.2 Employment**

4 Civilian labor force characteristics for the counties in the Central Coast Region
5 are presented in Table 19.34. The civilian labor force in the Central Coast Region
6 increased between 2000 and 2012.

7 **Table 19.34 Civilian Labor Force and Unemployment Rates in Central Coast Region**

Area	Civilian Labor Force (subject to unemployment insurance)			Unemployment Rate (percent)		
	2001	2008	2012	2001	2008	2012
San Luis Obispo County	126,176	136,615	138,650	4.0	5.7	9.3
Santa Barbara County	203,039	218,429	225,635	4.4	5.4	8.8
Total Central Coast Region	329,215	355,044	364,285	4.3	5.6	5.9
STATE OF CALIFORNIA	17,152,106	18,392,000	18,494,881	4.9	7.2	10.5

8 Source: BLS 2014

9 Total employment and farm employment in 2001, 2008, and 2012 in the Central
10 Coast Region are presented in Table 19.35. Farm employment accounted for less
11 than ten percent of total employment during this period.

12 **Table 19.35 Employment in Central Coast Region**

Area	Total Employment			Farm Employment		
	2001	2008	2012	2001	2008	2012
San Luis Obispo County	140,320	155,093	156,757	7,775	6,866	7,374
Santa Barbara County	243,955	260,056	257,841	15,228	16,483	18,075
Total Central Coast Region	384,275	415,149	414,598	23,003	23,349	25,449
STATE OF CALIFORNIA	19,411,367	20,820,306	20,653,860	479,283	438,013	443,764

13 Source: BEA 2014a

14 Note: Farm employment includes employment numbers in forestry, fishing, and related activities.

15 The farm employment numbers presented in Table 19.35 include only workers
16 directly involved in farming, forestry, and fishing activities. However, farming is
17 one of the most important basic industries in many counties in the Central Coast
18 Region; and supports many other businesses including farm inputs (e.g., fertilizer,
19 seed, machinery, and fuel) and processing of food and fiber grown on farms. As a

1 result, employment both directly on farm and indirectly dependent on farming is
 2 higher than the values displayed in Table 19.35.

3 **19.3.5.3 Income**

4 Per capita personal incomes for the counties in the Central Coast Region are
 5 lower than those for the state. Both San Luis Obispo and Santa Barbara had
 6 average annual per capita personal income growth rates between 2000 and 2008
 7 that were among the highest in the state. Per capita personal income for each of
 8 the two counties in the Central Coast Region in 2000, 2008 and 2012 are
 9 presented in Table 19.36.

10 **Table 19.36 Per Capita Personal Income in Central Coast Region**

Area	Per Capita Personal Income			Average Annual Growth Rate (percent)	
	2000	2008	2012	2000-2008	2008-2012
San Luis Obispo County	\$28,671	\$40,204	\$43,698	4.3	2.1
Santa Barbara County	\$33,317	\$45,997	\$47,862	4.1	1.0
Central Coast Region	\$31,540	\$43,735	\$46,241	4.2	1.4
STATE OF CALIFORNIA	\$33,404	\$44,003	\$46,477	3.5	1.4

11 Source: BEA 2014e

12 **19.3.5.4 Local Government Finances**

13 As of April 1, 2014, the county sales tax rates in the San Luis Obispo and Santa
 14 Barbara counties were 7.5 percent and 8.0 percent, respectively (BOE 2014).

15 Total annual taxable sales for San Luis Obispo and Santa Barbara counties in the
 16 Central Coast Region in 2000, 2008, and 2012 are presented in Table 19.37. The
 17 Central Coast Region’s average annual growth in total taxable sales were higher
 18 than for the state.

19 **Table 19.37 Total Taxable Sales in Central Coast Region**

Area	Total Taxable Sales (Millions)			Average Annual Growth Rate (percent)	
	2000	2008	2012	2000-2008	2008-2012
San Luis Obispo County	\$2,925	\$3,974	\$5,026	3.9	6.0
Santa Barbara County	\$4,823	\$5,884	\$6,051	2.5	0.7
Central Coast Region	\$7,748	\$9,858	\$11,077	3.1	3.0
STATE OF CALIFORNIA	\$441,854	\$531,654	\$407,714	2.3	-6.4

20 Sources: BOE 2000, 2008, 2012

21 The combined (secured and unsecured) property tax revenues in the Central Coast
 22 Region for Fiscal Year 2011-2012 are presented in Table 19.38. Total property
 23 tax revenues in the two counties accounted for about 2 percent of the total state
 24 property tax revenues.

1 **Table 19.38 Property Tax Revenues, Fiscal Year 2011-2012,**
 2 **in Central Coast Region**

Area	Property Tax Revenues (millions)
San Luis Obispo County	\$443
Santa Barbara County	\$695
Central Coast Region	\$1,138
STATE OF CALIFORNIA	\$55,459

3 Source: California State Controller 2014

4 **19.3.6 Southern California Region**

5 The Southern California Region includes portions of Ventura, Los Angeles,
 6 Orange, San Diego, Riverside, and San Bernardino counties served by the SWP.

7 **19.3.6.1 Population**

8 Population characteristics in Southern California Region are presented in
 9 Table 19.39. Among the counties in the Southern California Region, Riverside
 10 County had the highest average annual population growth rate, and Los Angeles
 11 County had the lowest average annual population growth rate between 2000
 12 and 2012.

13 **Table 19.39 Population Characteristics in Southern California Region**

Area	Population		Average Annual Growth Rate (percent)
	2000	2012	2000-2012
Ventura County	753,197	829,065	0.8
Los Angeles County	9,519,330	9,889,520	0.3
Orange County	2,846,289	3,057,879	0.6
San Diego County	2,813,833	3,128,734	0.9
Riverside County	1,545,387	2,234,193	3.1
San Bernardino County	1,710,139	2,059,699	1.6
Total Southern California Region	19,188,175	21,199,090	0.8
STATE OF CALIFORNIA	33,873,086	37,668,804	0.9

14 Sources: DOF 2013a, 2013b, 2014

15 **19.3.6.2 Employment**

16 Civilian labor force characteristics for the counties in the Southern California
 17 Region are presented in Table 19.40. The civilian labor force in the Southern
 18 California Region increased between 2001 and 2012. The average unemployment
 19 rates for the Southern California Region have been lower than for the state.

1 **Table 19.40 Civilian Labor Force and Unemployment Rates in Southern**
 2 **California Region**

Area	Civilian Labor Force (subject to unemployment insurance)			Unemployment Rate (percent)		
	2001	2008	2012	2001	2008	2012
Ventura County	399,325	429,444	440,649	4.8	6.3	9.0
Los Angeles County	4,752,839	4,934,756	4,879,674	5.7	7.5	10.9
Orange County	1,513,234	1,618,079	1,618,677	4.0	5.3	7.6
San Diego County	1,409,726	1,548,233	1,599,133	4.2	6.0	8.9
Riverside County	711,134	912,717	944,458	5.5	8.5	12.2
San Bernardino County	763,221	863,293	860,895	5.1	8.0	12.0
Total Southern California Region	9,549,479	10,306,522	10,343,486	5.1	7.0	10.2
STATE OF CALIFORNIA	17,152,106	18,392,000	18,494,881	4.9	7.2	10.5

3 Source: BLS 2014

4 Total employment and farm employment in 2001, 2008, and 2012 in the Southern
 5 California Region are presented in Table 19.41. Farm employment accounted for
 6 less than one percent of total employment.

7 **Table 19.41 Employment in Southern California Region**

Area	Total Employment			Farm Employment ¹		
	2001	2008	2012	2001	2008	2012
Ventura County	399,928	436,031	431,196	21,329	23,430	24,826
Los Angeles County	5,440,785	5,695,501	5,669,105	11,082	8,709	7,589
Orange County	1,845,392	1,999,036	1,963,080	7,888	4,713	3,183
San Diego County	1,723,801	1,901,598	1,887,077	17,871	15,718	14,778
Riverside County	677,214	866,247	864,308	20,892	15,669	15,024
San Bernardino County	730,150	881,700	864,432	6,050	3,931	3,688
Total Southern California Region	10,817,270	11,780,113	11,679,198	85,112	72,170	69,088
STATE OF CALIFORNIA	19,411,367	20,820,306	20,653,860	479,283	438,013	443,764

8 Source: BEA 2014a

9 Note:

10 Farm employment includes employment numbers in forestry, fishing, and related activities.

11 **19.3.6.3 Income**

12 Among the six counties in this region, San Bernardino County had the lowest per
 13 capita personal income in 2000 and 2008, as presented in Table 19.42. In 2012,
 14 Riverside County had the lowest per capita personal income.

1 **Table 19.42 Per Capita Personal Income in Southern California Region**

Area	Per Capita Personal Income			Average Annual Growth Rate (percent)	
	2000	2008	2012	2000-2008	2008-2012
Ventura County	\$34,296	\$46,634	\$48,837	3.9	1.2
Los Angeles County	\$29,878	\$42,881	\$44,474	4.6	0.9
Orange County	\$38,357	\$49,436	\$52,342	3.2	1.4
San Diego County	\$33,779	\$47,197	\$49,719	4.3	1.3
Riverside County	\$24,528	\$30,842	\$31,742	2.9	0.7
San Bernardino County	\$22,624	\$30,220	\$32,072	3.7	1.5
Total Southern California Region	\$30,801	\$41,078	\$44,004	3.7	1.7
STATE OF CALIFORNIA	\$33,404	\$44,003	\$46,477	3.5	1.4

2 Source: BEA 2014e

3 **19.3.6.4 Local Government Finances**

4 As of April 1, 2014, the county sales tax rates in the Southern California Region
5 ranged from 7.5 percent in Ventura County to 9.0 percent in Los Angeles County
6 (BOE 2014).

7 Total annual taxable sales for the counties in the Southern California Region in
8 2000, 2008, and 2012 are presented in Table 19.43. The counties in this region
9 have had higher average annual growth rates in total taxable retail sales compared
10 to the state. Between 2000 and 2008, Riverside and San Bernardino led the
11 region with higher average annual growth rates. However, between 2008 and
12 2012, the two counties experienced declining growth rates.

13 **Table 19.43 Total Taxable Sales in Southern California Region**

Area	Total Taxable Sales (millions)			Average Annual Growth Rate (percent)	
	2000	2008	2012	2000-2008	2008-2012
Ventura County	\$9,096	\$11,322	\$11,958	2.8	1.4
Los Angeles County	\$106,674	\$131,882	\$135,296	2.7	0.6
Orange County	\$44,462	\$53,607	\$55,231	2.4	0.7
San Diego County	\$36,245	\$45,329	\$47,947	2.8	1.4
Riverside County	\$16,979	\$26,004	\$28,096	5.5	2.0
San Bernardino County	\$18,885	\$27,778	\$29,532	4.9	1.5
Total Southern California Region	\$232,342	\$295,921	\$308,059	3.1	1.0
STATE OF CALIFORNIA	\$441,854	\$531,654	\$407,714	2.3	-6.4

14 Sources: BOE 2000, 2008, 2012

15 The combined (secured and unsecured) property tax revenues in the Southern
16 California Region for Fiscal Year 2011-2012 are presented in Table 19.44. Total

1 property tax revenues accounted for about 55 percent of the total state property
 2 tax revenues.

3 **Table 19.44 Property Tax Revenues, Fiscal Year 2011-2012,**
 4 **in Southern California Region**

Area	Property Tax Revenues (millions)
Ventura County	\$1,230
Los Angeles County	\$14,191
Orange County	\$5,046
San Diego County	\$4,646
Riverside County	\$2,812
San Bernardino County	\$2,132
Southern California Region	\$30,057
STATE OF CALIFORNIA	\$55,459

5 Source: California State Controller 2012

6 **19.3.7 Ocean Salmon Fishery**

7 The ocean salmon fishery along the southern Oregon and northern California
 8 coast are affected by the population of salmon that rely upon the northern
 9 California rivers, including the Sacramento and San Joaquin rivers. Changes in
 10 CVP and SWP water operations would affect the flow patterns and water quality
 11 of the Sacramento and San Joaquin rivers; and the survivability of the salmon that
 12 use those rivers for habitat, as described in Chapter 9, Fish and Aquatic
 13 Resources. This section discusses the economic contributions of the Pacific Coast
 14 salmon fishery.

15 Management of the California ocean salmon fishery is a combined effort of the
 16 California Department of Fish and Wildlife (CDFW) and the Pacific Fishery
 17 Management Council (PFMC), a regional council of the National Oceanic and
 18 Atmospheric Administration. The California Department of Fish and Wildlife
 19 manages salmon harvest from the shoreline to three nautical miles off the
 20 California coast. From three nautical miles to two hundred nautical miles
 21 offshore is managed by the PFMC. The PFMC is responsible for developing the
 22 Pacific Coast Salmon Fishery Management Plan (FMP) that guides management
 23 of the ocean commercial and recreational fishery in California, Oregon, and
 24 Washington (PFMC 2014a). The annual ocean salmon fishery regulations
 25 promote the maximum amount of harvest while ensuring that suitable population
 26 levels are maintained (NOAA 2014).

27 **19.3.7.1 Commercial Ocean Fisheries for Salmon along the Southern**
 28 **Oregon and Northern California Coasts**

29 The commercial ocean salmon fishery plays a large role in the overall California
 30 commercial ocean industry, as shown in Table 19.45. The total harvest value for
 31 Chinook salmon ranked fourth among all commercially harvested ocean species
 32 in 2012. The harvest value rank of Chinook salmon in California between 2001

1 and 2012 as compared to the other commercially harvested ocean species are
 2 presented in Table 19.46.

3 **Table 19.45 Top Ten Species by Total Value for Commercially Harvested Ocean**
 4 **Species in California in 2012**

Rank	Species	Total Value
1	Dungeness Crab	\$85,643,530
2	California Market Squid	\$63,883,456
3	California Spiny Lobster	\$13,706,721
4	Chinook Salmon	\$12,841,853
5	Sablefish	\$8,987,599
6	Pacific Oyster	\$8,736,923
7	Sea Urchins	\$8,320,111
8	Spot Shrimp	\$4,462,204
9	Pacific Sardine	\$4,248,504
10	Kumamoto Oyster	\$3,170,760

5 Sources: NMFS 2014a, 2014b, 2014c, 2014d, 2014e, 2014f, 2014g, 2014h, 2014i, 2014j

6 **Table 19.46 Chinook Salmon Total Harvest Value Ranking as compared to Other**
 7 **Commercially Harvested Ocean Species in California**

Year	Total Value of Chinook Salmon Landings	Rank
2001	\$4,760,786	7
2002	\$7,610,882	4
2003	\$12,153,111	3
2004	\$17,770,036	3
2005	\$12,804,188	3
2006	\$5,260,526	4
2007	\$7,835,240	4
2008	Season Closed	
2009	Season Closed	
2010	\$1,214,959	19
2011	\$5,096,433	7
2012	\$12,841,853	4

8 Source: NMFS 2014k

9 Annual revenues from commercial ocean salmon fishery in California have
 10 fluctuated with changes in salmon prices and total landings. The dollar per
 11 dressed pound for Chinook salmon paid to the commercial operator can change
 12 within a season, across seasons, and at different ports, as presented in
 13 Table 19.47. Prices for Chinook salmon have increased over the past years;
 14 however, the costs for fuel, labor, and equipment maintenance also have
 15 increased.

1 **Table 19.47 Average Annual Commercial Chinook Salmon Prices**

Year	Average Annual California Price (dollar per dressed pound)	Average Annual Oregon Price (dollar per dressed pound)
2001	\$1.98	\$1.61
2002	\$1.55	\$1.54
2003	\$1.91	\$1.97
2004	\$2.87	\$3.45
2005	\$2.97	\$3.17
2006	\$5.13	\$5.48
2007	\$5.18	\$5.66
2008	Season Closed	\$7.31
2009	Season Closed	Season Closed
2010	\$5.46	\$5.49
2011	\$5.17	\$5.96
2012	\$5.34	\$5.75

2 Source: PFMC 2014b (Tables D-4, D-5)

3 The total value of landings for the commercial ocean fishery in southern Oregon
4 and California are presented in Table 19.48.

5 **Table 19.48 Value of Landings for Salmon for the Commercial Ocean**
6 **Salmon Fishery**

Year	Total Value, California	Total Value, Oregon
2001	\$4,773	\$4,721
2002	\$7,776	\$5,391
2003	\$12,181	\$7,222
2004	\$17,895	\$9,919
2005	\$12,913	\$8,503
2006	\$5,350	\$2,701
2007	\$7,902	\$2,822
2008	Season Closed	\$51,118
2009	Season Closed	\$51,118
2010	\$1,246	\$2,791
2011	\$5,133	\$2,401
2012	\$13,521	\$4,271

7 Sources: PFMC 2014b (Tables D-4, D-5); PacFIN 2014

8 The economic contribution of the California commercial ocean salmon fishery
9 extends beyond the revenues received by fishermen. Supporting industries
10 include fish processors, boat manufacturers, repair and maintenance. The
11 economic contribution of the commercial ocean salmon fishery can be estimated
12 through the use of Input-Output models. Economic contributions are estimated by
13 PFMC using an Input-Output model, the Fishery Economic Assessment Model
14 (FEAM), as summarized in Table 19.49 for the commercial ocean salmon fishery
15 by management area.

1 **Table 19.49 Estimated Total Economic Impact for the Commercial Fishery by PFMC**

Year	Economic Values by Management Areas (\$1,000)					
	KMZ – Oregon	KMZ – California	Fort Bragg	San Francisco	Monterey	Total
2001	\$635	\$328	\$1,033	\$10,857	\$2,297	\$15,150
2002	\$806	\$797	\$3,730	\$15,516	\$4,179	\$25,028
2003	\$699	\$259	\$15,160	\$15,795	\$2,491	\$34,404
2004	\$1,502	\$2,373	\$7,434	\$23,356	\$5,257	\$39,922
2005	\$1,259	\$582	\$5,420	\$13,496	\$7,083	\$27,840
2006	\$378	\$0	\$2,471	\$6,389	\$985	\$10,223
2007	\$780	\$1,156	\$3,407	\$8,131	\$1,658	\$15,132
2008	\$72	\$0	\$0	\$0	\$0	\$72
2009	\$42	\$0	\$0	\$0	\$0	\$42
2010	\$367	\$35	\$1,780	\$140	\$161	\$2,483
2011	\$504	\$505	\$4,952	\$2,225	\$979	\$9,165
2012	\$698	\$725	\$4,706	\$10,653	\$5,759	\$22,541
2013	\$1,252	\$2,146	\$12,909	\$19,181	\$4,010	\$39,498

2 Source: PFMC 2014b (Tables IV-16, IV-17)

3 Notes:

4 All values estimated using the Fishery Economic Assessment Model, and presented as 2013 dollars.

5 Southern Oregon values include data for Brookings, Oregon which may include values from landings outside of the KMZ.

6 a. KMZ –Oregon represents the area from Humbug Mountain to the Oregon-California Border, and includes landings at the Brookings port and season length and quota values for the entire area including Chetco River Ocean Terminal Area between Twin Rocks and the Oregon-California border.

7 b. KMZ –California represents the area from Oregon-California Border to Humboldt South Jetty, and includes landings at the Crescent City and Eureka ports.

12 Fisherman and industries that rely on the commercial ocean salmon fishery have
13 access to financial assistance from the federal government in years of low revenue
14 or closure. The fishery can be declared a failure by the Department of Commerce
15 after requests are sent by state or local officials and certain criteria have been met.
16 After a fishery failure is declared, disaster relief can be provided in the form of
17 monetary compensation, community grants, low-interest loans, habitat restoration,
18 or fishery capacity reduction. Disaster relief related to the California commercial
19 ocean salmon fishery has occurred six times between 1994 and 2009, as
20 summarized in Table 19.50 (CRS 2013). Direct payments may involve a
21 minimum amount to any permit holder and additional amounts based upon past
22 landing values (Hackett and Hansen 2008). Disaster relief funds distribution is
23 conducted by the PFMC and the California Salmon Council.

1 **Table 19.50 Disaster Relief Monies and Programs for the Commercial Ocean**
 2 **Salmon Fishery in California**

Year	Programs	Dollar Value
1994	Fishery capacity reduction, habitat restoration jobs, and data collection jobs	\$12 Million
1995	Similar programs as in 1994	\$13 Million
1998	Fishery capacity reduction	\$3.5 Million
2007	Direct payments to fisherman and businesses dependent on the Klamath River salmon	\$60.4 Million
2008	Direct payments to fisherman and businesses dependent on the Sacramento River salmon	\$170 Million
2009-2010	Continuation of 2008 programs	Remainder of the 2008 \$170 Million

3 Source: CRS 2013

4 **19.3.7.2 Ocean Sport Fisheries for Salmon along the Southern Oregon**
 5 **and Northern California Coasts**

6 The PFMC and CDFW also manages the ocean sport fishery. The economic
 7 contribution of the ocean sport salmon fishery can be estimated through the use of
 8 Input-Output models. Economic contributions are estimated by PFMC using an
 9 Input-Output model, the Fishery Economic Assessment Model (FEAM), as
 10 summarized in Table 19.51.

11 **Table 19.51 Estimated Total Economic Impact for the Recreational Fishery**
 12 **by PFMC**

Year	Economic Values by Management Areas (\$1,000)					
	KMZ – Oregon	KMZ-California	Fort Bragg	San Francisco	Monterey	Total
2001	\$1,052	\$1,136	\$2,101	\$7,683	\$3,079	\$15,051
2002	\$775	\$1,026	\$2,221	\$9,646	\$4,752	\$18,420
2003	\$608	\$743	\$1,677	\$6,990	\$2,288	\$12,306
2004	\$751	\$1,229	\$2,175	\$11,310	\$4,439	\$19,904
2005	\$501	\$794	\$1,759	\$8,554	\$3,234	\$14,842
2006	\$426	\$743	\$1,450	\$5,812	\$1,947	\$10,378
2007	\$437	\$977	\$1,170	\$4,119	\$1,427	\$8,130
2008	\$189	\$0	\$26	\$0	\$0	\$215
2009	\$241	\$276	\$0	\$0	\$0	\$517
2010	\$229	\$201	\$421	\$1,712	\$1,140	\$3,703
2011	\$241	\$744	\$972	\$3,367	\$1,778	\$7,102
2012	\$732	\$1,614	\$970	\$6,069	\$2,947	\$12,332

13 Source: PFMC 2014b (Tables IV-16, IV-17)

14 Notes:
 15 All values estimated using the Fishery Economic Assessment Model, and presented as 2013 dollars.
 16 Southern Oregon values include data for Brookings, Oregon which may include values from landings outside of
 17 the KMZ.

- 1 a. KMZ –Oregon represents the area from Humbug Mountain to the Oregon-California Border, and includes
- 2 landings at the Brookings port and season length and quota values for the entire area including Chetco River
- 3 Ocean Terminal Area between Twin Rocks and the Oregon-California border.
- 4 b. KMZ –California represents the area from Oregon-California Border to Humboldt South Jetty, and includes
- 5 landings at the Crescent City and Eureka ports.

6 **19.3.8 Ocean Salmon Fisheries for the Yurok and Hoopa Valley**
 7 **Tribes**

8 The salmon populations are extremely important to the Yurok Tribe and Hoopa
 9 Valley Tribe as part of their lives, cultural traditions, ceremonies, and community
 10 health (Reclamation 2012). Fifty percent of the total available salmon in the
 11 Trinity River is the federally protected harvest for the Yurok and Hoopa Valley
 12 tribes (DOI 1993). Each tribe determines the use of the harvest. Historical
 13 landing data for the Yurok and Hoopa Valley tribes are presented in Table 19.52
 14 (Reclamation 2012).

15 **Table 19.52 Salmon Landings by the Yurok Tribe and Hoopa Valley Tribe**

Year	Spring Run Chinook Salmon	Fall Run Chinook Salmon	Total
2001	19,640	39,044	58,684
2002	15,136	24,700	39,836
2003	9,065	30,078	39,143
2004	8,682	25,971	34,653
2005	7,302	8,087	15,389
2006	4,409	10,698	15,107
2007	5,849	27,594	33,443
2008	3,439	22,901	26,340
2009	3,562	28,565	32,127
2010	5,023	30,315	35,338
2011	5,005	28,084	33,089
2012	6,477	101,662	108,139
2013 ^a	4,972	63,030	68,002

- 16 Source: PFMC 2014b (Table B-5)
- 17 Note:
- 18 a. 2013 data are preliminary.
- 19 Includes landings at the Klamath River estuary, along the Klamath River from the estuary to Weitchpec (at the
- 20 confluence of the Klamath and Trinity rivers), and along the Trinity River.

21 **19.4 Impact Analysis**

22 This section describes the potential mechanisms and analytical methods for
 23 change in socioeconomic factors; results of the impact analysis; potential
 24 mitigation measures; and cumulative effects.

25 This Chapter includes the analysis of overall regional economic changes and
 26 economic changes related to changes in CVP and SWP water supplies for M&I
 27 water users. More detailed discussions of changes in agricultural production are
 28 presented in Chapter 12, Agricultural Resources.

1 **19.4.1 Potential Mechanisms and Analytical Methods**

2 As described in Chapter 4, Approach to Environmental Analysis, the impact
3 assessment considers changes in socioeconomic factors related to changes in CVP
4 and SWP operations under the alternatives as compared to the No Action
5 Alternative and Second Basis of Comparison.

6 Changes in CVP and SWP operations under the alternatives as compared to the
7 No Action Alternative and Second Basis of Comparison could change water
8 supply availability for CVP and SWP water users, recreational opportunities at
9 reservoirs that store CVP and SWP water, and salmon from the Delta watershed
10 that are relied upon by commercial, sport, and tribal fisherman.

11 **19.4.1.1 Regional Changes in Irrigated Agricultural Production Value**

12 Changes in CVP and SWP operations could change the extent of total agricultural
13 production value as compared to the No Action Alternative and the Second Basis
14 of Comparison. As described in Chapter 12, Agricultural Resources, there was no
15 changes in agricultural production in the Central Valley under long-term
16 conditions (over the 81-year model simulation period). Therefore, this analysis
17 only addresses regional economic changes during dry and critical dry years.

18 This analysis uses model output from the Statewide Agricultural Production
19 (SWAP) model and the IMPLAN model. The SWAP model, as described in
20 Chapter 12, is a regional model of irrigated agricultural production and economics
21 that simulates the decisions of producers (farmers) in the Central Valley Region.
22 The model selects the crops, water supplies, and other inputs that maximize profit
23 subject to constraints on water and land, and subject to economic conditions
24 regarding prices, yields, and costs. The SWAP model incorporates CVP and
25 SWP water supplies, other local water supplies represented in the CalSim II
26 model, and groundwater. As conditions change within a SWAP subregion
27 (e.g., the quantity of available project water supply declines), the model optimizes
28 production by adjusting the crop mix, water sources and quantities used, and other
29 inputs. The model also fallows land when that appears to be the most cost-
30 effective response to resource conditions. The analysis only reduces groundwater
31 withdrawals based upon an optimization of agricultural production costs. The
32 analysis does not restrict groundwater withdrawals based upon groundwater
33 overdraft or groundwater quality conditions.

34 As described in Chapter 7, Groundwater Resources and Groundwater Quality,
35 The Sustainable Groundwater Management Act (SGMA) requires preparation of
36 Groundwater Sustainability Plans (GSPs) by 2020 or 2022 for most of the
37 groundwater basins. The GSPs will identify methods to implement measures that
38 will achieve sustainable groundwater operations by 2040 or 2042. The analysis in
39 this Chapter is focused on conditions that would occur in 2030. If local agencies
40 fully implement GSPs prior to the regulatory deadline, increasing groundwater
41 use would be less of an option for agricultural water users. However, to achieve
42 sustainable conditions, some measures could require several years to design and
43 construct new water supply facilities, and sustainable groundwater conditions are
44 not required until the 2040s. Therefore, it was assumed that Central Valley

1 agriculture water users would not reduce groundwater use by 2030, and that
2 groundwater use would increase in response to reduced CVP and SWP
3 water supplies.

4 As described in Chapter 12, the impact to irrigated acreage and agricultural
5 production is relatively small. Most of the change in CVP or SWP irrigation
6 supplies would be offset by changes in groundwater pumping, with only small
7 changes in crop acreage in production. However, this is an aggregate result for
8 the Central Valley. Individual growers that rely on CVP or SWP supply and have
9 no access to groundwater would have their irrigated acreage affected by larger
10 amounts. Some of their change in production can and would be offset by changes
11 on other farms that have access to groundwater or other surface supplies. Over
12 time, growers without the buffer of access to groundwater could be driven to sell
13 to or merge with other farming operations. From the larger, regional perspective,
14 total value of production is estimated to change relatively little.

15 The regional economic analysis was conducted using the results of the impact
16 analysis on agricultural production and M&I water use. The incremental impact
17 results, estimated by the SWAP and CWEST economic models, were input into
18 the regional IMPLAN models as the direct change caused by each of
19 Alternative as compared to the No Action Alternative and the Second Basis of
20 Comparison. Changes in economic effects depend upon loss of production or
21 expenditures for water supplies, interactions within the regional economy, and
22 “leakage” of economic activity between regions. Economic linkages create
23 multiplier effects in a regional economy in the IMPLAN input-output model
24 based upon estimates of county-level final demands and final payments developed
25 from published data, national average matrix of technical coefficients, and
26 mathematical relationships. IMPLAN uses information from the U.S. Department
27 of Commerce’s Bureau of Economic Analysis, U.S. Department of Labor’s
28 Bureau of Labor Statistics, and other federal and state government agencies. Data
29 is collected for 440 different industrial sectors of the national economy per the
30 North American Industry Classification System based on the primary commodity
31 or service produced. Data sets are provided for the IMPLAN model for each
32 county in the United States. In this analysis counties were grouped into the
33 Central Valley Region (does not include Contra Costa County), San Francisco
34 Bay Area Region (does include Contra Costa County), Central Coast Region, and
35 Southern California Region.

36 IMPLAN is a static model that estimates impacts for a snapshot in time when the
37 impacts are expected to occur, based on the makeup of the economy at the time of
38 the underlying IMPLAN data. IMPLAN measures the initial impact to the
39 economy based on average expenditure patterns, but does not consider long-term
40 adjustments if labor and capital move into alternative uses.

41 Irrigated acreage occurs in the San Francisco Bay Area, Central Coast, and
42 Southern California regions that use CVP and SWP water. This irrigated acreage
43 is not included in the SWAP model simulation; and therefore, is not evaluated
44 quantitatively in this EIS. However, changes in irrigated acreage in response to

1 reductions in CVP and SWP water deliveries are assumed to occur in a similar
2 manner as projected for the Central Valley Region.

3 As described in this chapter, the SWAP and IMPLAN models are annual-time
4 step models that use information from the monthly-time step model. The model
5 results represent long-term responses and must be used in a comparative manner
6 to reduce the effects of use of monthly assumptions and other assumptions that
7 are indicative of real-time operations, but do not specific match real-time
8 observations. The CalSim II model output includes minor fluctuations of up to
9 5 percent due to model assumptions and approaches. Therefore, if the
10 quantitative changes between a specific alternative and the No Action
11 Alternative and/or Second Basis of Comparison are 5 percent or less, the
12 conditions under the specific alternative would be considered to be “similar” to
13 conditions under the No Action Alternative and/or Second Basis of Comparison.

14 **19.4.1.2 Regional Changes in Municipal and Industrial Water Supplies and**
15 **Water Supply Costs**

16 Changes in CVP and SWP operations could change availability of water supplies
17 for M&I water in the study area, related costs of additional supplies or shortages,
18 and changes in regional economics as compared to the No Action Alternative and
19 the Second Basis of Comparison. The quantitative analyses of regional changes
20 related to changes in M&I water supplies and associated costs, employment, and
21 economic output are analyzed using the California Water Economics Spreadsheet
22 Tool (CWEST) model and the IMPLAN model.

23 Changes in M&I water supplies were evaluated using a regional economic model
24 that was specifically modified to address water supply and cost changes to CVP
25 and SWP M&I water users. The CWEST is a regional model that considers the
26 economic costs to M&I water users including the cost of CVP and SWP water
27 supplies, regional surface water supplies (including recycled water), conveyance
28 costs, shortage costs, and changes in groundwater pumping costs. The model
29 operations on an annual time step. Annual supplies are calculated for each water
30 user based upon annual CVP and/or SWP water supplies, local surface water and
31 groundwater supplies, surface water and groundwater storage, wastewater effluent
32 and stormwater recycling water treatment, and desalination water treatment.

33 CVP and SWP water supply inputs are provided for the 81-year hydrologic period
34 from the CalSim II model. The CWEST model analyzes the changes in annual
35 conditions over the 81-long-term condition, and averages the overall costs for
36 each Alternative over the 81-long-term condition. The CWEST model evaluates
37 responses to changes in CVP and SWP water supplies differently for wet, above
38 normal, and below normal water year types as compared to dry and critical dry
39 water year types.

40 The goal of the CWEST model is to minimize the cost for the water providers and
41 end-users to meet 2030 water demand. In years when the combination of average
42 existing water supplies (either for the wetter or drier conditions) are greater than
43 the 2030 water demand, the CWEST model assumes any overage water amount
44 would be placed into surface water or groundwater storage, if available. If

1 storage is not available, groundwater pumping would be reduced so that the other
 2 available supplies can be utilized. The CWEST model assumes that local surface
 3 water, other imported water supplies, recycled water use, and desalinated water
 4 use would not be reduced. However, during wet years, total CVP and SWP water
 5 deliveries may not be delivered if groundwater pumping is reduced to zero and
 6 local storage facilities are full.

7 In years when annual supplies are less than the 2030 water demand, the model
 8 assumes that water users with local surface water and groundwater storage would
 9 first fully utilize those supplies, and participate in temporary water transfers or a
 10 similar annual option if necessary. If shortage and transfer costs occur frequently,
 11 the model can select to purchase additional fixed-yield supplies, such as
 12 additional recycled water, desalination water treatment, or groundwater capacity.
 13 The model optimizes these long-term supply decisions to provide the lowest-cost
 14 water supply portfolio to meet 2030 demands throughout the 81-year hydrologic
 15 period.

16 The CWEST model local supply amounts and costs for this EIS are primarily
 17 based upon information presented in 2010 Urban Water Management Plans
 18 (UWMPs) developed by the CVP and SWP contractors (see Appendix 5D,
 19 Municipal and Industrial Water Demands and Supplies). The assumptions related
 20 to future water supplies presented in the UWMPs were evaluated to determine if
 21 the projects were reasonable and certain to occur by 2030. Projects that had
 22 undergone environmental review, were under design, or under construction were
 23 considered to exist in 2030 water supply assumptions in the CWEST model.
 24 Projects described in the UWMPs were considered as options to increase fixed-
 25 yield supplies. Existing and future water supplies considered for municipalities
 26 by 2030 are presented in Appendix 5B, Future Municipal Water Supplies for CVP
 27 and SWP Water Users. For smaller water users that are not addressed in an
 28 UWMP, information was obtained from water master plans and integrated
 29 regional water management plans.

30 CWEST calculates the change in the cost of water supplies plus end-user shortage
 31 costs. It does not calculate the total cost of water supplies. To provide a basis for
 32 understanding the relative importance of a change in costs, annual operating
 33 expenses were obtained from the fiscal year 2011-12 reports for special districts,
 34 counties, and cities published by the State Controllers' office (2013, 2014,
 35 2014a). These operating expenses were updated to 2014 dollars using the
 36 California urban consumer price index. The cost change from CWEST, divided
 37 by the operating expense, provides a reasonable indication of the relative
 38 importance of cost changes for urban water providers.

39 The level of 2014 operating expense for each region includes:

- 40 • Central Valley Region
 - 41 – Sacramento Valley - \$257 million
 - 42 – San Joaquin Valley - \$297 million
- 43 • San Francisco Bay Area Region - \$415 million
- 44 • Central Coast Region - \$38 million

1 • Southern California Region (also known as “South Coast”) - \$1,613 million
2 The CWEST model assumes that groundwater pumping would occur up to the
3 amounts included in the UWMPs for wetter and drier conditions. As described
4 above for agricultural production, it is assumed that full implementation of
5 SGMA would not occur by 2030. Therefore, it was assumed that water users that
6 are not currently operating groundwater resources in accordance with adjudication
7 or other types of agreements, would not reduce groundwater use by 2030.

8 The IMPLAN model, described above, also is used to analyze changes in regional
9 economics related to M&I water supplies. Increased costs of water supply are
10 estimated from CWEST results. It is assumed that these costs must be passed on
11 to regional water users. Regional water users are assumed to reduce their
12 spending by an amount equal to the water supply cost increase. This reduced
13 spending is distributed over regional industries according to coefficients provided
14 by IMPLAN.

15 As described in this chapter, the CWEST and IMPLAN models are annual-time
16 step models that use information from the monthly-time step model. The model
17 results represent long-term responses and must be used in a comparative manner
18 to reduce the effects of use of monthly assumptions and other assumptions that
19 are indicative of real-time operations, but do not specific match real-time
20 observations. The CalSim II model output includes minor fluctuations of up to
21 5 percent due to model assumptions and approaches. Therefore, if the
22 quantitative changes between a specific alternative and the No Action
23 Alternative and/or Second Basis of Comparison are 5 percent or less, the
24 conditions under the specific alternative would be considered to be “similar” to
25 conditions under the No Action Alternative and/or Second Basis of Comparison.

26 **19.4.1.3 Changes in Local Government Finances**

27 Changes in CVP and SWP operations would not result in major changes in land
28 use, as described in Chapter 13, Land Use. Therefore, changes to collection of
29 local taxes and fees are not anticipated under the alternatives as compared to the
30 No Action Alternative and the Second Basis of Comparison. Therefore, changes
31 in local government finances are not evaluated in this EIS.

32 **19.4.1.4 Changes in Recreational Economics**

33 Reservoirs that store CVP and SWP water provide a wide diversity of recreational
34 experiences on the water surface, as described in Chapter 15, Recreational
35 Resources. However, changes to recreational economic opportunities under the
36 alternatives primarily would occur due to changes in surface water elevations at
37 San Luis Reservoir and reduced Striped Bass fishing opportunities under
38 Alternatives 3 and 4.

39 This EIS does not quantitatively analyze potential changes in recreation user days
40 or recreation spending because specific projects or responses to the changes in
41 reservoir elevations are not considered under the purpose and need of this EIS.
42 The qualitative analysis presented in this Chapter is based upon potential changes
43 in recreational use related to changes under the alternatives as compared to the No

1 Action Alternative and the Second Basis of Comparison, as described in
2 Chapter 15, Recreational Resources.

3 **19.4.1.5 Changes in Commercial, Sport, and Tribal Salmon Fishing**
4 **Opportunities**

5 Changes in CVP and SWP operations under the alternatives could change the
6 salmon population as compared to the No Action Alternative and the Second
7 Basis of Comparison. Commercial, sport, and tribal fishing primarily relies upon
8 Fall-run Chinook Salmon because the populations of other runs of salmon are
9 substantially lower. Specific population changes for Fall-run Chinook Salmon are
10 not projected in this EIS. Therefore, this Chapter presents a qualitative analysis
11 of potential changes in socioeconomic factors under the alternatives as compared
12 to the No Action Alternative and the Second Basis of Comparison.

13 **19.4.1.6 Effects of Cross Delta Water Transfers**

14 Historically water transfer programs have been developed on an annual basis.
15 The demand for water transfers is dependent upon the availability of water
16 supplies to meet water demands. Water transfer transactions have increased over
17 time as CVP and SWP water supply availability has decreased, especially during
18 drier water years.

19 Parties seeking water transfers generally acquire water from sellers who have
20 available surface water who can make the water available through releasing
21 previously stored water, pump groundwater instead of using surface water
22 (groundwater substitution); idle crops; or substitute crops that uses less water in
23 order to reduce normal consumptive use of surface water.

24 Water transfers using CVP and SWP Delta pumping plants and south of Delta
25 canals generally occur when there is unused capacity in these facilities. These
26 conditions generally occur drier water year types when the flows from upstream
27 reservoirs plus unregulated flows are adequate to meet the Sacramento Valley
28 water demands and the CVP and SWP export allocations. In non-wet years, the
29 CVP and SWP water allocations would be less than full contract amounts;
30 therefore, capacity may be available in the CVP and SWP conveyance facilities to
31 move water from other sources.

32 Projecting future socioeconomic conditions related to water transfer activities is
33 difficult because specific water transfer actions required to make the water
34 available, convey the water, and/or use the water would change each year due to
35 changing hydrological conditions, CVP and SWP water availability, specific local
36 agency operations, and local cropping patterns. Reclamation recently prepared a
37 long-term regional water transfer environmental document which evaluated
38 potential changes in conditions related to water transfer actions (Reclamation
39 2014c). Results from this analysis were used to inform the impact assessment of
40 potential effects of water transfers under the alternatives as compared to the No
41 Action Alternative and the Second Basis of Comparison.

1 **19.4.2 Conditions in Year 2030 without Implementation of**
2 **Alternatives 1 through 5**

3 This EIS includes two bases of comparison, as described in Chapter 3,
4 Description of Alternatives: the No Action Alternative and the Second Basis of
5 Comparison. Both of these bases are evaluated at 2030 conditions. Changes that
6 would occur over the next 15 years without implementation of the alternatives are
7 not analyzed in this EIS. However, the changes to socioeconomics that are
8 assumed to occur by 2030 under the No Action Alternative and the Second Basis
9 of Comparison are summarized in this section. Many of the changed conditions
10 would occur in the same manner under both the No Action Alternative and the
11 Second Basis of Comparison.

12 **19.4.2.1 Common Changes in Conditions under the No Action**
13 **Alternative and Second Basis of Comparison**

14 Conditions in 2030 would be different than existing conditions due to:

- 15 • Climate change and sea level rise
16 • General plan development throughout California, including increased water
17 demands in portions of Sacramento Valley
18 • Implementation of reasonable and foreseeable water resources management
19 projects to provide water supplies

20 It is anticipated that climate change would result in more short-duration high-
21 rainfall events and less snowpack in the winter and early spring months. The
22 reservoirs would be full more frequently by the end of April or May by 2030 than
23 in recent historical conditions. However, as the water is released in the spring,
24 there would be less snowpack to refill the reservoirs. This condition would
25 reduce reservoir storage and available water supplies to downstream uses in the
26 summer. The reduced end of September storage also would reduce the ability to
27 release stored water to downstream regional reservoirs. These conditions would
28 occur for all reservoirs in the California foothills and mountains, including
29 non-CVP and SWP reservoirs.

30 These changes would result in a decline of the long-term average CVP and SWP
31 water supply deliveries by 2030 as compared to recent historical long-term
32 average deliveries under the No Action Alternative and the Second Basis of
33 Comparison. However, the CVP and SWP water deliveries would be less under
34 the No Action Alternative as compared to the Second Basis of Comparison, as
35 described in Chapter 5, Surface Water Resources and Water Supplies, which
36 could result in more crop idling.

37 Under the No Action Alternative and the Second Basis of Comparison, land uses
38 in 2030 would occur in accordance with adopted general plans.

39 The No Action Alternative and the Second Basis of Comparison assumes
40 completion of water resources management and environmental restoration
41 projects that would have occurred without implementation of Alternatives 1
42 through 5, including regional and local recycling projects, surface water and

1 groundwater storage projects, conveyance improvement projects, and desalination
 2 projects, as described in Chapter 3, Description of Alternatives. The No Action
 3 Alternative and the Second Basis of Comparison also assumes implementation of
 4 actions included in the 2008 U.S. Fish and Wildlife Service (USFWS) Biological
 5 Opinion (BO) and 2009 National Marine Fisheries Service (NMFS) BO that
 6 would have been implemented without the BOs by 2030, as described in
 7 Chapter 3, Description of Alternatives.

8 **19.4.2.2 Population Projections under the No Action Alternative and**
 9 **Second Basis of Comparison**

10 The 2030 population projections for each region addressed in this EIS are
 11 presented in Tables 19.53 through 19.59.

12 **Table 19.53 Population Projections in Trinity River Region**

Area	Population		Average Annual Growth Rate (percent)
	2012	2030	2012-2030
Trinity County	13,471	15,309	0.7
Humboldt County	134,728	143,811	0.4
Del Norte County	28,527	31,252	0.5
Total Trinity River Region	176,726	190,373	0.4
STATE OF CALIFORNIA	37,427,946	44,574,756	0.9

13 Sources: DOF 2013a, 2013b, 2014

14 **Table 19.54 Population Projections in Central Valley Region – Sacramento Valley**

Area	Population		Average Annual Growth Rate (percent)
	2012	2030	2012-2030
Shasta County	177,516	210,997	0.9
Plumas County	19,901	20,390	0.1
Tehama County	62,985	75,522	1.0
Glenn County	28,105	33,318	0.9
Colusa County	21,552	28,112	1.4
Butte County	220,465	276,009	1.2
Yuba County	72,642	97,037	1.6
Nevada County	97,366	111,836	0.8
Sutter County	94,620	131,390	1.7
Placer County	351,463	454,124	1.4
El Dorado County	180,483	230,503	1.3
Sacramento Valley Subtotal	1,333,615	1,669,238	1.3
Total Central Valley Region	7,408,750	9,677,315	1.5
STATE OF CALIFORNIA	37,668,804	44,574,756	0.9

15 Sources: DOF 2013a, 2013b, 2014

1 **Table 19.55 Population Projections in Central Valley – San Joaquin Valley**

Area	Population		Average Annual Growth Rate (percent)
	2012	2030	2012-2030
Stanislaus County	519,339	666,446	1.4
Madera County	152,325	219,908	2.1
Merced County	260,029	359,798	1.8
Fresno County	943,493	1,232,151	1.5
Tulare County	451,540	636,606	1.9
Kings County	151,774	209,440	1.8
Kern County	849,977	1,276,155	2.3
San Joaquin Valley Subtotal	3,328,477	4,600,505	1.8
Total Central Valley Region	7,238,742	9,468,443	1.5
STATE OF CALIFORNIA	37,668,804	44,574,756	0.9

2 Sources: DOF 2013a, 2013b, 2014

3 **Table 19.56 Population Projections in Central Valley Region – Delta and Suisun Marsh**

Area	Population		Average Annual Growth Rate (percent)
	2012	2030	2012-2030
Sacramento County	1,433,525	1,731,061	1.1
Yolo County	204,349	250,420	1.1
Solano County	415,787	490,381	0.9
San Joaquin County	692,997	935,709	1.7
Contra Costa County	1,066,602	1,263,049	0.9
Delta and Suisun Marsh Subtotal	3,813,260	4,670,621	1.1
Total Central Valley Region	7,238,742	9,468,443	1.5
STATE OF CALIFORNIA	37,668,804	44,574,756	0.9

5 Sources: DOF 2013a, 2013b, 2014

1 **Table 19.57 Population Projections in San Francisco Bay Area Region**

Area	Population		Average Annual Growth Rate (percent)
	2012	2030	2012-2030
Alameda County	1,530,176	1,650,596	0.4
Santa Clara County	1,813,696	2,048,021	0.7
San Benito County	56,137	59,259	0.3
Napa County	137,731	158,538	0.8
Total San Francisco Bay Area Region	3,537,740	3,916,413	0.6
STATE OF CALIFORNIA	37,668,804	44,574,756	0.9

2 Sources: DOF 2013a, 2013b, 2014

3 **Table 19.58 Population Projections in Central Coast Region**

Area	Population		Average Annual Growth Rate (percent)
	2000	2030	2012-2030
San Luis Obispo County	271,502	311,388	0.8
Santa Barbara County	426,351	469,070	0.5
Total Central Coast Region	697,853	780,457	0.6
STATE OF CALIFORNIA	37,668,804	44,574,756	0.9

4 Sources: DOF 2013a, 2013b, 2014

5 **Table 19.59 Population Projections in Southern California Region**

Area	Population		Average Annual Growth Rate (percent)
	2012	2030	2012-2030
Ventura County	829,065	956,324	0.8
Los Angeles County	9,889,520	11,138,280	0.7
Orange County	3,057,879	3,385,762	0.6
San Diego County	3,128,734	3,665,358	0.9
Riverside County	2,234,193	3,145,948	1.9
San Bernardino County	2,059,699	2,588,990	1.3
Total Southern California Region	21,199,090	24,880,663	0.9
STATE OF CALIFORNIA	37,668,804	44,574,756	0.9

6 Sources: DOF 2013a, 2013b, 2014

1 **19.4.3 Evaluation of Alternatives**

2 Alternatives 1 through 5 have been compared to the No Action Alternative; and
3 the No Action Alternative and Alternatives 1 through 5 have been compared to
4 the Second Basis of Comparison.

5 During review of the numerical modeling analyses used in this EIS, an error was
6 determined in the CalSim II model assumptions related to the Stanislaus River
7 operations for the Second Basis of Comparison, Alternative 1, and Alternative 4
8 model runs. Appendix 5C includes a comparison of the CalSim II model run
9 results presented in this Chapter and CalSim II model run results with the error
10 corrected. Appendix 5C also includes a discussion of changes in the comparison
11 of groundwater conditions for the following Alternative analyses.

- 12 • No Action Alternative compared to the Second Basis of Comparison
- 13 • Alternative 1 compared to the No Action Alternative
- 14 • Alternative 3 compared to the Second Basis of Comparison
- 15 • Alternative 5 compared to the Second Basis of Comparison.

16 **19.4.3.1 No Action Alternative**

17 The No Action Alternative is compared to the Second Basis of Comparison.

18 **19.4.3.1.1 Trinity River Region**

19 *Regional Changes to Irrigated Agriculture*

20 There are no agricultural lands irrigated with CVP and SWP water supplies in the
21 Trinity River Region. Therefore, there would be no changes in irrigated lands
22 under the No Action Alternative as compared to the Second Basis of Comparison.

23 *Regional Changes to Municipal and Industrial Water Supplies*

24 The CVP would continue to release water in Trinity River for downstream
25 beneficial uses, including water supplies under the No Action Alternative and the
26 Second Basis of Comparison. There are no municipal and industrial CVP or SWP
27 water service contractors in the Trinity River Region.

28 *Regional Changes to Recreational Opportunities*

29 Recreational opportunities would be similar in the Trinity River Region under the
30 No Action Alternative as compared to the Second Basis of Comparison as
31 described in Chapter 15, Recreational Resources.

32 *Regional Changes related to Changes in Salmon Fishing*

33 Trinity River flows would be similar under the No Action Alternative as
34 compared to the Second Basis of Comparison. This could result in similar salmon
35 harvest conditions by the Yurok and Hoopa Valley tribes.

36 **19.4.3.1.2 Central Valley Region**

37 *Regional Changes to Irrigated Agriculture*

38 As described in Chapter 5, Surface Water Resources and Water Supplies, CVP
39 and SWP water supplies would be less under the No Action Alternative than
40 under the Second Basis of Comparison. It is anticipated that groundwater use

1 would increase in response to reduced CVP and SWP water supplies in 2030
 2 because sustainable groundwater management plans would not be fully
 3 implemented until the 2040s, as discussed in Chapter 12, Agricultural Resources.

4 The agricultural production value under long-term average conditions would be
 5 reduced by less than 1 percent (\$1.6 million/year in the Sacramento Valley and
 6 \$0.5 million/year in the San Joaquin Valley) primarily due to an increase in
 7 groundwater pumping of approximately 6 percent. The agricultural production
 8 value under dry and critical dry conditions also would be reduced by less than
 9 1 percent (\$11.3 million/year in the Sacramento Valley and \$20.3 million/year in
 10 the San Joaquin Valley) primarily due to an increase in groundwater pumping.

11 The overall reduction in agricultural production values are less than 0.05 percent
 12 under long-term conditions; and, changes in employment and regional economic
 13 output would be minimal. Therefore, the analysis of employment and regional
 14 economic output is focused on dry and critical dry years.

15 The direct changes in agricultural production would result in changes to
 16 employment and regional economic output in the Sacramento and San Joaquin
 17 valleys, as summarized in Tables 19.60 and 19.61, respectively.

18 **Table 19.60 Changes in Agricultural-Related Employment and Regional Economic**
 19 **Output for the Sacramento Valley under the No Action Alternative as Compared to**
 20 **the Second Basis of Comparison in Dry and Critical Dry Years**

Economic Sectors	Employment				Economic Output (\$ millions)			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agriculture	-87	-21	0	-108	-11.3	-1.3	0.0	-12.7
Mining & Logging	0	0	0	0	0.0	0.0	0.0	0.0
Construction	0	-1	0	-1	0.0	-0.1	0.0	-0.2
Manufacturing	0	0	0	0	0.0	-0.1	0.0	-0.1
Transportation, Warehousing & Utilities	0	-1	0	-2	0.0	-0.4	-0.1	-0.5
Wholesale Trade	0	-1	-1	-2	0.0	-0.2	-0.1	-0.3
Retail Trade	0	0	-4	-4	0.0	0.0	-0.3	-0.3
Information	0	0	0	0	0.0	0.0	-0.1	-0.1
Financial Activities	0	-7	-2	-9	0.0	-1.6	-0.8	-2.5
Services	0	-3	-12	-15	0.0	-0.3	-1.0	-1.3
Government	0	0	0	0	0.0	-0.1	0.0	-0.1
Total	-87	-36	-19	-142	-11.3	-4.2	-2.5	-18.1

1 **Table 19.61 Changes in Agricultural-Related Employment and Regional Economic**
 2 **Output for the San Joaquin Valley under the No Action Alternative as Compared to**
 3 **the Second Basis of Comparison in Dry and Critical Dry Years**

Economic Sectors	Employment				Economic Output (\$ millions)			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agriculture	-139	-53	0	-192	-20.3	-2.3	-0.1	-22.7
Mining & Logging	0	-1	0	-1	0.0	-0.3	0.0	-0.3
Construction	0	-2	0	-2	0.0	-0.2	0.0	-0.2
Manufacturing	0	-1	0	-2	0.0	-1.8	-0.3	-2.1
Transportation, Warehousing & Utilities	0	-3	-1	-4	0.0	-0.8	-0.2	-1.0
Wholesale Trade	0	-2	-1	-3	0.0	-0.4	-0.2	-0.5
Retail Trade	0	0	-7	-8	0.0	0.0	-0.6	-0.6
Information	0	0	0	-1	0.0	-0.1	-0.1	-0.2
Financial Activities	0	-12	-3	-15	0.0	-2.7	-1.5	-4.1
Services	0	-5	-21	-26	0.0	-0.5	-1.7	-2.2
Government	0	-1	0	-1	0.0	-0.2	-0.1	-0.3
Total	-139	-79	-35	-254	-20.3	-9.2	-4.9	-34.4

4 As described in Chapter 11, Geology and Soils Resources, increased groundwater
 5 pumping under the long-term average conditions may result in an additional
 6 increment of subsidence in those areas within the Central Valley. The additional
 7 amount of subsidence and the economic costs associated with it have not been
 8 quantified in this EIS. However, total subsidence-related costs have been shown
 9 to be substantial, as reported by Borchers et al. (2014) who estimated that the cost
 10 of subsidence in San Joaquin Valley between 1955 and 1972 was more than
 11 \$1.3 billion (in 2013 dollars). These estimates are based on the impacts to major
 12 infrastructure in the region including the San Joaquin River, Delta Mendota
 13 Canal, Friant-Kern Canal and San Luis Canal in addition to privately owned
 14 infrastructure. The incremental subsidence-related costs, expressed on an annual
 15 basis, could be an unknown fraction of that cumulative cost.

16 *Regional Changes to Municipal and Industrial Water Supplies*

17 As described in Chapter 5, Surface Water Resources and Water Supplies, CVP
 18 and SWP water supplies would be less under the No Action Alternative than
 19 under the Second Basis of Comparison. The analysis assumed CVP and SWP
 20 water deliveries, as described in Chapter 5, and determined the need for new
 21 water supplies, changes in water storage and groundwater pumping, water
 22 transfers, water shortage costs, and excess water savings. The factors and basis of
 23 the analysis are described in detail in Appendix 19A, CWEST Model. The
 24 analysis assumes that no new annual transfer supplies would be implemented until
 25 shortages were greater than 5 percent. The costs of these shortages are included

1 in the analysis. It is assumed that some communities that do not have
 2 alternative water supplies (e.g., cities of Huron and Coalinga) and would utilize
 3 water transfers.

4 The average annual water supply costs over the 81-year hydrologic period for
 5 M&I water supplies are presented in Tables 19.62 and 19.63 for the Sacramento
 6 and San Joaquin Valley, respectively.

7 **Table 19.62 Changes in Municipal and Industrial Water Supply Costs for the**
 8 **Sacramento Valley under the No Action Alternative as Compared to the Second**
 9 **Basis of Comparison**

Differences in Total	No Action Alternative	Second Basis of Comparison	Changes
Average Annual CVP/SWP Deliveries (TAF)	447	463	-16
Delivery Cost (\$1,000)	\$8,031	\$8,317	-\$287
Assumed New Supply Deliveries (TAF)	0	0	0
Annualized New Supply Costs (\$1,000)	\$0	\$0	\$0
Water Storage Costs (\$1,000)	\$0	\$0	\$0
Lost Water Sales Revenues (\$1,000)	\$213	\$207	\$6
Transfer Costs (\$1,000)	\$739	\$517	\$222
Shortage Costs (\$1,000)	\$69	\$68	\$1
Groundwater Pumping Savings (due to reductions in Groundwater Pumping) (\$1,000)	-\$3,858	-\$3,916	\$58
Excess Water Savings (\$1,000)	-\$2,275	-\$2,563	\$288
Average Annual Changes in Water Supply Costs (\$1,000)	\$2,919	\$2,630	\$288

10 Note: In 2012 dollars

11 **Table 19.63 Changes in Municipal and Industrial Water Supply Costs for the San**
 12 **Joaquin Valley under the No Action Alternative as Compared to the Second Basis**
 13 **of Comparison**

Differences in Total	No Action Alternative	Second Basis of Comparison	Changes
Average Annual CVP/SWP Deliveries (TAF)	214	237	-23
Delivery Cost (\$1,000)	\$3,460	\$3,854	-\$394
Assumed New Supply Deliveries (TAF)	2	0	2
Annualized New Supply Costs (\$1,000)	\$429	\$15	\$414
Water Storage Costs (\$1,000)	\$942	\$820	\$122
Lost Water Sales Revenues (\$1,000)	\$361	\$322	\$39
Transfer Costs (\$1,000)	\$2,673	\$2,623	\$50
Shortage Costs (\$1,000)	\$115	\$102	\$13
Groundwater Pumping Savings (due to reductions in Groundwater Pumping) (\$1,000)	-\$15,377	-\$16,011	\$634
Excess Water Savings (\$1,000)	-\$1,029	-\$1,318	\$289
Average Annual Changes in Water Supply Costs (\$1,000)	-\$8,427	-\$9,593	\$1,166

14 Note: In 2012 dollars

15 The changes in M&I water supply costs would result in changes to employment
 16 and regional economic output in the Sacramento and San Joaquin valleys, as

1 summarized in Tables 19.64 and 19.65, respectively. The M&I average annual
 2 water supply operating expenses would increase by 0.11 and 0.39 percent in the
 3 Sacramento Valley and the San Joaquin Valley, respectively; and therefore, the
 4 results would be similar.

5 **Table 19.64 Changes in Municipal and Industrial Water Supply Related**
 6 **Employment and Regional Economic Output for the Sacramento Valley under the**
 7 **No Action Alternative as Compared to the Second Basis of Comparison**

Economic Sectors	Employment				Economic Output (\$ thousands)			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agriculture	0	0	0	0	0.0	0.1	-1.7	-1.6
Mining & Logging	0	0	0	0	0.0	0.4	-0.3	0.1
Construction	0	0	0	0	0.0	29.0	-2.5	26.5
Manufacturing	0	0	0	0	0.0	3.1	-22.2	-19.1
Transportation, Warehousing & Utilities	1	0	0	1	286.4	2.8	-18.0	271.2
Wholesale Trade	0	0	0	0	0.0	1.0	-27.1	-26.1
Retail Trade	0	0	-1	-1	0.0	0.9	-46.6	-45.6
Information	0	0	0	0	0.0	3.4	-20.6	-17.2
Financial Activities	0	0	0	0	0.0	13.0	-147.7	-134.6
Services	0	0	-2	-1	0.0	30.8	-154.7	-123.9
Government	0	0	0	0	0.0	0.2	-3.8	-3.7
Total	1	1	-3	-1	286.4	84.8	-445.2	-74.0

8 Note: In 2012 dollars

9 **Table 19.65 Changes in Municipal and Industrial Water Supply Related**
 10 **Employment and Regional Economic Output for the San Joaquin Valley under the**
 11 **No Action Alternative as Compared to the Second Basis of Comparison**

Economic Sectors	Employment				Economic Output (\$thousands)			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agriculture	0	0	0	0	0.0	0.0	-6.7	-6.7
Mining & Logging	0	0	0	0	0.0	-0.4	-6.4	-6.8
Construction	0	0	0	0	0.0	-13.3	-5.6	-18.9
Manufacturing	0	0	0	0	0.0	-1.4	-46.4	-47.8
Transportation, Warehousing & Utilities	-1	0	0	-1	-140.8	-1.4	-44.7	-186.9
Wholesale Trade	0	0	0	0	0.0	-0.4	-39.0	-39.3
Retail Trade	0	0	-1	-1	0.0	-0.4	-97.4	-97.8
Information	0	0	0	0	0.0	-1.0	-27.0	-28.0
Financial Activities	0	0	-1	-1	0.0	-4.3	-263.7	-268.0
Services	0	0	-3	-3	0.0	-11.7	-292.3	-303.9
Government	0	0	0	0	0.0	-0.1	-12.9	-13.0
Total	-1	0	-6	-7	-140.8	-34.3	-842.0	-1,017.2

12 Note:
 13 In 2012 dollars

1 *Regional Changes to Recreational Opportunities*

2 Recreational opportunities would decrease at San Luis Reservoir by 6 percent
3 under the No Action Alternative as compared to the Second Basis of Comparison,
4 as described in Chapter 15, Recreation Resources. Therefore, it is anticipated that
5 recreational economic factors would be reduced under the No Action
6 Alternative as compared to the Second Basis of Comparison.

7 *Effects Related to Cross Delta Water Transfers*

8 Potential effects to socioeconomic factors could be similar to those identified in a
9 recent environmental analysis conducted by Reclamation for long-term water
10 transfers from the Sacramento to San Joaquin valleys (Reclamation 2014c).
11 Potential effects to socioeconomic factors were identified as adverse in the
12 seller's service area related to loss of income to farm workers and the associated
13 agriculturally-related businesses and retail enterprises if crop idling methods were
14 used to provide transfer water. The analysis also identified that local sales taxes
15 could decline due to the loss of household income. If groundwater substitution
16 was used to provide transfer water, agricultural production values could decline
17 due to additional cost of pumping. However, income from the water transfer
18 could increase operating income for the sellers. The regional impact would
19 depend upon the extent of lands involved in the water transfer program in any
20 specific year.

21 Under the No Action Alternative, the timing of cross Delta water transfers would
22 be limited to July through September and include annual volumetric limits, in
23 accordance with the 2008 USFWS BO and 2009 NMFS BO. Under the Second
24 Basis of Comparison, water could be transferred throughout the year without an
25 annual volumetric limit. Overall, the potential for cross Delta water transfers
26 would be less under the No Action Alternative than under the Second Basis of
27 Comparison.

28 **19.4.3.1.3 San Francisco Bay Area Region**

29 *Regional Changes to Irrigated Agriculture*

30 It is anticipated that as in the Central Valley Region, reductions in CVP and SWP
31 water supplies within the San Francisco Bay Area Region would not result in
32 reductions in long-term irrigated acreage or land use changes due to the use of
33 other water supplies. However, there could be a reduction in irrigated acreage in
34 dry and critical dry years under the No Action Alternative as compared to the
35 Second Basis of Comparison.

36 *Regional Changes to Municipal and Industrial Water Supplies*

37 As described in Chapter 5, Surface Water Resources and Water Supplies, CVP
38 and SWP water supplies would be less under the No Action Alternative than
39 under the Second Basis of Comparison. The analysis assumed CVP and SWP
40 water deliveries, as described in Chapter 5, and determined the need for new
41 water supplies, changes in water storage and groundwater pumping, water
42 transfers, water shortage costs, and excess water savings. The factors and basis of
43 the analysis is described in detail in Appendix 19A, CWEST Model. The analysis

1 assumes that no new annual transfer supplies would be implemented until
 2 shortages were greater than 5 percent. The costs of these shortages are included
 3 in the analysis.

4 The average annual water supply operating expenses over the 81-year hydrologic
 5 period for M&I water supplies would increase by \$7.276 million, or 1.75 percent,
 6 as presented in Table 19.66; and therefore, the results would be similar under the
 7 No Action Alternative and Second Basis of Comparison.

8 **Table 19.66 Changes in Municipal and Industrial Water Supply Costs for the San**
 9 **Francisco Bay Area Region under the No Action Alternative as Compared to the**
 10 **Second Basis of Comparison**

Differences in Total	No Action Alternative	Second Basis of Comparison	Changes
Average Annual CVP/SWP Deliveries (TAF)	396	445	-48
Delivery Cost (\$1,000)	\$11,044	\$12,515	-\$1,471
Assumed New Supply Deliveries (TAF)	18	16	2
Annualized New Supply Costs (\$1,000)	\$599	\$234	\$365
Water Storage Costs (\$1,000)	\$1,577	\$1,963	-\$386
Lost Water Sales Revenues (\$1,000)	\$4,286	\$1,595	\$2,691
Transfer Costs (\$1,000)	\$5,722	\$1,154	\$4,568
Shortage Costs (\$1,000)	\$1,410	\$523	\$887
Groundwater Pumping Savings (due to reductions in Groundwater Pumping) (\$1,000)	-\$493	-\$792	\$298
Excess Water Savings (\$1,000)	-\$225	-\$549	\$324
Average Annual Changes in Water Supply Costs (\$1,000)	\$23,919	\$16,643	\$7,276

11 Note: In 2012 dollars

12 The changes in M&I water supply costs would result in changes to employment
 13 and regional economic output, as summarized in Table 19.67.

1 **Table 19.67 Changes in Municipal and Industrial Water Supply Related**
 2 **Employment and Regional Economic Output for the San Francisco Bay Area**
 3 **Region under the No Action Alternative as Compared to the Second Basis of**
 4 **Comparison**

Economic Sectors	Employment				Economic Output (\$ thousands)			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agriculture	0	0	0	0	0.0	0.1	-7.9	-7.8
Mining & Logging	0	0	0	0	0.0	1.6	-5.0	-3.4
Construction	0	1	0	1	0.0	158.8	-37.1	121.7
Manufacturing	0	0	0	0	0.0	28.8	-478.0	-449.1
Transportation, Warehousing & Utilities	5	0	-1	4	1,492.4	11.2	-183.5	1,320.1
Wholesale Trade	0	0	-1	-1	0.0	5.0	-350.6	-345.7
Retail Trade	0	0	-6	-6	0.0	4.2	-567.2	-563.0
Information	0	0	-1	-1	0.0	16.8	-306.6	-289.8
Financial Activities	0	0	-5	-4	0.0	55.8	-1,740.5	-1,684.7
Services	0	1	-20	-19	0.0	133.7	-2,162.8	-2,029.1
Government	0	0	0	0	0.0	0.7	-55.1	-54.4
Total	5	3	-35	-27	1,492.4	416.7	-5,894.3	-3,985.2

5 Note: In 2012 dollars

6 *Regional Changes to Recreational Opportunities*

7 Changes in CVP and SWP water supplies and operations under the No Action
 8 Alternative as compared to the Second Basis of Comparison generally would
 9 result in lower reservoir elevations in reservoirs (up to 10 to 18 percent) that store
 10 CVP and SWP water; and would result in reduced recreational economic factors
 11 under the No Action Alternative as compared to the Second Basis of Comparison.

12 *Regional Changes to Salmon Fishing*

13 Changes in commercial and sport ocean salmon fishing primarily would be
 14 related to the presence of fall-run Chinook Salmon from Central Valley
 15 hatcheries. It is assumed that the production of hatchery fish would be similar
 16 under the No Action Alternative and the Second Basis of Comparison. However,
 17 survival of the fall-run Chinook Salmon hatchery fish to the Pacific Ocean could
 18 be related to changes in CVP and SWP operations. As described in Chapter 9,
 19 Fish and Aquatic Resources, there would be little change in through-Delta
 20 survival by emigrating natural juvenile fall-run Chinook Salmon under the No
 21 Action Alternative as compared to the Second Basis of Comparison. It is
 22 assumed that the survival of the hatchery juvenile fall-run Chinook Salmon would
 23 be similar to the survival of the natural juvenile fall-run Chinook Salmon.
 24 Therefore, the availability of fish for commercial and sport ocean salmon fishing
 25 and the associated economic conditions for the fishing industry would be similar
 26 under the No Action Alternative and the Second Basis of Comparison.

1 **19.4.3.1.4 Central Coast Region**

2 *Regional Changes to Irrigated Agriculture*

3 It is anticipated that as in the Central Valley Region, reductions in CVP and SWP
 4 water supplies within the Central Coast Region would not result in reductions in
 5 long-term irrigated acreage or land use changes due to the use of other water
 6 supplies. However, there could be a reduction in irrigated acreage in dry and
 7 critical dry years under the No Action Alternative as compared to the Second
 8 Basis of Comparison.

9 *Regional Changes to Municipal and Industrial Water Supplies*

10 As described in Chapter 5, Surface Water Resources and Water Supplies, CVP
 11 and SWP water supplies would be less under the No Action Alternative than
 12 under the Second Basis of Comparison. The analysis assumed CVP and SWP
 13 water deliveries, as described in Chapter 5, and determined the need for new
 14 water supplies, changes in water storage and groundwater pumping, water
 15 transfers, water shortage costs, and excess water savings. The factors and basis of
 16 the analysis is described in detail in Appendix 19A, CWEST Model. The analysis
 17 assumes that no new annual transfer supplies would be implemented until
 18 shortages were greater than 5 percent. The costs of these shortages are included
 19 in the analysis. It is assumed that some communities that do not have
 20 alternative water supplies would utilize water transfers.

21 The average annual water supply operating expenses over the 81-year hydrologic
 22 period for M&I water supplies would increase by 0.7 percent, as presented in
 23 Table 19.68; and therefore, the results would be similar under the No Action
 24 Alternative and Second Basis of Comparison.

25 **Table 19.68 Changes in Municipal and Industrial Water Supply Costs for the**
 26 **Central Coast Region under the No Action Alternative as Compared to the Second**
 27 **Basis of Comparison**

Differences in Total	No Action Alternative	Second Basis of Comparison	Changes
Average Annual CVP/SWP Deliveries (TAF)	44	54	-10
Delivery Cost (\$1,000)	\$6,663	\$8,174	-\$1,510
Assumed New Supply Deliveries (TAF)	0	0	0
Annualized New Supply Costs (\$1,000)	\$0	\$0	\$0
Water Storage Costs (\$1,000)	\$0	\$0	\$0
Lost Water Sales Revenues (\$1,000)	\$0	\$0	\$0
Transfer Costs (\$1,000)	\$0	\$0	\$0
Shortage Costs (\$1,000)	\$0	\$0	\$0
Groundwater Pumping Savings (due to reductions in Groundwater Pumping) (\$1,000)	-\$8,068	-\$8,643	\$575
Excess Water Savings (\$1,000)	-\$2,970	-\$4,176	\$1,206
Average Annual Changes in Water Supply Costs (\$1,000)	-\$4,374	-\$4,645	\$271

28 Note: In 2012 dollars

1 The changes in M&I water supply costs would result in changes to employment
2 and regional economic output, as summarized in Table 19.69.

3 **Table 19.69 Changes in Municipal and Industrial Water Supply Related**
4 **Employment and Regional Economic Output for the Central Coast Region under**
5 **the No Action Alternative as Compared to the Second Basis of Comparison**

Economic Sectors	Employment				Economic Output (\$ thousands)			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agriculture	0	0	0	0	0.0	0.6	-4.0	-3.4
Mining & Logging	0	0	0	0	0.0	6.4	-9.3	-2.9
Construction	0	2	0	2	0.0	201.9	-9.7	192.2
Manufacturing	0	0	0	0	0.0	26.8	-51.8	-25.0
Transportation, Warehousing & Utilities	6	0	0	6	1,510.8	17.0	-56.2	1,471.6
Wholesale Trade	0	0	0	0	0.0	4.8	-58.6	-53.8
Retail Trade	0	0	-1	-1	0.0	6.1	-118.5	-112.4
Information	0	0	0	0	0.0	12.0	-39.0	-27.0
Financial Activities	0	0	-1	-1	0.0	68.9	-352.0	-283.2
Services	0	2	-5	-3	0.0	167.1	-447.4	-280.3
Government	0	0	0	0	0.0	0.9	-13.2	-12.3
Total	6	4	-8	2	1,510.8	512.7	-1,159.9	863.6

6 Note: In 2012 dollars

7 *Regional Changes to Recreational Opportunities*

8 Changes in CVP and SWP water supplies and operations under the No Action
9 Alternative as compared to the Second Basis of Comparison generally would
10 result in lower reservoir elevations in reservoirs that store CVP and SWP water
11 (up to 10 to 18 percent) that store CVP and SWP water; and would result in
12 reduced recreational economic factors under the No Action Alternative as
13 compared to the Second Basis of Comparison..

14 **19.4.3.1.5 Southern California Region**

15 *Regional Changes to Irrigated Agriculture*

16 It is anticipated that as in the Central Valley Region, reductions in CVP and SWP
17 water supplies within the Southern California Region would not result in
18 reductions in long-term irrigated acreage or land use changes due to the use of
19 other water supplies. However, there could be a reduction in irrigated acreage in
20 dry and critical dry years under the No Action Alternative as compared to the
21 Second Basis of Comparison.

22 *Regional Changes to Municipal and Industrial Water Supplies*

23 As described in Chapter 5, Surface Water Resources and Water Supplies, CVP
24 and SWP water supplies would be less under the No Action Alternative than
25 under the Second Basis of Comparison. The analysis assumed CVP and SWP

1 water deliveries, as described in Chapter 5, and determined the need for new
 2 water supplies, changes in water storage and groundwater pumping, water
 3 transfers, water shortage costs, and excess water savings. The factors and basis of
 4 the analysis is described in detail in Appendix 19A, CWEST Model. The analysis
 5 assumes that no new annual transfer supplies would be implemented until
 6 shortages were greater than 5 percent. The costs of these shortages are included
 7 in the analysis. It is assumed that some communities that do not have
 8 alternative water supplies would utilize water transfers.

9 The average annual water supply costs over the 81-year hydrologic period for
 10 M&I water supplies would increase by 2.14 percent, as presented in Table 19.70;
 11 and therefore, the results would be similar under the No Action Alternative and
 12 Second Basis of Comparison.

13 **Table 19.70 Changes in Municipal and Industrial Water Supply Costs for the**
 14 **Southern California Region under the No Action Alternative as Compared to the**
 15 **Second Basis of Comparison**

Differences in Total	No Action Alternative	Second Basis of Comparison	Changes
Average Annual CVP/SWP Deliveries (TAF)	1,932	2,394	-461
Delivery Cost (\$1,000)	\$239,692	\$296,795	-\$57,103
Assumed New Supply Deliveries (TAF)	47	11	35
Annualized New Supply Costs (\$1,000)	\$12,688	\$4,032	\$8,656
Water Storage Costs (\$1,000)	\$7,598	\$2,824	\$4,774
Lost Water Sales Revenues (\$1,000)	\$14,614	\$1,119	\$13,495
Transfer Costs (\$1,000)	\$11,484	\$3,705	\$7,779
Shortage Costs (\$1,000)	\$17,319	\$353	\$16,966
Groundwater Pumping Savings (due to reductions in Groundwater Pumping) (\$1,000)	-\$57,474	-\$91,507	\$34,033
Excess Water Savings (\$1,000)	-\$4,629	-\$10,573	\$5,944
Average Annual Changes in Water Supply Costs (\$1,000)	\$241,291	\$206,749	\$34,542

16 Note: In 2012 dollars

17 The changes in M&I water supply costs would result in changes to employment
 18 and regional economic output, as summarized in Table 19.71.

Table 19.71 Changes in Municipal and Industrial Water Supply Related Employment and Regional Economic Output for the Southern California Region under the No Action Alternative as Compared to the Second Basis of Comparison

Economic Sectors	Employment				Economic Output (\$ thousands)			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agriculture	0	0	2	0	0.0	-12.5	272.7	260.2
Mining & Logging	0	-1	1	0	0.0	-164.2	369.0	204.8
Construction	0	-43	3	0	0.0	-5,205.5	395.5	-4,810.0
Manufacturing	0	-2	10	0	0.0	-1,452.6	6,814.5	5,361.9
Transportation, Warehousing & Utilities	-175	-2	12	-175	-43,673.4	-592.0	2,602.9	-41,662.5
Wholesale Trade	0	-1	20	0	0.0	-275.3	4,339.0	4,063.8
Retail Trade	0	-2	58	0	0.0	-170.6	5,106.3	4,935.7
Information	0	-1	6	0	0.0	-637.5	2,962.1	2,324.6
Financial Activities	0	-9	52	0	0.0	-2,528.7	17,797.9	15,269.1
Services	0	-46	212	0	0.0	-5,542.2	20,430.6	14,888.4
Government	0	0	3	0	0.0	-29.8	587.3	557.5
Total	-175	-108	378	-175	-43,673.4	-16,611.0	61,677.8	1,393.5

Note: In 2012 dollars

Regional Changes to Recreational Opportunities

Changes in CVP and SWP water supplies and operations under the No Action Alternative as compared to the Second Basis of Comparison generally would result in lower reservoir elevations in reservoirs that store CVP and SWP water, (up to 10 to 18 percent) that store CVP and SWP water; and would result in reduced recreational economic factors under the No Action Alternative as compared to the Second Basis of Comparison..

19.4.3.2 Alternative 1

As described in Chapter 3, Description of Alternatives, Alternative 1 is identical to the Second Basis of Comparison. As described in Chapter 4, Approach to Environmental Analysis, Alternative 1 as compared to the No Action Alternative and the Second Basis of Comparison. However, because socioeconomic factors under Alternative 1 are identical to socioeconomic factors under the Second Basis of Comparison; Alternative 1 is only compared to the No Action Alternative.

19.4.3.2.1 Alternative 1 Compared to the No Action Alternative

Trinity River Region

Regional Changes to Irrigated Agriculture

There are no agricultural lands irrigated with CVP and SWP water supplies in the Trinity River Region. Therefore, there would be no changes in irrigated lands under Alternative 1 as compared to the No Action Alternative.

1 *Regional Changes to Municipal and Industrial Water Supplies*

2 The CVP would continue to release water in Trinity River for downstream
3 beneficial uses, including water supplies under Alternative 1 as compared to the
4 No Action Alternative. There are no CVP or SWP water contractors in the
5 Trinity River Region.

6 *Regional Changes to Recreational Opportunities*

7 Recreational opportunities would be similar in the Trinity River Region under
8 Alternative 1 as compared to the No Action Alternative as described in
9 Chapter 15, Recreational Resources.

10 *Regional Changes to Salmon Fishing*

11 Trinity River flows would be similar under Alternative 1 as compared to the No
12 Action Alternative. This could result in similar salmon harvest conditions by the
13 Yurok and Hoopa Valley tribes.

14 *Central Valley Region*

15 *Regional Changes to Irrigated Agriculture*

16 As described in Chapter 5, Surface Water Resources and Water Supplies, CVP
17 and SWP water supplies would be greater under Alternative 1 as compared to the
18 No Action Alternative. It is anticipated that groundwater use would decrease in
19 response to increased CVP and SWP water supplies in 2030; and sustainable
20 groundwater management plans would not be fully implemented until the 2040s,
21 as discussed in Chapter 12, Agricultural Resources.

22 The agricultural production value under long-term average conditions would be
23 increased by less than 1 percent (\$1.6 million/year in the Sacramento Valley and
24 \$0.5 million/year in the San Joaquin Valley) primarily due to a decrease in
25 groundwater pumping of approximately 7 percent. The agricultural production
26 value under dry and critical dry conditions also would be increased by less than
27 1 percent (\$11.3 million/year in the Sacramento Valley and \$20.3 million/year in
28 the San Joaquin Valley) primarily due to a decrease in groundwater pumping.

29 The overall increase in agricultural production values are less than 0.05 percent
30 under long-term conditions; and, changes in employment and regional economic
31 output would be minimal. Therefore, the analysis of employment and regional
32 economic output is focused on dry and critical dry years.

33 The direct changes in agricultural production would result in changes to
34 employment and regional economic output in the Sacramento and San Joaquin
35 valleys, as summarized in Tables 19.72 and 19.73, respectively.

1 **Table 19.72 Changes in Agricultural-Related Employment and Regional Economic**
 2 **Output for the Sacramento Valley under Alternative 1 as compared to the No**
 3 **Action Alternative in Dry and Critical Dry Years**

Economic Sectors	Employment				Economic Output (\$ millions)			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agriculture	87	21	0	108	11.3	1.3	0	12.7
Mining & Logging	0	0	0	0	0	0	0	0
Construction	0	1	0	1	0	0.1	0	0.2
Manufacturing	0	0	0	0	0	0.1	0	0.1
Transportation, Warehousing & Utilities	0	1	0	2	0	0.4	0.1	0.5
Wholesale Trade	0	1	1	2	0	0.2	0.1	0.3
Retail Trade	0	0	4	4	0	0	0.3	0.3
Information	0	0	0	0	0	0	0.1	0.1
Financial Activities	0	7	2	9	0	1.6	0.8	2.5
Services	0	3	12	15	0	0.3	1	1.3
Government	0	0	0	0	0	0.1	0	0.1
Total	87	36	19	142	11.3	4.2	2.5	18.1

4 Note: In 2012 dollars.

5 **Table 19.73 Changes in Agricultural-Related Employment and Regional Economic**
 6 **Output for the San Joaquin Valley under Alternative 1 as compared to the No**
 7 **Action Alternative in Dry and Critical Dry Years**

Economic Sectors	Employment				Economic Output (\$ millions)			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agriculture	139	53	0	192	20.3	2.3	0.1	22.7
Mining & Logging	0	1	0	1	0	0.3	0	0.3
Construction	0	2	0	2	0	0.2	0	0.2
Manufacturing	0	1	0	2	0	1.8	0.3	2.1
Transportation, Warehousing & Utilities	0	3	1	4	0	0.8	0.2	1
Wholesale Trade	0	2	1	3	0	0.4	0.2	0.5
Retail Trade	0	0	7	8	0	0	0.6	0.6
Information	0	0	0	1	0	0.1	0.1	0.2
Financial Activities	0	12	3	15	0	2.7	1.5	4.1
Services	0	5	21	26	0	0.5	1.7	2.2
Government	0	1	0	1	0	0.2	0.1	0.3
Total	139	79	35	254	20.3	9.2	4.9	34.4

8 Note: In 2012 dollars.

1 As described in Chapter 11, Geology and Soils Resources, increased groundwater
2 pumping under the long-term average conditions may result in an additional
3 increment of subsidence in those areas within the Central Valley. The additional
4 amount of subsidence and the economic costs associated with it have not been
5 quantified in this EIS. However, total subsidence-related costs have been shown
6 to be substantial, as reported by Borchers et al. (2014) who estimated that the cost
7 of subsidence in San Joaquin Valley between 1955 and 1972 was more than
8 \$1.3 billion (in 2013 dollars). These estimates are based on the impacts to major
9 infrastructure in the region including the San Joaquin River, Delta Mendota
10 Canal, Friant-Kern Canal and San Luis Canal in addition to privately owned
11 infrastructure. The incremental subsidence-related costs, expressed on an annual
12 basis, could be an unknown fraction of that cumulative cost.

13 *Regional Changes to Municipal and Industrial Water Supplies*

14 As described in Chapter 5, Surface Water Resources and Water Supplies, CVP
15 and SWP water supplies would increase under Alternative 1 as compared to the
16 No Action Alternative. The analysis assumed CVP and SWP water deliveries, as
17 described in Chapter 5, and determined the need for new water supplies, changes
18 in water storage and groundwater pumping, water transfers, water shortage costs,
19 and excess water savings. The factors and basis of the analysis are described in
20 detail in Appendix 19A, CWEST Model. The analysis assumes that no new
21 annual transfer supplies would be implemented until shortages were greater than
22 5 percent. The costs of these shortages are included in the analysis. It is assumed
23 that some communities that do not have alternative water supplies would utilize
24 water transfers.

25 The average annual water supply costs over the 81-year hydrologic period for
26 M&I water supplies are presented in Tables 19.74 and 19.75 for the Sacramento
27 and San Joaquin Valley, respectively. The average annual water supply operating
28 expenses would decrease by 0.11 and 0.39 percent in the Sacramento Valley and
29 the San Joaquin Valley, respectively; and therefore, the results would be similar
30 under Alternative 1 and the No Action Alternative.

1 **Table 19.74 Changes in Municipal and Industrial Water Supply Costs for the**
 2 **Sacramento Valley under Alternative 1 as compared to the No Action Alternative**

Differences in Total	Alternative 1	No Action Alternative	Changes
Average Annual CVP/SWP Deliveries (TAF)	463	447	16
Delivery Cost (\$1,000)	\$8,317	\$8,031	\$287
Assumed New Supply Deliveries (TAF)	0	0	0
Annualized New Supply Costs (\$1,000)	\$0	\$0	\$0
Water Storage Costs (\$1,000)	\$0	\$0	\$0
Lost Water Sales Revenues (\$1,000)	\$207	\$213	-\$6
Transfer Costs (\$1,000)	\$517	\$739	-\$222
Shortage Costs (\$1,000)	\$68	\$69	-\$1
Groundwater Pumping Savings (due to reductions in Groundwater Pumping) (\$1,000)	-\$3,916	-\$3,858	-\$58
Excess Water Savings (\$1,000)	-\$2,563	-\$2,275	-\$288
Average Annual Changes in Water Supply Costs (\$1,000)	\$2,630	\$2,919	-\$288

3 Note: In 2012 dollars

4 **Table 19.75 Changes in Municipal and Industrial Water Supply Costs for the San**
 5 **Joaquin Valley under Alternative 1 as compared to the No Action Alternative**

Differences in Total	Alternative 1	No Action Alternative	Changes
Average Annual CVP/SWP Deliveries (TAF)	237	214	23
Delivery Cost (\$1,000)	\$3,854	\$3,460	\$394
Assumed New Supply Deliveries (TAF)	0	2	-2
Annualized New Supply Costs (\$1,000)	\$15	\$429	-\$414
Water Storage Costs (\$1,000)	\$820	\$942	-\$122
Lost Water Sales Revenues (\$1,000)	\$322	\$361	-\$39
Transfer Costs (\$1,000)	\$2,623	\$2,673	-\$50
Shortage Costs (\$1,000)	\$102	\$115	-\$13
Groundwater Pumping Savings (due to reductions in Groundwater Pumping) (\$1,000)	-\$16,011	-\$15,377	-\$634
Excess Water Savings (\$1,000)	-\$1,318	-\$1,029	-\$289
Average Annual Changes in Water Supply Costs (\$1,000)	-\$9,593	-\$8,427	-\$1,166

6 The changes in M&I water supply costs would result in changes to employment
 7 and regional economic output in the Sacramento and San Joaquin valleys, as
 8 summarized in Tables 19.76 and 19.77, respectively.

1 **Table 19.76 Changes in Municipal and Industrial Water Supply Related**
 2 **Employment and Regional Economic Output for the Sacramento Valley under**
 3 **Alternative 1 as compared to the No Action Alternative**

Economic Sectors	Employment				Economic Output (\$ thousands)			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agriculture	0	0	0	0	0.0	-0.1	1.7	1.6
Mining & Logging	0	0	0	0	0.0	-0.4	0.3	-0.1
Construction	0	0	0	0	0.0	-29.0	2.5	-26.5
Manufacturing	0	0	0	0	0.0	-3.1	22.2	19.1
Transportation, Warehousing & Utilities	-1	0	0	-1	-286.4	-2.8	18.0	-271.2
Wholesale Trade	0	0	0	0	0.0	-1.0	27.1	26.1
Retail Trade	0	0	1	1	0.0	-0.9	46.6	45.6
Information	0	0	0	0	0.0	-3.4	20.6	17.2
Financial Activities	0	0	0	0	0.0	-13.0	147.7	134.6
Services	0	0	2	-1	0.0	-30.8	154.7	123.9
Government	0	0	0	0	0.0	-0.2	3.8	3.7
Total	-1	-1	3	-1	-286.4	-84.8	445.2	74.0

4 Note: In 2012 dollars

5 **Table 19.77 Changes in Municipal and Industrial Water Supply Related**
 6 **Employment and Regional Economic Output for the San Joaquin Valley under**
 7 **Alternative 1 as compared to the No Action Alternative**

Economic Sectors	Employment				Economic Output (\$ thousands)			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agriculture	0	0	0	0	0.0	0.0	6.7	6.7
Mining & Logging	0	0	0	0	0.0	0.4	6.4	6.8
Construction	0	0	0	0	0.0	13.3	5.6	18.9
Manufacturing	0	0	0	0	0.0	1.4	46.4	47.8
Transportation, Warehousing & Utilities	1	0	0	1	140.8	1.4	44.7	186.9
Wholesale Trade	0	0	0	0	0.0	0.4	39.0	39.3
Retail Trade	0	0	1	1	0.0	0.4	97.4	97.8
Information	0	0	0	0	0.0	1.0	27.0	28.0
Financial Activities	0	0	1	1	0.0	4.3	263.7	268.0
Services	0	0	3	3	0.0	11.7	292.3	303.9
Government	0	0	0	0	0.0	0.1	12.9	13.0
Total	1	0	6	7	140.8	34.3	842.0	1,017.2

8 Note: In 2012 dollars

9 *Regional Changes to Recreational Opportunities*

10 Recreational opportunities would increase at San Luis Reservoir by 6 percent
 11 under Alternative 1 as compared to the No Action Alternative, as described in
 12 Chapter 15, Recreation Resources. Therefore, it is anticipated that recreational

1 economic factors would be increased under Alternative 1 as compared to the No
2 Action Alternative.

3 *Effects Related to Cross Delta Water Transfers*

4 Potential effects to socioeconomic factors could be similar to those identified in a
5 recent environmental analysis conducted by Reclamation for long-term water
6 transfers from the Sacramento to San Joaquin valleys (Reclamation 2014c) as
7 described above under the No Action Alternative compared to the Second Basis
8 of Comparison. For the purposes of this EIS, it is anticipated that similar
9 conditions would occur during implementation of cross Delta water transfers
10 under Alternative 1 and the No Action Alternative, and that impacts on
11 socioeconomic factors could be adverse in the seller's service area.

12 Under Alternative 1, water could be transferred throughout the year without an
13 annual volumetric limit. Under the No Action Alternative, the timing of cross
14 Delta water transfers would be limited to July through September and include
15 annual volumetric limits, in accordance with the 2008 USFWS BO and 2009
16 NMFS BO. Overall, the potential for cross Delta water transfers would be
17 increased under Alternative 1 as compared to the No Action Alternative.

18 *San Francisco Bay Area Region*

19 *Regional Changes to Irrigated Agriculture*

20 It is anticipated that as in the Central Valley Region, increases in CVP and SWP
21 water supplies within the San Francisco Bay Area Region would not result in
22 changes in long-term irrigated acreage or land use changes due to the use of other
23 water supplies. However, there could be an increase in irrigated acreage in dry
24 and critical dry years under Alternative 1 as compared to the No Action
25 Alternative.

26 *Regional Changes to Municipal and Industrial Water Supplies*

27 As described in Chapter 5, Surface Water Resources and Water Supplies, CVP
28 and SWP water supplies would increase under Alternative 1 as compared to the
29 No Action Alternative. The analysis assumed CVP and SWP water deliveries, as
30 described in Chapter 5, and determined the need for new water supplies, changes
31 in water storage and groundwater pumping, water transfers, water shortage costs,
32 and excess water savings. The factors and basis of the analysis is described in
33 detail in Appendix 19A, CWEST Model. The analysis assumes that no new
34 annual transfer supplies would be implemented until shortages were greater than
35 5 percent. The costs of these shortages are included in the analysis.

36 The average annual water supply operating expenses over the 81-year hydrologic
37 period for M&I water supplies would decrease by 1.75 percent, as presented in
38 Table 19.78; and therefore, the results would be similar under Alternative 1 and
39 the No Action Alternative.

1 **Table 19.78 Changes in Municipal and Industrial Water Supply Costs for the San**
 2 **Francisco Bay Area Region under Alternative 1 as compared to the No Action**
 3 **Alternative**

Differences in Total	Alternative 1	No Action Alternative	Changes
Average Annual CVP/SWP Deliveries (TAF)	445	396	48
Delivery Cost (\$1,000)	\$12,515	\$11,044	\$1,471
Assumed New Supply Deliveries (TAF)	16	18	-2
Annualized New Supply Costs (\$1,000)	\$234	\$599	-\$365
Water Storage Costs (\$1,000)	\$1,963	\$1,577	\$386
Lost Water Sales Revenues (\$1,000)	\$1,595	\$4,286	-\$2,691
Transfer Costs (\$1,000)	\$1,154	\$5,722	-\$4,568
Shortage Costs (\$1,000)	\$523	\$1,410	-\$887
Groundwater Pumping Savings (due to reductions in Groundwater Pumping) (\$1,000)	-\$792	-\$493	-\$298
Excess Water Savings (\$1,000)	-\$549	-\$225	-\$324
Average Annual Changes in Water Supply Costs (\$1,000)	\$16,643	\$23,919	-\$7,276

4 Note: In 2012 dollars

5 The changes in M&I water supply costs would result in changes to employment
 6 and regional economic output, as summarized in Table 19.79.

7 **Table 19.79 Changes in Municipal and Industrial Water Supply Related**
 8 **Employment and Regional Economic Output for the San Francisco Bay Area**
 9 **Region under Alternative 1 as compared to the No Action Alternative**

Economic Sectors	Employment				Economic Output (\$ thousands)			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agriculture	0	0	0	0	0.0	-0.1	7.9	7.8
Mining & Logging	0	0	0	0	0.0	-1.6	5.0	3.4
Construction	0	-1	0	-1	0.0	-158.8	37.1	-121.7
Manufacturing	0	0	0	0	0.0	-28.8	478.0	449.1
Transportation, Warehousing & Utilities	-5	0	1	-4	-1,492.4	-11.2	183.5	-1,320.1
Wholesale Trade	0	0	1	1	0.0	-5.0	350.6	345.7
Retail Trade	0	0	6	6	0.0	-4.2	567.2	563.0
Information	0	0	1	1	0.0	-16.8	306.6	289.8
Financial Activities	0	0	5	4	0.0	-55.8	1,740.5	1,684.7
Services	0	-1	20	19	0.0	-133.7	2,162.8	2,029.1
Government	0	0	0	0	0.0	-0.7	55.1	54.4
Total	-5	-3	35	27	-1,492.4	-416.7	5,894.3	3,985.2

10 Note: In 2012 dollars

1 *Regional Changes to Recreational Opportunities*

2 Changes in CVP and SWP water supplies and operations under Alternative 1 as
 3 compared to the No Action Alternative generally would result in higher reservoir
 4 elevations in reservoirs that store CVP and SWP water (up to 11 to 21 percent);
 5 and would result in increased recreational economic factors under Alternative 1 as
 6 compared to the No Action Alternative.

7 *Regional Changes to Salmon Fishing*

8 Changes in commercial and sport ocean salmon fishing primarily would be
 9 related to the presence of fall-run Chinook Salmon from Central Valley
 10 hatcheries. It is assumed that the production of hatchery fish would be similar
 11 under Alternative 1 and the No Action Alternative. However, survival of the fall-
 12 run Chinook Salmon hatchery fish to the Pacific Ocean could be related to
 13 changes in CVP and SWP operations. As described in Chapter 9, Fish and
 14 Aquatic Resources, there would be little change in through-Delta survival by
 15 emigrating natural juvenile fall-run Chinook Salmon under Alternative 1 and the
 16 No Action Alternative. It is assumed that the survival of the hatchery juvenile
 17 fall-run Chinook Salmon would be similar to the survival of the natural juvenile
 18 fall-run Chinook Salmon. Therefore, the availability of fish for commercial and
 19 sport ocean salmon fishing and the associated economic conditions for the fishing
 20 industry would be similar under Alternative 1 and the No Action Alternative.

21 *Central Coast Region*

22 *Regional Changes to Irrigated Agriculture*

23 It is anticipated that as in the Central Valley Region, increases in CVP and SWP
 24 water supplies within the Central Coast Region would not result in increases in
 25 long-term irrigated acreage or land use changes due to the use of other water
 26 supplies. However, there could be increased irrigated acreage in dry and critical
 27 dry years under Alternative 1 as compared to the No Action Alternative.

28 *Regional Changes to Municipal and Industrial Water Supplies*

29 As described in Chapter 5, Surface Water Resources and Water Supplies, CVP
 30 and SWP water supplies would be higher under Alternative 1 as compared to the
 31 No Action Alternative. The analysis assumed CVP and SWP water deliveries, as
 32 described in Chapter 5, and determined the need for new water supplies, changes
 33 in water storage and groundwater pumping, water transfers, water shortage costs,
 34 and excess water savings. The factors and basis of the analysis is described in
 35 detail in Appendix 19A, CWEST Model. The analysis assumes that no new
 36 annual transfer supplies would be implemented until shortages were greater than
 37 5 percent. The costs of these shortages are included in the analysis. It is assumed
 38 that some communities that do not have alternative water supplies would utilize
 39 water transfers.

40 The average annual water supply operating expenses over the 81-year hydrologic
 41 period for M&I water supplies would increase 0.7 percent, as presented in
 42 Table 19.80; and therefore, the results would be similar under Alternative 1 and
 43 the No Action Alternative.

1 **Table 19.80 Changes in Municipal and Industrial Water Supply Costs for the**
 2 **Central Coast Region under Alternative 1 as compared to the No Action Alternative**

Differences in Total	Alternative 1	No Action Alternative	Changes
Average Annual CVP/SWP Deliveries (TAF)	54	44	10
Delivery Cost (\$1,000)	\$8,174	\$6,663	\$1,510
Assumed New Supply Deliveries (TAF)	0	0	0
Annualized New Supply Costs (\$1,000)	\$0	\$0	\$0
Water Storage Costs (\$1,000)	\$0	\$0	\$0
Lost Water Sales Revenues (\$1,000)	\$0	\$0	\$0
Transfer Costs (\$1,000)	\$0	\$0	\$0
Shortage Costs (\$1,000)	\$0	\$0	\$0
Groundwater Pumping Savings (due to reductions in Groundwater Pumping) (\$1,000)	-\$8,643	-\$8,068	-\$575
Excess Water Savings (\$1,000)	-\$4,176	-\$2,970	-\$1,206
Average Annual Changes in Water Supply Costs (\$1,000)	-\$4,645	-\$4,374	-\$271

3 Note: In 2012 dollars

4 The changes in M&I water supply costs would result in changes to employment
 5 and regional economic output, as summarized in Table 19.81.

6 **Table 19.81 Changes in Municipal and Industrial Water Supply Related**
 7 **Employment and Regional Economic Output for the Central Coast Region under**
 8 **Alternative 1 as compared to the No Action Alternative**

Economic Sectors	Employment				Economic Output (\$ thousands)			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agriculture	0	0	0	0	0.0	-0.6	4.0	3.4
Mining & Logging	0	0	0	0	0.0	-6.4	9.3	2.9
Construction	0	-2	0	-2	0.0	-201.9	9.7	-192.2
Manufacturing	0	0	0	0	0.0	-26.8	51.8	25.0
Transportation, Warehousing & Utilities	-6	0	0	-6	-1,510.8	-17.0	56.2	-1,471.6
Wholesale Trade	0	0	0	0	0.0	-4.8	58.6	53.8
Retail Trade	0	0	1	1	0.0	-6.1	118.5	112.4
Information	0	0	0	0	0.0	-12.0	39.0	27.0
Financial Activities	0	0	1	1	0.0	-68.9	352.0	283.2
Services	0	-2	5	3	0.0	-167.1	447.4	280.3
Government	0	0	0	0	0.0	-0.9	13.2	12.3
Total	-6	-4	8	-2	-1,510.8	-512.7	1,159.9	-863.6

9 Note: In 2012 dollars

1 *Regional Changes to Recreational Opportunities*

2 Changes in CVP and SWP water supplies and operations under Alternative 1 as
3 compared to the No Action Alternative generally would result in higher reservoir
4 elevations in reservoirs that store CVP and SWP water (up to 11 to 21 percent);
5 and would result in increased recreational economic factors under Alternative 1 as
6 compared to the No Action Alternative.

7 *Southern California Region*

8 *Regional Changes to Irrigated Agriculture*

9 It is anticipated that as in the Central Valley Region, increases in CVP and SWP
10 water supplies within the Southern California Region would not result in
11 increases in long-term irrigated acreage or land use changes due to the use of
12 other water supplies. However, there could be increased irrigated acreage in dry
13 and critical dry years under Alternative 1 as compared to the No Action
14 Alternative.

15 *Regional Changes to Municipal and Industrial Water Supplies*

16 As described in Chapter 5, Surface Water Resources and Water Supplies, CVP
17 and SWP water supplies would be higher under Alternative 1 as compared to the
18 No Action Alternative. The analysis assumed CVP and SWP water deliveries, as
19 described in Chapter 5, and determined the need for new water supplies, changes
20 in water storage and groundwater pumping, water transfers, water shortage costs,
21 and excess water savings. The factors and basis of the analysis is described in
22 detail in Appendix 19A, CWEST Model. The analysis assumes that no new
23 annual transfer supplies would be implemented until shortages were greater than
24 5 percent. The costs of these shortages are included in the analysis. It is assumed
25 that some communities that do not have alternative water supplies would utilize
26 water transfers.

27 The average annual water supply operating expenses over the 81-year hydrologic
28 period for M&I water supplies would decrease 2.14 percent, as presented in
29 Table 19.82; and therefore, the results would be similar under Alternative 1 and
30 the No Action Alternative.

1 **Table 19.82 Changes in Municipal and Industrial Water Supply Costs for the**
 2 **Southern California Region under Alternative 1 as compared to the No Action**
 3 **Alternative**

Differences in Total	Alternative 1	No Action Alternative	Changes
Average Annual CVP/SWP Deliveries (TAF)	2,394	1,932	461
Delivery Cost (\$1,000)	\$296,795	\$239,692	\$57,103
Assumed New Supply Deliveries (TAF)	11	47	-35
Annualized New Supply Costs (\$1,000)	\$4,032	\$12,688	-\$8,656
Water Storage Costs (\$1,000)	\$2,824	\$7,598	-\$4,774
Lost Water Sales Revenues (\$1,000)	\$1,119	\$14,614	-\$13,495
Transfer Costs (\$1,000)	\$3,705	\$11,484	-\$7,779
Shortage Costs (\$1,000)	\$353	\$17,319	-\$16,966
Groundwater Pumping Savings (due to reductions in Groundwater Pumping) (\$1,000)	-\$91,507	-\$57,474	-\$34,033
Excess Water Savings (\$1,000)	-\$10,573	-\$4,629	-\$5,944
Average Annual Changes in Water Supply Costs (\$1,000)	\$206,749	\$241,291	-\$34,542

4 Note: In 2012 dollars

5 The changes in M&I water supply costs would result in changes to employment
 6 and regional economic output, as summarized in Table 19.83.

7 **Table 19.83 Changes in Municipal and Industrial Water Supply Related**
 8 **Employment and Regional Economic Output for the Southern California Region**
 9 **under Alternative 1 as compared to the No Action Alternative**

Economic Sectors	Employment				Economic Output (\$ thousands)			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agriculture	0	0	-2	-1	0.0	12.5	-272.7	-260.2
Mining & Logging	0	1	-1	-1	0.0	164.2	-369.0	-204.8
Construction	0	43	-3	40	0.0	5,205.5	-395.5	4,810.0
Manufacturing	0	2	-10	-8	0.0	1,452.6	-6,814.5	-5,361.9
Transportation, Warehousing & Utilities	175	2	-12	166	43,673.4	592.0	-2,602.9	41,662.5
Wholesale Trade	0	1	-20	-19	0.0	275.3	-4,339.0	-4,063.8
Retail Trade	0	2	-58	-56	0.0	170.6	-5,106.3	-4,935.7
Information	0	1	-6	-5	0.0	637.5	-2,962.1	-2,324.6
Financial Activities	0	9	-52	-43	0.0	2,528.7	-17,797.9	-15,269.1
Services	0	46	-212	-166	0.0	5,542.2	-20,430.6	-14,888.4
Government	0	0	-3	-3	0.0	29.8	-587.3	-557.5
Total	175	108	-378	-95	43,673.4	16,611.0	-61,677.8	-1,393.5

10 Note: In 2012 dollars

1 *Regional Changes to Recreational Opportunities*

2 Changes in CVP and SWP water supplies and operations under Alternative 1 as
3 compared to the No Action Alternative generally would result in higher reservoir
4 elevations in reservoirs that store CVP and SWP water (up to 11 to 21 percent);
5 and would result in increased recreational economic factors under Alternative 1 as
6 compared to the No Action Alternative.

7 **19.4.3.2.2 Alternative 1 Compared to the Second Basis of Comparison**

8 As described in Chapter 3, Description of Alternatives, Alternative 1 is identical
9 to the Second Basis of Comparison.

10 **19.4.3.3 Alternative 2**

11 The CVP and SWP operations under Alternative 2 are identical to the CVP and
12 SWP operations under the No Action Alternative, therefore, Alternative 2 is only
13 compared to the Second Basis of Comparison.

14 **19.4.3.3.1 Alternative 2 Compared to the Second Basis of Comparison**

15 The CVP and SWP operations under Alternative 2 are identical to the CVP and
16 SWP operations under the No Action Alternative. Therefore, changes to
17 socioeconomic factors under Alternatives 2 as compared to the Second Basis of
18 Comparison would be the same as the impacts described in Section 12.4.3.1, No
19 Action Alternative.

20 **19.4.3.4 Alternative 3**

21 As described in Chapter 3, Description of Alternatives, CVP and SWP operations
22 under Alternative 3 are similar to the Second Basis of Comparison with modified
23 Old and Middle River flow criteria and New Melones Reservoir operations and
24 reductions in Striped Bass fishing opportunities. As described in Chapter 4,
25 Approach to Environmental Analysis, Alternative 3 is compared to the No Action
26 Alternative and the Second Basis of Comparison.

27 **19.4.3.4.1 Alternative 3 Compared to the No Action Alternative**

28 *Trinity River Region*

29 *Regional Changes to Irrigated Agriculture*

30 There are no agricultural lands irrigated with CVP and SWP water supplies in the
31 Trinity River Region. Therefore, there would be no changes in irrigated lands
32 under Alternative 3 as compared to the No Action Alternative.

33 *Regional Changes to Municipal and Industrial Water Supplies*

34 The CVP would continue to release water in Trinity River for downstream
35 beneficial uses, including water supplies under Alternative 3 as compared to the
36 No Action Alternative. There are no CVP or SWP water contractors in the
37 Trinity River Region.

1 *Regional Changes to Recreational Opportunities*

2 Recreational opportunities would be similar in the Trinity River Region under
3 Alternative 3 as compared to the No Action Alternative as described in
4 Chapter 15, Recreational Resources.

5 *Regional Changes to Salmon Fishing*

6 Trinity River flows would be similar under Alternative 3 as compared to the No
7 Action Alternative. This could result in similar salmon harvest conditions by the
8 Yurok and Hoopa Valley tribes.

9 *Central Valley Region*

10 *Regional Changes to Irrigated Agriculture*

11 As described in Chapter 5, Surface Water Resources and Water Supplies, CVP
12 and SWP water supplies would be greater under Alternative 3 as compared to the
13 No Action Alternative. It is anticipated that groundwater use would decrease in
14 response to increased CVP and SWP water supplies in 2030; and sustainable
15 groundwater management plans would not be fully implemented until the 2040s,
16 as discussed in Chapter 12, Agricultural Resources.

17 The agricultural production value under long-term average conditions would be
18 increased by less than 1 percent (\$1.2 million/year in the Sacramento Valley and
19 \$0.3 million/year in the San Joaquin Valley) primarily due to a decrease in
20 groundwater pumping of approximately 4 percent. The agricultural production
21 value under dry and critical dry conditions also would be increased by less than
22 1 percent (\$9.2 million/year in the Sacramento Valley and \$11.4 million/year in
23 the San Joaquin Valley), primarily due to a decrease in groundwater pumping.

24 The overall increase in agricultural production values are less than 0.05 percent
25 under long-term conditions; and, changes in employment and regional economic
26 output would be minimal. Therefore, the analysis of employment and regional
27 economic output is focused on dry and critical dry years.

28 The direct changes in agricultural production would result in changes to
29 employment and regional economic output in the Sacramento and San Joaquin
30 valleys, as summarized in Tables 19.84 and 19.85, respectively.

1 **Table 19.84 Changes in Agricultural-Related Employment and Regional Economic**
 2 **Output for the Sacramento Valley under Alternative 3 as compared to the No**
 3 **Action Alternative in Dry and Critical Dry Years**

Economic Sectors	Employment				Economic Output (\$ millions)			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agriculture	69	18	0	86	9.2	1.1	0.0	10.3
Mining & Logging	0	0	0	0	0.0	0.0	0.0	0.0
Construction	0	1	0	1	0.0	0.1	0.0	0.1
Manufacturing	0	0	0	0	0.0	0.1	0.0	0.1
Transportation, Warehousing & Utilities	0	1	0	1	0.0	0.3	0.1	0.4
Wholesale Trade	0	1	0	1	0.0	0.2	0.1	0.3
Retail Trade	0	0	3	3	0.0	0.0	0.3	0.3
Information	0	0	0	0	0.0	0.0	0.1	0.1
Financial Activities	0	5	2	7	0.0	1.3	0.7	2.0
Services	0	3	10	13	0.0	0.2	0.9	1.1
Government	0	0	0	0	0.0	0.1	0.0	0.1
Total	69	29	17	115	9.2	3.4	2.2	14.8

4 Note: In 2012 dollars

5 **Table 19.85 Changes in Agricultural-Related Employment and Regional Economic**
 6 **Output for the San Joaquin Valley under Alternative 3 as compared to the No**
 7 **Action Alternative in Dry and Critical Dry Years**

Economic Sectors	Employment				Economic Output (\$ millions)			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agriculture	103	26	0	130	11.4	1.2	0.0	12.7
Mining & Logging	0	1	0	1	0.0	0.2	0.0	0.2
Construction	0	1	0	1	0.0	0.1	0.0	0.1
Manufacturing	0	1	0	1	0.0	1.2	0.1	1.3
Transportation, Warehousing & Utilities	0	2	0	2	0.0	0.5	0.1	0.6
Wholesale Trade	0	1	0	1	0.0	0.2	0.1	0.3
Retail Trade	0	0	3	3	0.0	0.0	0.3	0.3
Information	0	0	0	0	0.0	0.0	0.1	0.1
Financial Activities	0	8	1	10	0.0	1.8	0.6	2.5
Services	0	3	9	12	0.0	0.3	0.7	1.0
Government	0	0	0	1	0.0	0.1	0.0	0.1
Total	103	44	15	161	11.4	5.7	2.1	19.1

8 Note: In 2012 dollars

1 As described in Chapter 11, Geology and Soils Resources, increased groundwater
2 pumping under the long-term average conditions may result in an additional
3 increment of subsidence in those areas within the Central Valley. The additional
4 amount of subsidence and the economic costs associated with it have not been
5 quantified in this EIS. However, total subsidence-related costs have been shown
6 to be substantial, as reported by Borchers et al. (2014) who estimated that the cost
7 of subsidence in San Joaquin Valley between 1955 and 1972 was more than
8 \$1.3 billion (in 2013 dollars). These estimates are based on the impacts to major
9 infrastructure in the region including the San Joaquin River, Delta Mendota
10 Canal, Friant-Kern Canal and San Luis Canal in addition to privately owned
11 infrastructure. The incremental subsidence-related costs, expressed on an annual
12 basis, could be an unknown fraction of that cumulative cost.

13 *Regional Changes to Municipal and Industrial Water Supplies*

14 As described in Chapter 5, Surface Water Resources and Water Supplies, CVP
15 and SWP water supplies would increase under Alternative 3 as compared to the
16 No Action Alternative. The analysis assumed CVP and SWP water deliveries, as
17 described in Chapter 5, and determined the need for new water supplies, changes
18 in water storage and groundwater pumping, water transfers, water shortage costs,
19 and excess water savings. The factors and basis of the analysis is described in
20 detail in Appendix 19A, CWEST Model. The analysis assumes that no new
21 annual transfer supplies would be implemented until shortages were greater than
22 5 percent. The costs of these shortages are included in the analysis. It is assumed
23 that some communities that do not have alternative water supplies would utilize
24 water transfers.

25 The average annual water supply costs over the 81-year hydrologic period for
26 M&I water supplies are presented in Tables 19.86 and 19.87 for the Sacramento
27 and San Joaquin Valley, respectively. Average annual water supply operating
28 expenses would decrease by 0.07 and 0.5 percent in the Sacramento Valley and
29 the San Joaquin Valley, respectively; and therefore, the results would be similar
30 under Alternative 3 and the No Action Alternative.

1 **Table 19.86 Changes in Municipal and Industrial Water Supply Costs for the**
 2 **Sacramento Valley under Alternative 3 as compared to the No Action Alternative**

Differences in Total	Alternative 3	No Action Alternative	Changes
Average Annual CVP/SWP Deliveries (TAF)	461	447	13
Delivery Cost (\$1,000)	\$8,285	\$8,031	\$255
Assumed New Supply Deliveries (TAF)	0	0	0
Annualized New Supply Costs (\$1,000)	\$0	\$0	\$0
Water Storage Costs (\$1,000)	\$0	\$0	\$0
Lost Water Sales Revenues (\$1,000)	\$243	\$213	\$30
Transfer Costs (\$1,000)	\$601	\$739	-\$138
Shortage Costs (\$1,000)	\$77	\$69	\$8
Groundwater Pumping Savings (due to reductions in Groundwater Pumping) (\$1,000)	-\$3,938	-\$3,858	-\$81
Excess Water Savings (\$1,000)	-\$2,517	-\$2,275	-\$241
Average Annual Changes in Water Supply Costs (\$1,000)	\$2,750	\$2,919	-\$169

3 Note: In 2012 dollars

4 **Table 19.87 Changes in Municipal and Industrial Water Supply Costs for the**
 5 **San Joaquin Valley under Alternative 3 as compared to the No Action Alternative**

Differences in Total	Alternative 3	No Action Alternative	Changes
Average Annual CVP/SWP Deliveries (TAF)	241	214	27
Delivery Cost (\$1,000)	\$3,896	\$3,460	\$436
Assumed New Supply Deliveries (TAF)	0	2	-2
Annualized New Supply Costs (\$1,000)	\$13	\$429	-\$417
Water Storage Costs (\$1,000)	\$465	\$942	-\$477
Lost Water Sales Revenues (\$1,000)	\$284	\$361	-\$78
Transfer Costs (\$1,000)	\$2,104	\$2,673	-\$568
Shortage Costs (\$1,000)	\$89	\$115	-\$26
Groundwater Pumping Savings (due to reductions in Groundwater Pumping) (\$1,000)	-\$15,660	-\$15,377	-\$283
Excess Water Savings (\$1,000)	-\$1,378	-\$1,029	-\$349
Average Annual Changes in Water Supply Costs (\$1,000)	-\$10,187	-\$8,427	-\$1,761

6 Note: In 2012 dollars

7 The changes in M&I water supply costs would result in changes to employment
 8 and regional economic output in the Sacramento and San Joaquin valleys, as
 9 summarized in Tables 19.88 and 19.89, respectively.

1 **Table 19.88 Changes in Municipal and Industrial Water Supply Related**
 2 **Employment and Regional Economic Output for the Sacramento Valley under**
 3 **Alternative 3 as compared to the No Action Alternative**

Economic Sectors	Employment				Economic Output (\$ thousands)			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agriculture	0	0	0	0	0.0	0.1	-1.2	-1.1
Mining & Logging	0	0	0	0	0.0	0.4	-0.2	0.2
Construction	0	0	0	0	0.0	25.8	-1.8	23.9
Manufacturing	0	0	0	0	0.0	2.8	-16.2	-13.5
Transportation, Warehousing & Utilities	1	0	0	1	254.4	2.5	-13.1	243.7
Wholesale Trade	0	0	0	0	0.0	0.9	-20.0	-19.1
Retail Trade	0	0	0	0	0.0	0.8	-33.8	-33.0
Information	0	0	0	0	0.0	3.0	-15.1	-12.1
Financial Activities	0	0	0	0	0.0	11.6	-107.7	-96.1
Services	0	0	-1	-1	0.0	27.4	-112.8	-85.4
Government	0	0	0	0	0.0	0.1	-2.8	-2.7
Total	1	1	-2	0	254.4	75.3	-324.8	4.9

4 Note: In 2012 dollars

5 **Table 19.89 Changes in Municipal and Industrial Water Supply Related**
 6 **Employment and Regional Economic Output for the San Joaquin Valley under**
 7 **Alternative 3 as compared to the No Action Alternative**

Economic Sectors	Employment				Economic Output (\$ thousands)			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agriculture	0	0	0	0	0.0	-0.2	-8.9	-9.1
Mining & Logging	0	0	0	0	0.0	-1.2	-8.5	-9.7
Construction	0	0	0	0	0.0	-43.3	-7.4	-50.7
Manufacturing	0	0	0	0	0.0	-4.4	-62.0	-66.3
Transportation, Warehousing & Utilities	-2	0	0	-2	-457.3	-4.4	-59.6	-521.3
Wholesale Trade	0	0	0	0	0.0	-1.2	-51.6	-52.8
Retail Trade	0	0	-2	-2	0.0	-1.3	-130.7	-132.0
Information	0	0	0	0	0.0	-3.2	-36.0	-39.2
Financial Activities	0	0	-1	-1	0.0	-14.1	-352.2	-366.3
Services	0	0	-5	-5	0.0	-38.0	-391.1	-429.1
Government	0	0	0	0	0.0	-0.3	-17.2	-17.5
Total	-2	-1	-8	-11	-457.3	-111.6	-1,125.2	-1,694.1

8 Note: In 2012 dollars

9 *Regional Changes to Recreational Opportunities*

10 Recreational opportunities would be similar at San Luis Reservoir under
 11 Alternative 3 as compared to the No Action Alternative, as described in
 12 Chapter 15, Recreation Resources. Recreational opportunities related to Striped
 13 Bass fishing would initially be increased when Alternative 3 is implemented.

1 However, by 2030, Striped Bass fishing opportunities would be reduced under
 2 Alternative 3 as compared to the Second Basis of Comparison due to actions to
 3 reduce predation. Therefore, it is anticipated that recreational economic factors
 4 would be reduced under Alternative 3 as compared to the No Action Alternative.

5 *Effects Related to Cross Delta Water Transfers*

6 Potential effects to socioeconomic factors could be similar to those identified in a
 7 recent environmental analysis conducted by Reclamation for long-term water
 8 transfers from the Sacramento to San Joaquin valleys (Reclamation 2014c) as
 9 described above under the No Action Alternative compared to the Second Basis
 10 of Comparison. For the purposes of this EIS, it is anticipated that similar
 11 conditions would occur during implementation of cross Delta water transfers
 12 under Alternative 3 and the No Action Alternative, and that impacts on
 13 socioeconomic factors could be adverse in the seller's service area.

14 Under Alternative 3, water could be transferred throughout the year without an
 15 annual volumetric limit. Under the No Action Alternative, the timing of cross
 16 Delta water transfers would be limited to July through September and include
 17 annual volumetric limits, in accordance with the 2008 USFWS BO and 2009
 18 NMFS BO. Overall, the potential for cross Delta water transfers would be
 19 increased under Alternative 3 as compared to the No Action Alternative.

20 *San Francisco Bay Area Region*

21 *Regional Changes to Irrigated Agriculture*

22 It is anticipated that as in the Central Valley Region, increases in CVP and SWP
 23 water supplies within the San Francisco Bay Area Region would not result in
 24 changes in long-term irrigated acreage or land use changes due to the use of other
 25 water supplies. However, there could be an increase in irrigated acreage in dry
 26 and critical dry years under Alternative 3 as compared to the No Action
 27 Alternative.

28 *Regional Changes to Municipal and Industrial Water Supplies*

29 As described in Chapter 5, Surface Water Resources and Water Supplies, CVP
 30 and SWP water supplies would increase under Alternative 3 as compared to the
 31 No Action Alternative. The analysis assumed CVP and SWP water deliveries, as
 32 described in Chapter 5, and determined the need for new water supplies, changes
 33 in water storage and groundwater pumping, water transfers, water shortage costs,
 34 and excess water savings. The factors and basis of the analysis is described in
 35 detail in Appendix 19A, CWEST Model. The analysis assumes that no new
 36 annual transfer supplies would be implemented until shortages were greater than
 37 5 percent. The costs of these shortages are included in the analysis.

38 The average annual water supply operating expenses over the 81-year hydrologic
 39 period for M&I water supplies would decrease by 1.23 percent, as presented in
 40 Table 19.90; and therefore, the results would be similar under Alternative 3 and
 41 the No Action Alternative.

1 **Table 19.90 Changes in Municipal and Industrial Water Supply Costs for the San**
 2 **Francisco Bay Area Region under Alternative 3 as compared to the No Action**
 3 **Alternative**

Differences in Total	Alternative 3	No Action Alternative	Changes
Average Annual CVP/SWP Deliveries (TAF)	431	396	34
Delivery Cost (\$1,000)	\$12,096	\$11,044	\$1,052
Assumed New Supply Deliveries (TAF)	18	18	0
Annualized New Supply Costs (\$1,000)	\$575	\$599	-\$24
Water Storage Costs (\$1,000)	\$2,303	\$1,577	\$726
Lost Water Sales Revenues (\$1,000)	\$2,381	\$4,286	-\$1,905
Transfer Costs (\$1,000)	\$1,826	\$5,722	-\$3,896
Shortage Costs (\$1,000)	\$743	\$1,410	-\$667
Groundwater Pumping Savings (due to reductions in Groundwater Pumping) (\$1,000)	-\$726	-\$493	-\$232
Excess Water Savings (\$1,000)	-\$393	-\$225	-\$167
Average Annual Changes in Water Supply Costs (\$1,000)	\$18,806	\$23,919	-\$5,113

4 Note: In 2012 dollars

5 The changes in M&I water supply costs would result in changes to employment
 6 and regional economic output, as summarized in Table 19.91.

7 **Table 19.91 Changes in Municipal and Industrial Water Supply Related**
 8 **Employment and Regional Economic Output for the San Francisco Bay Area**
 9 **Region under Alternative 3 as compared to the No Action Alternative**

Economic Sectors	Employment				Economic Output (\$ thousands)			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agriculture	0	0	0	0	0.0	0.1	-6.0	-5.9
Mining & Logging	0	0	0	0	0.0	1.9	-3.8	-1.9
Construction	0	1	0	1	0.0	186.7	-28.2	158.6
Manufacturing	0	0	0	0	0.0	33.9	-363.5	-329.6
Transportation, Warehousing & Utilities	6	0	-1	5	1,754.5	13.2	-139.1	1,628.6
Wholesale Trade	0	0	-1	-1	0.0	5.8	-268.7	-262.9
Retail Trade	0	0	-5	-5	0.0	4.9	-428.6	-423.7
Information	0	0	0	0	0.0	19.8	-233.1	-213.4
Financial Activities	0	0	-3	-3	0.0	65.6	-1,320.3	-1,254.7
Services	0	1	-15	-14	0.0	157.2	-1,639.6	-1,482.4
Government	0	0	0	0	0.0	0.8	-41.8	-41.0
Total	6	3	-26	-17	1,754.5	489.9	-4,472.7	-2,228.3

10 Note: In 2012 dollars

11 *Regional Changes to Recreational Opportunities*

12 Changes in CVP and SWP water supplies and operations under Alternative 3 as
 13 compared to the No Action Alternative generally would result in higher reservoir
 14 elevations in reservoirs that store CVP and SWP water (up to 9 to 17 percent);

1 and would result in increased recreational economic factors under Alternative 3 as
2 compared to the No Action Alternative.

3 *Regional Changes to Salmon Fishing*

4 Commercial and sport ocean salmon fishing would be reduced under
5 Alternative 3 and the No Action Alternative due to increased commercial and
6 sport ocean salmon harvests limits.

7 *Central Coast Region*

8 *Regional Changes to Irrigated Agriculture*

9 It is anticipated that as in the Central Valley Region, increases in CVP and SWP
10 water supplies within the Central Coast Region would not result in increases in
11 long-term irrigated acreage or land use changes due to the use of other water
12 supplies. However, there could be increased irrigated acreage in dry and critical
13 dry years under Alternative 3 as compared to the No Action Alternative.

14 *Regional Changes to Municipal and Industrial Water Supplies*

15 As described in Chapter 5, Surface Water Resources and Water Supplies, CVP
16 and SWP water supplies would be higher under Alternative 3 as compared to the
17 No Action Alternative. The analysis assumed CVP and SWP water deliveries, as
18 described in Chapter 5, and determined the need for new water supplies, changes
19 in water storage and groundwater pumping, water transfers, water shortage costs,
20 and excess water savings. The factors and basis of the analysis is described in
21 detail in Appendix 19A, CWEST Model. The analysis assumes that no new
22 annual transfer supplies would be implemented until shortages were greater than
23 5 percent. The costs of these shortages are included in the analysis. It is assumed
24 that some communities that do not have alternative water supplies would utilize
25 water transfers.

26 The average annual water supply operating expenses over the 81-year hydrologic
27 period for M&I water supplies would decrease by \$125,000, or 0.33 percent, as
28 presented in Table 19.92; and therefore, the results would be similar under
29 Alternative 3 and the No Action Alternative.

1 **Table 19.92 Changes in Municipal and Industrial Water Supply Costs for the**
 2 **Central Coast Region under Alternative 3 as compared to the No Action Alternative**

Differences in Total	Alternative 3	No Action Alternative	Changes
Average Annual CVP/SWP Deliveries (TAF)	51	44	8
Delivery Cost (\$1,000)	\$7,814	\$6,663	\$1,151
Assumed New Supply Deliveries (TAF)	0	0	0
Annualized New Supply Costs (\$1,000)	\$0	\$0	\$0
Water Storage Costs (\$1,000)	\$0	\$0	\$0
Lost Water Sales Revenues (\$1,000)	\$0	\$0	\$0
Transfer Costs (\$1,000)	\$0	\$0	\$0
Shortage Costs (\$1,000)	\$0	\$0	\$0
Groundwater Pumping Savings (due to reductions in Groundwater Pumping) (\$1,000)	-\$8,333	-\$8,068	-\$265
Excess Water Savings (\$1,000)	-\$3,980	-\$2,970	-\$1,010
Average Annual Changes in Water Supply Costs (\$1,000)	-\$4,499	-\$4,374	-\$125

3 Note: In 2012 dollars

4 The changes in M&I water supply costs would result in changes to employment
 5 and regional economic output, as summarized in Table 19.93.

6 **Table 19.93 Changes in Municipal and Industrial Water Supply Related**
 7 **Employment and Regional Economic Output for the Central Coast Region under**
 8 **Alternative 3 as compared to the No Action Alternative**

Economic Sectors	Employment				Economic Output (\$ thousands)			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agriculture	0	0	0	0	0.0	0.4	-2.8	-2.4
Mining & Logging	0	0	0	0	0.0	4.9	-6.5	-1.7
Construction	0	1	0	1	0.0	153.8	-6.8	147.0
Manufacturing	0	0	0	0	0.0	20.4	-36.5	-16.0
Transportation, Warehousing & Utilities	5	0	0	5	1,150.6	13.0	-39.5	1,124.0
Wholesale Trade	0	0	0	0	0.0	3.7	-41.4	-37.8
Retail Trade	0	0	-1	-1	0.0	4.7	-83.0	-78.4
Information	0	0	0	0	0.0	9.1	-27.4	-18.3
Financial Activities	0	0	-1	0	0.0	52.5	-247.3	-194.8
Services	0	1	-3	-2	0.0	127.3	-314.2	-186.9
Government	0	0	0	0	0.0	0.7	-9.3	-8.6
Total	5	3	-6	2	1,150.6	390.4	-814.8	726.2

9 Note: In 2012 dollars

1 *Regional Changes to Recreational Opportunities*

2 Changes in CVP and SWP water supplies and operations under Alternative 3 as
3 compared to the No Action Alternative generally would result in higher reservoir
4 elevations in reservoirs that store CVP and SWP water (up to 9 to 17 percent);
5 and would result in increased recreational economic factors under Alternative 3 as
6 compared to the No Action Alternative.

7 *Southern California Region*

8 *Regional Changes to Irrigated Agriculture*

9 It is anticipated that as in the Central Valley Region, increases in CVP and SWP
10 water supplies within the Southern California Region would not result in
11 increases in long-term irrigated acreage or land use changes due to the use of
12 other water supplies. However, there could be increased irrigated acreage in dry
13 and critical dry years under Alternative 3 as compared to the No Action
14 Alternative.

15 *Regional Changes to Municipal and Industrial Water Supplies*

16 As described in Chapter 5, Surface Water Resources and Water Supplies, CVP
17 and SWP water supplies would be higher under Alternative 3 as compared to the
18 No Action Alternative. The analysis assumed CVP and SWP water deliveries, as
19 described in Chapter 5, and determined the need for new water supplies, changes
20 in water storage and groundwater pumping, water transfers, water shortage costs,
21 and excess water savings. The factors and basis of the analysis is described in
22 detail in Appendix 19A, CWEST Model. The analysis assumes that no new
23 annual transfer supplies would be implemented until shortages were greater than
24 5 percent. The costs of these shortages are included in the analysis. It is assumed
25 that some communities that do not have alternative water supplies would utilize
26 water transfers.

27 The average annual water supply costs over the 81-year hydrologic period for
28 M&I water supplies would be \$4.94 million, or 0.31 percent, as presented in
29 Table 19.94; and therefore, the results would be similar under Alternative 3 and
30 the No Action Alternative.

1 **Table 19.94 Changes in Municipal and Industrial Water Supply Costs for the**
 2 **Southern California Region under Alternative 3 as compared to the No Action**
 3 **Alternative**

Differences in Total	Alternative 3	No Action Alternative	Changes
Average Annual CVP/SWP Deliveries (TAF)	2,241	1,932	308
Delivery Cost (\$1,000)	\$278,085	\$239,692	\$38,393
Assumed New Supply Deliveries (TAF)	40	47	-7
Annualized New Supply Costs (\$1,000)	\$10,584	\$12,688	-\$2,104
Water Storage Costs (\$1,000)	\$8,154	\$7,598	\$556
Lost Water Sales Revenues (\$1,000)	\$11,409	\$14,614	-\$3,205
Transfer Costs (\$1,000)	\$6,181	\$11,484	-\$5,303
Shortage Costs (\$1,000)	\$12,632	\$17,319	-\$4,687
Groundwater Pumping Savings (due to reductions in Groundwater Pumping) (\$1,000)	-\$81,693	-\$57,474	-\$24,218
Excess Water Savings (\$1,000)	-\$9,005	-\$4,629	-\$4,376
Average Annual Changes in Water Supply Costs (\$1,000)	\$236,347	\$241,291	-\$4,944

4 Note: In 2012 dollars

5 The changes in M&I water supply costs would result in changes to employment
 6 and regional economic output, as summarized in Table 19.95.

7 **Table 19.95 Changes in Municipal and Industrial Water Supply Related**
 8 **Employment and Regional Economic Output for the Southern California under**
 9 **Alternative 3 as compared to the No Action Alternative**

Economic Sectors	Employment				Economic Output (\$ thousands)			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agriculture	0	0	-1	-1	0.0	10.5	-146.4	-135.8
Mining & Logging	0	1	-1	0	0.0	138.6	-199.8	-61.2
Construction	0	37	-2	35	0.0	4,391.6	-211.9	4,179.8
Manufacturing	0	2	-6	-3	0.0	1,225.5	-3,662.5	-2,437.0
Transportation, Warehousing & Utilities	148	2	-6	143	36,845.0	499.5	-1,389.7	35,954.8
Wholesale Trade	0	1	-11	-10	0.0	232.2	-2,405.6	-2,173.3
Retail Trade	0	2	-31	-29	0.0	143.9	-2,688.1	-2,544.2
Information	0	1	-3	-2	0.0	537.8	-1,595.7	-1,057.9
Financial Activities	0	7	-28	-20	0.0	2,133.4	-9,496.1	-7,362.8
Services	0	39	-113	-74	0.0	4,675.7	-10,892.2	-6,216.5
Government	0	0	-2	-1	0.0	25.1	-314.7	-289.6
Total	148	91	-202	37	36,845.0	14,013.9	-33,002.7	17,856.2

10 Note: In 2012 dollars

1 *Regional Changes to Recreational Opportunities*

2 Changes in CVP and SWP water supplies and operations under Alternative 3 as
3 compared to the No Action Alternative generally would result in higher reservoir
4 elevations in reservoirs that store CVP and SWP water (up to 9 to 17 percent);
5 and would result in increased recreational economic factors under Alternative 3 as
6 compared to the No Action Alternative.

7 **19.4.3.4.2 Alternative 3 Compared to the Second Basis of Comparison**

8 *Trinity River Region*

9 *Regional Changes to Irrigated Agriculture*

10 There are no agricultural lands irrigated with CVP and SWP water supplies in the
11 Trinity River Region. Therefore, there would be no changes in irrigated lands
12 under Alternative 3 as compared to the Second Basis of Comparison.

13 *Regional Changes to Municipal and Industrial Water Supplies*

14 The CVP would continue to release water in Trinity River for downstream
15 beneficial uses, including water supplies under Alternative 3 and the Second Basis
16 of Comparison. There are no CVP or SWP water contractors in the Trinity River
17 Region.

18 *Regional Changes to Recreational Opportunities*

19 Recreational opportunities would be similar in the Trinity River Region under
20 Alternative 3 as compared to the Second Basis of Comparison as described in
21 Chapter 15, Recreational Resources.

22 *Regional Changes to Salmon Fishing*

23 Trinity River flows would be similar under Alternative 3 as compared to the
24 Second Basis of Comparison. This could result in similar salmon harvest
25 conditions by the Yurok and Hoopa Valley tribes.

26 *Central Valley Region*

27 *Regional Changes to Irrigated Agriculture*

28 As described in Chapter 5, Surface Water Resources and Water Supplies, CVP
29 and SWP water supplies would be less under Alternative 3 than under the Second
30 Basis of Comparison. It is anticipated that groundwater use would increase in
31 response to reduced CVP and SWP water supplies in 2030 because sustainable
32 groundwater management plans would not be fully implemented until the 2040s,
33 as discussed in Chapter 12, Agricultural Resources.

34 The agricultural production value under long-term average conditions would be
35 reduced by less than 1 percent (\$0.3 million/year in the Sacramento Valley and
36 \$0.3 million/year in the San Joaquin Valley) primarily due to an increase in
37 groundwater pumping of approximately 2 percent. The agricultural production
38 value under dry and critical dry conditions also would be reduced by less than
39 1 percent (\$2.1 million/year in the Sacramento Valley and \$8.9 million/year in the
40 San Joaquin Valley) primarily due to an increase in groundwater pumping.

1 The overall reduction in agricultural production values are less than 0.05 percent
 2 under long-term conditions; and, changes in employment and regional economic
 3 output would be minimal. Therefore, the analysis of employment and regional
 4 economic output is focused on dry and critical dry years.

5 The direct changes in agricultural production would result in changes to
 6 employment and regional economic output in the Sacramento and San Joaquin
 7 valleys, as summarized in Tables 19.96 and 19.97, respectively.

8 **Table 19.96 Changes in Agricultural-Related Employment and Regional Economic**
 9 **Output for the Sacramento Valley under Alternative 3 as Compared to the Second**
 10 **Basis of Comparison in Dry and Critical Dry Years**

Economic Sectors	Employment				Economic Output (\$ millions)			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agriculture	-18	-4	0	-22	-2.1	-0.2	0.0	-2.3
Mining & Logging	0	0	0	0	0.0	0.0	0.0	0.0
Construction	0	0	0	0	0.0	0.0	0.0	0.0
Manufacturing	0	0	0	0	0.0	0.0	0.0	0.0
Transportation, Warehousing & Utilities	0	0	0	0	0.0	-0.1	0.0	-0.1
Wholesale Trade	0	0	0	0	0.0	0.0	0.0	-0.1
Retail Trade	0	0	0	-1	0.0	0.0	0.0	0.0
Information	0	0	0	0	0.0	0.0	0.0	0.0
Financial Activities	0	-2	0	-2	0.0	-0.4	-0.1	-0.5
Services	0	-1	-1	-2	0.0	-0.1	-0.1	-0.2
Government	0	0	0	0	0.0	0.0	0.0	0.0
Total	-18	-7	-2	-27	-2.1	-0.9	-0.3	-3.3

11 Note: In 2012 dollars

1 **Table 19.97 Changes in Agricultural-Related Employment and Regional Economic**
 2 **Output for the San Joaquin Valley under Alternative 3 as Compared to the Second**
 3 **Basis of Comparison in Dry and Critical Dry Years**

Economic Sectors	Employment				Economic Output (\$ millions)			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agriculture	-36	-26	0	-63	-8.9	-1.1	0.0	-10.0
Mining & Logging	0	0	0	0	0.0	-0.1	0.0	-0.1
Construction	0	-1	0	-1	0.0	-0.1	0.0	-0.1
Manufacturing	0	0	0	-1	0.0	-0.7	-0.2	-0.8
Transportation, Warehousing & Utilities	0	-1	-1	-2	0.0	-0.3	-0.1	-0.5
Wholesale Trade	0	-1	-1	-1	0.0	-0.1	-0.1	-0.2
Retail Trade	0	0	-4	-4	0.0	0.0	-0.4	-0.4
Information	0	0	0	0	0.0	0.0	-0.1	-0.1
Financial Activities	0	-4	-2	-5	0.0	-0.8	-0.9	-1.7
Services	0	-2	-12	-14	0.0	-0.2	-1.0	-1.2
Government	0	0	0	0	0.0	-0.1	0.0	-0.1
Total	-36	-36	-20	-92	-8.9	-3.5	-2.8	-15.3

4 Note: In 2012 dollars

5 As described in Chapter 11, Geology and Soils Resources, increased groundwater
 6 pumping under the long-term average conditions may result in an additional
 7 increment of subsidence in those areas within the Central Valley. The additional
 8 amount of subsidence and the economic costs associated with it have not been
 9 quantified in this EIS. However, total subsidence-related costs have been shown
 10 to be substantial, as reported by Borchers et al. (2014) who estimated that the cost
 11 of subsidence in San Joaquin Valley between 1955 and 1972 was more than \$1.3
 12 billion (in 2013 dollars). These estimates are based on the impacts to major
 13 infrastructure in the region including the San Joaquin River, Delta Mendota
 14 Canal, Friant-Kern Canal and San Luis Canal in addition to privately owned
 15 infrastructure. The incremental subsidence-related costs, expressed on an annual
 16 basis, could be an unknown fraction of that cumulative cost.

17 *Regional Changes to Municipal and Industrial Water Supplies*

18 As described in Chapter 5, Surface Water Resources and Water Supplies, CVP
 19 and SWP water supplies would be similar in the Sacramento Valley and greater in
 20 the San Joaquin Valley under Alternative 3 than under the Second Basis of
 21 Comparison. The analysis assumed CVP and SWP water deliveries, as described
 22 in Chapter 5, and determined the need for new water supplies, changes in water
 23 storage and groundwater pumping, water transfers, water shortage costs, and
 24 excess water savings. The factors and basis of the analysis is described in detail
 25 in Appendix 19A, CWEST Model. The analysis assumes that no new annual
 26 transfer supplies would be implemented until shortages were greater than
 27 5 percent. The costs of these shortages are included in the analysis. It is assumed

1 that some communities that do not have alternative water supplies would utilize
 2 water transfers.

3 The average annual water supply operating expenses over the 81-year hydrologic
 4 period for M&I water supplies are presented in Tables 19.98 and 19.99 for the
 5 Sacramento and San Joaquin Valley, respectively. Average annual water supply
 6 operating costs would increase in the Sacramento Valley by 0.05 percent,
 7 decrease in the San Joaquin Valley by 0.2 percent; and therefore, the results
 8 would be similar under Alternative 3 and the Second Basis of Comparison.

9 **Table 19.98 Changes in Municipal and Industrial Water Supply Costs for the**
 10 **Sacramento Valley under Alternative 3 as Compared to the Second Basis of**
 11 **Comparison**

Differences in Total	Alternative 3	Second Basis of Comparison	Changes
Average Annual CVP/SWP Deliveries (TAF)	461	463	-2
Delivery Cost (\$1,000)	\$8,285	\$8,317	-\$32
Assumed New Supply Deliveries (TAF)	0	0	0
Annualized New Supply Costs (\$1,000)	\$0	\$0	\$0
Water Storage Costs (\$1,000)	\$0	\$0	\$0
Lost Water Sales Revenues (\$1,000)	\$243	\$207	\$35
Transfer Costs (\$1,000)	\$601	\$517	\$84
Shortage Costs (\$1,000)	\$77	\$68	\$9
Groundwater Pumping Savings (due to reductions in Groundwater Pumping) (\$1,000)	-\$3,938	-\$3,916	-\$23
Excess Water Savings (\$1,000)	-\$2,517	-\$2,563	\$46
Average Annual Changes in Water Supply Costs (\$1,000)	\$2,750	\$2,630	\$119

12 Note: In 2012 dollars

13 **Table 19.99 Changes in Municipal and Industrial Water Supply Costs for the San**
 14 **Joaquin Valley under Alternative 3 as Compared to the Second Basis of**
 15 **Comparison**

Differences in Total	Alternative 3	Second Basis of Comparison	Changes
Average Annual CVP/SWP Deliveries (TAF)	241	237	4
Delivery Cost (\$1,000)	\$3,896	\$3,854	\$42
Assumed New Supply Deliveries (TAF)	0	0	0
Annualized New Supply Costs (\$1,000)	\$13	\$15	-\$3
Water Storage Costs (\$1,000)	\$465	\$820	-\$355
Lost Water Sales Revenues (\$1,000)	\$284	\$322	-\$39
Transfer Costs (\$1,000)	\$2,104	\$2,623	-\$518
Shortage Costs (\$1,000)	\$89	\$102	-\$13
Groundwater Pumping Savings (due to reductions in Groundwater Pumping) (\$1,000)	-\$15,660	-\$16,011	\$351
Excess Water Savings (\$1,000)	-\$1,378	-\$1,318	-\$59
Average Annual Changes in Water Supply Costs (\$1,000)	-\$10,187	-\$9,593	-\$595

16 Note: In 2012 dollars

1 The changes in M&I water supply costs would result in changes to employment
 2 and regional economic output in the Sacramento and San Joaquin valleys, as
 3 summarized in Tables 19.100 and 19.101, respectively.

4 **Table 19.100 Changes in Municipal and Industrial Water Supply Related**
 5 **Employment and Regional Economic Output for the Sacramento Valley under**
 6 **Alternative 3 as Compared to the Second Basis of Comparison**

Economic Sectors	Employment				Economic Output (\$ thousands)			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agriculture	0	0	0	0	0.0	0.0	0.5	0.5
Mining & Logging	0	0	0	0	0.0	0.0	0.1	0.0
Construction	0	0	0	0	0.0	-3.5	0.7	-2.8
Manufacturing	0	0	0	0	0.0	-0.4	6.4	6.0
Transportation, Warehousing & Utilities	0	0	0	0	-34.6	-0.3	5.2	-29.7
Wholesale Trade	0	0	0	0	0.0	-0.1	7.7	7.6
Retail Trade	0	0	0	0	0.0	-0.1	13.6	13.5
Information	0	0	0	0	0.0	-0.4	6.0	5.5
Financial Activities	0	0	0	0	0.0	-1.6	42.9	41.3
Services	0	0	0	0	0.0	-3.7	45.0	41.2
Government	0	0	0	0	0.0	0.0	1.1	1.1
Total	0	0	1	1	-34.6	-10.2	129.2	84.4

7 Note: In 2012 dollars

8 **Table 19.101 Changes in Municipal and Industrial Water Supply Related**
 9 **Employment and Regional Economic Output for the San Joaquin Valley under**
 10 **Alternative 3 as Compared to the Second Basis of Comparison**

Economic Sectors	Employment				Economic Output (\$ thousands)			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agriculture	0	0	0	0	0.0	-0.1	-2.3	-2.4
Mining & Logging	0	0	0	0	0.0	-0.8	-2.1	-3.0
Construction	0	0	0	0	0.0	-29.9	-1.9	-31.8
Manufacturing	0	0	0	0	0.0	-3.0	-15.5	-18.6
Transportation, Warehousing & Utilities	-1	0	0	-1	-315.8	-3.0	-14.9	-333.7
Wholesale Trade	0	0	0	0	0.0	-0.8	-12.7	-13.5
Retail Trade	0	0	0	0	0.0	-0.9	-33.4	-34.3
Information	0	0	0	0	0.0	-2.2	-9.0	-11.2
Financial Activities	0	0	0	0	0.0	-9.7	-88.6	-98.4
Services	0	0	-1	-1	0.0	-26.2	-99.0	-125.2
Government	0	0	0	0	0.0	-0.2	-4.3	-4.5
Total	-1	-1	-2	-4	-315.8	-77.0	-283.5	-676.3

11 Note: In 2012 dollars

1 *Regional Changes to Recreational Opportunities*

2 Recreational opportunities would be similar at San Luis Reservoir under
3 Alternative 3 as compared to the Second Basis of Comparison, as described in
4 Chapter 15, Recreation Resources. Recreational opportunities related to Striped
5 Bass fishing would initially be increased when Alternative 3 is implemented.
6 However, by 2030, Striped Bass fishing opportunities would be reduced under
7 Alternative 3 as compared to the Second Basis of Comparison due to actions to
8 reduce predation. Therefore, it is anticipated that recreational economic factors
9 would be reduced under Alternative 3 as compared to the Second Basis of
10 Comparison.

11 *Effects Related to Cross Delta Water Transfers*

12 Potential effects to socioeconomic factors could be similar to those identified in a
13 recent environmental analysis conducted by Reclamation for long-term water
14 transfers from the Sacramento to San Joaquin valleys (Reclamation 2014c) as
15 described above under the No Action Alternative compared to the Second Basis
16 of Comparison. For the purposes of this EIS, it is anticipated that similar
17 conditions would occur during implementation of cross Delta water transfers
18 under Alternative 3 and the Second Basis of Comparison, and that impacts on
19 socioeconomic factors could be adverse in the seller's service area.

20 Under Alternative 3 and Second Basis of Comparison, water could be transferred
21 throughout the year without an annual volumetric limit. Overall, the potential for
22 cross Delta water transfers would be similar under Alternative 3 as compared to
23 the Second Basis of Comparison.

24 *San Francisco Bay Area Region*

25 *Regional Changes to Irrigated Agriculture*

26 It is anticipated that as in the Central Valley Region, reductions in CVP and SWP
27 water supplies within the San Francisco Bay Area Region would not result in
28 reductions in long-term irrigated acreage or land use changes due to the use of
29 other water supplies. However, there could be a reduction in irrigated acreage in
30 dry and critical dry years under Alternative 3 as compared to the Second Basis of
31 Comparison.

32 *Regional Changes to Municipal and Industrial Water Supplies*

33 As described in Chapter 5, Surface Water Resources and Water Supplies, CVP
34 and SWP water supplies would be less under Alternative 3 than under the Second
35 Basis of Comparison. The analysis assumed CVP and SWP water deliveries, as
36 described in Chapter 5, and determined the need for new water supplies, changes
37 in water storage and groundwater pumping, water transfers, water shortage costs,
38 and excess water savings. The factors and basis of the analysis is described in
39 detail in Appendix 19A, CWEST Model. The analysis assumes that no new
40 annual transfer supplies would be implemented until shortages were greater than
41 5 percent. The costs of these shortages are included in the analysis.

42 The average annual water supply operating expenses over the 81-year hydrologic
43 period for M&I water supplies would increase by \$2.16 million, or 0.52 percent,

1 as presented in Table 19.102; and therefore, the results would be similar under
2 Alternative 3 and the Second Basis of Comparison.

3 **Table 19.102 Changes in Municipal and Industrial Water Supply Costs for the San**
4 **Francisco Bay Area Region under Alternative 3 as Compared to the Second Basis**
5 **of Comparison**

Differences in Total	Alternative 3	Second Basis of Comparison	Changes
Average Annual CVP/SWP Deliveries (TAF)	431	445	-14
Delivery Cost (\$1,000)	\$12,096	\$12,515	-\$419
Assumed New Supply Deliveries (TAF)	18	16	2
Annualized New Supply Costs (\$1,000)	\$575	\$234	\$342
Water Storage Costs (\$1,000)	\$2,303	\$1,963	\$340
Lost Water Sales Revenues (\$1,000)	\$2,381	\$1,595	\$786
Transfer Costs (\$1,000)	\$1,826	\$1,154	\$672
Shortage Costs (\$1,000)	\$743	\$523	\$221
Groundwater Pumping Savings (due to reductions in Groundwater Pumping) (\$1,000)	-\$726	-\$792	\$66
Excess Water Savings (\$1,000)	-\$393	-\$549	\$156
Average Annual Changes in Water Supply Costs (\$1,000)	\$18,806	\$16,643	\$2,163

6 Note: In 2012 dollars

7 The changes in M&I water supply costs would result in changes to employment
8 and regional economic output, as summarized in Table 19.103.

9 **Table 19.103 Changes in Municipal and Industrial Water Supply Related**
10 **Employment and Regional Economic Output for the San Francisco Bay Area**
11 **Region under Alternative 3 as Compared to the Second Basis of Comparison**

Economic Sectors	Employment				Economic Output (\$ thousands)			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agriculture	0	0	0	0	0.0	0.0	1.9	1.9
Mining & Logging	0	0	0	0	0.0	0.3	1.2	1.5
Construction	0	0	0	0	0.0	28.0	9.0	36.9
Manufacturing	0	0	0	0	0.0	5.1	114.4	119.5
Transportation, Warehousing & Utilities	1	0	0	1	262.6	2.0	44.3	308.9
Wholesale Trade	0	0	0	0	0.0	0.9	81.9	82.8
Retail Trade	0	0	2	2	0.0	0.7	138.5	139.3
Information	0	0	0	0	0.0	3.0	73.5	76.4
Financial Activities	0	0	1	1	0.0	9.8	420.2	430.0
Services	0	0	5	5	0.0	23.5	523.1	546.7
Government	0	0	0	0	0.0	0.1	13.3	13.4
Total	1	0	8	10	262.6	73.3	1,421.3	1,757.2

12 Note: In 2012 dollars

1 *Regional Changes to Recreational Opportunities*

2 Changes in CVP and SWP water supplies and operations under Alternative 3 as
3 compared to the Second Basis of Comparison generally would result in similar
4 reservoir elevations in reservoirs that store CVP and SWP water and similar
5 recreational economic factors under Alternative 3 as compared to the Second
6 Basis of Comparison.

7 *Regional Changes to Salmon Fishing*

8 Commercial and sport ocean salmon fishing would be reduced under
9 Alternative 3 and the Second Basis of Comparison due to increased commercial
10 and sport ocean salmon harvests limits.

11 *Central Coast Region*

12 *Regional Changes to Irrigated Agriculture*

13 It is anticipated that as in the Central Valley Region, reductions in CVP and SWP
14 water supplies within the Central Coast Region would not result in reductions in
15 long-term irrigated acreage or land use changes due to the use of other water
16 supplies. However, there could be a reduction in irrigated acreage in dry and
17 critical dry years under Alternative 3 as compared to the Second Basis of
18 Comparison.

19 *Regional Changes to Municipal and Industrial Water Supplies*

20 As described in Chapter 5, Surface Water Resources and Water Supplies, CVP
21 and SWP water supplies would be less under Alternative 3 than under the Second
22 Basis of Comparison. The analysis assumed CVP and SWP water deliveries, as
23 described in Chapter 5, and determined the need for new water supplies, changes
24 in water storage and groundwater pumping, water transfers, water shortage costs,
25 and excess water savings. The factors and basis of the analysis is described in
26 detail in Appendix 19A, CWEST Model. The analysis assumes that no new
27 annual transfer supplies would be implemented until shortages were greater than
28 5 percent. The costs of these shortages are included in the analysis. It is assumed
29 that some communities that do not have alternative water supplies would utilize
30 water transfers.

31 The average annual water supply operating expenses over the 81-year hydrologic
32 period for M&I water supplies would increase by \$146,000, or 0.38 percent, as
33 presented in Table 19.104; and therefore, the results would be similar under
34 Alternative 3 and the Second Basis of Comparison.

Table 19.104 Changes in Municipal and Industrial Water Supply Costs for the Central Coast Region under Alternative 3 as Compared to the Second Basis of Comparison

Differences in Total	Alternative 3	Second Basis of Comparison	Changes
Average Annual CVP/SWP Deliveries (TAF)	51	54	-2
Delivery Cost (\$1,000)	\$7,814	\$8,174	-\$360
Assumed New Supply Deliveries (TAF)	0	0	0
Annualized New Supply Costs (\$1,000)	\$0	\$0	\$0
Water Storage Costs (\$1,000)	\$0	\$0	\$0
Lost Water Sales Revenues (\$1,000)	\$0	\$0	\$0
Transfer Costs (\$1,000)	\$0	\$0	\$0
Shortage Costs (\$1,000)	\$0	\$0	\$0
Groundwater Pumping Savings (due to reductions in Groundwater Pumping) (\$1,000)	-\$8,333	-\$8,643	\$310
Excess Water Savings (\$1,000)	-\$3,980	-\$4,176	\$196
Average Annual Changes in Water Supply Costs (\$1,000)	-\$4,499	-\$4,645	\$146

Note: In 2012 dollars

The changes in M&I water supply costs would result in changes to employment and regional economic output, as summarized in Table 19.105.

Table 19.105 Changes in Municipal and Industrial Water Supply Related Employment and Regional Economic Output for the Central Coast Region under Alternative 3 as Compared to the Second Basis of Comparison

Economic Sectors	Employment				Economic Output (\$ thousands)			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agriculture	0	0	0	0	0.0	-0.1	1.2	1.0
Mining & Logging	0	0	0	0	0.0	-1.5	2.8	1.2
Construction	0	0	0	0	0.0	-48.1	2.9	-45.2
Manufacturing	0	0	0	0	0.0	-6.4	15.4	9.0
Transportation, Warehousing & Utilities	-2	0	0	-2	-359.9	-4.1	16.7	-347.2
Wholesale Trade	0	0	0	0	0.0	-1.2	17.2	16.1
Retail Trade	0	0	0	0	0.0	-1.5	35.5	34.1
Information	0	0	0	0	0.0	-2.9	11.6	8.8
Financial Activities	0	0	0	0	0.0	-16.4	104.9	88.5
Services	0	0	1	1	0.0	-39.8	133.4	93.6
Government	0	0	0	0	0.0	-0.2	3.9	3.7
Total	-2	-1	2	0	-359.9	-122.1	345.5	-136.5

Note: In 2012 dollars

Regional Changes to Recreational Opportunities

Changes in CVP and SWP water supplies and operations under Alternative 3 as compared to the Second Basis of Comparison generally would result in similar reservoir elevations in reservoirs that store CVP and SWP water and similar

1 recreational economic factors under Alternative 3 as compared to the Second
 2 Basis of Comparison.

3 *Southern California Region*

4 *Regional Changes to Irrigated Agriculture*

5 It is anticipated that as in the Central Valley Region, reductions in CVP and SWP
 6 water supplies within the Southern California Region would not result in
 7 reductions in long-term irrigated acreage or land use changes due to the use of
 8 other water supplies. However, there could be a reduction in irrigated acreage in
 9 dry and critical dry years under Alternative 3 as compared to the Second Basis of
 10 Comparison.

11 *Regional Changes to Municipal and Industrial Water Supplies*

12 As described in Chapter 5, Surface Water Resources and Water Supplies, CVP
 13 and SWP water supplies would be less under Alternative 3 than under the Second
 14 Basis of Comparison. The analysis assumed CVP and SWP water deliveries, as
 15 described in Chapter 5, and determined the need for new water supplies, changes
 16 in water storage and groundwater pumping, water transfers, water shortage costs,
 17 and excess water savings. The factors and basis of the analysis is described in
 18 detail in Appendix 19A, CWEST Model. The analysis assumes that no new
 19 annual transfer supplies would be implemented until shortages were greater than
 20 5 percent. The costs of these shortages are included in the analysis. It is assumed
 21 that some communities that do not have alternative water supplies would utilize
 22 water transfers.

23 The average annual water supply costs over the 81-year hydrologic period for
 24 M&I water supplies would increase by 1.83 percent, as presented in Table 19.106;
 25 and therefore, the results would be similar under Alternative 3 and the Second
 26 Basis of Comparison.

27 **Table 19.106 Changes in Municipal and Industrial Water Supply Costs for the**
 28 **Southern California Region under Alternative 3 as Compared to the Second Basis**
 29 **of Comparison**

Differences in Total	Alternative 3	Second Basis of Comparison	Changes
Average Annual CVP/SWP Deliveries (TAF)	2,241	2,394	-153
Delivery Cost (\$1,000)	\$278,085	\$296,795	-\$18,710
Assumed New Supply Deliveries (TAF)	40	11	28
Annualized New Supply Costs (\$1,000)	\$10,584	\$4,032	\$6,552
Water Storage Costs (\$1,000)	\$8,154	\$2,824	\$5,330
Lost Water Sales Revenues (\$1,000)	\$11,409	\$1,119	\$10,289
Transfer Costs (\$1,000)	\$6,181	\$3,705	\$2,476
Shortage Costs (\$1,000)	\$12,632	\$353	\$12,279
Groundwater Pumping Savings (due to reductions in Groundwater Pumping) (\$1,000)	-\$81,693	-\$91,507	\$9,814
Excess Water Savings (\$1,000)	-\$9,005	-\$10,573	\$1,568
Average Annual Changes in Water Supply Costs (\$1,000)	\$236,347	\$206,749	\$29,598

30 Note: In 2012 dollars

1 The changes in M&I water supply costs would result in changes to employment
2 and regional economic output, as summarized in Table 19.107.

3 **Table 19.107 Changes in Municipal and Industrial Water Supply Related**
4 **Employment and Regional Economic Output for the Southern California Region**
5 **under Alternative 3 as Compared to the Second Basis of Comparison**

Economic Sectors	Employment				Economic Output (\$ thousands)			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agriculture	0	0	1	1	0.0	-2.0	126.3	124.4
Mining & Logging	0	0	1	0	0.0	-25.7	169.2	143.5
Construction	0	-7	1	-5	0.0	-813.9	183.7	-630.2
Manufacturing	0	0	5	4	0.0	-227.1	3,152.0	2,924.9
Transportation, Warehousing & Utilities	-27	0	5	-22	-6,828.3	-92.6	1,213.1	-5,707.8
Wholesale Trade	0	0	9	9	0.0	-43.0	1,933.5	1,890.4
Retail Trade	0	0	27	27	0.0	-26.7	2,418.2	2,391.5
Information	0	0	3	3	0.0	-99.7	1,366.4	1,266.7
Financial Activities	0	-1	24	23	0.0	-395.4	8,301.7	7,906.3
Services	0	-7	99	92	0.0	-866.5	9,538.4	8,671.9
Government	0	0	1	1	0.0	-4.7	272.6	268.0
Total	-27	-17	177	132	-6,828.3	-2,597.1	28,675.1	19,249.7

6 Note: In 2012 dollars

7 *Regional Changes to Recreational Opportunities*

8 Changes in CVP and SWP water supplies and operations under Alternative 3 as
9 compared to the Second Basis of Comparison generally would result in similar
10 reservoir elevations in reservoirs that store CVP and SWP water and similar
11 recreational economic factors under Alternative 3 as compared to the Second
12 Basis of Comparison.

13 **19.4.3.5 Alternative 4**

14 The CVP and SWP operations under Alternative 4 are identical to the CVP and
15 SWP operations under the Second Basis of Comparison and Alternative 1, as
16 described in Chapter 3, Description of Alternatives. In addition, Alternative 4
17 includes Striped Bass predation control which would reduce recreational
18 opportunities. The non-recreational socioeconomic factors under Alternative 4
19 would be identical to the conditions under the Second Basis of Comparison.
20 Alternative 4 is compared to the No Action Alternative and the Second Basis of
21 Comparison.

22 **19.4.3.5.1 Alternative 4 Compared to the No Action Alternative**

23 The CVP and SWP operations under Alternative 4 are identical to the CVP and
24 SWP operations under the Second Basis of Comparison and Alternative 1.
25 Therefore, changes in non-recreational socioeconomic factors under Alternative 4
26 as compared to the No Action Alternative would be the similar to impacts
27 described in Section 12.4.3.2.1, Alternative 1 Compared to the No Action

1 Alternative. Recreational opportunities related to Striped Bass fishing would
2 initially be increased when Alternative 4 is implemented. However, by 2030,
3 Striped Bass fishing opportunities would be reduced under Alternative 4 as
4 compared to the No Action Alternative due to actions to reduce predation.
5 Commercial and sport ocean salmon fishing opportunities would be reduced
6 under Alternative 4 as compared to the No Action Alternative due to increased
7 harvest limitations.

8 **19.4.3.5.2 Alternative 4 Compared to the Second Basis of Comparison**

9 As described in Chapter 3, Description of Alternatives, socioeconomic factors
10 under Alternative 4 are the same as non-recreational socioeconomic factors under
11 the Second Basis of Comparison. Recreational opportunities related to Striped
12 Bass fishing would initially be increased when Alternative 4 is implemented.
13 However, by 2030, Striped Bass fishing opportunities would be reduced under
14 Alternative 4 as compared to the Second Basis of Comparison due to actions to
15 reduce predation. Commercial and sport ocean salmon fishing opportunities
16 would be reduced under Alternative 4 as compared to the Second Basis of
17 Comparison due to increased harvest limitations.

18 **19.4.3.6 Alternative 5**

19 As described in Chapter 3, Description of Alternatives, CVP and SWP operations
20 under Alternative 5 are similar to the No Action Alternative with modified Old
21 and Middle River flow criteria and New Melones Reservoir operations. As
22 described in Chapter 4, Approach to Environmental Analysis, Alternative 5 is
23 compared to the No Action Alternative and the Second Basis of Comparison.

24 **19.4.3.6.1 Alternative 5 Compared to the No Action Alternative**

25 *Trinity River Region*

26 *Regional Changes to Irrigated Agriculture*

27 There are no agricultural lands irrigated with CVP and SWP water supplies in the
28 Trinity River Region. Therefore, there would be no changes in irrigated lands
29 under Alternative 5 as compared to the No Action Alternative.

30 *Regional Changes to Municipal and Industrial Water Supplies*

31 The CVP would continue to release water in Trinity River for downstream
32 beneficial uses, including water supplies under Alternative 5 as compared to the
33 No Action Alternative. There are no CVP or SWP water contractors in the
34 Trinity River Region.

35 *Regional Changes to Recreational Opportunities*

36 Recreational opportunities would be similar in the Trinity River Region under
37 Alternative 5 as compared to the No Action Alternative as described in
38 Chapter 15, Recreational Resources.

1 *Regional Changes to Salmon Fishing*

2 Trinity River flows would be similar under Alternative 5 as compared to the No
3 Action Alternative. This could result in similar salmon harvest conditions by the
4 Yurok and Hoopa Valley tribes.

5 *Central Valley Region*

6 *Regional Changes to Irrigated Agriculture*

7 As described in Chapter 5, Surface Water Resources and Water Supplies, CVP
8 and SWP water supplies would be similar under Alternative 5 and the No Action
9 Alternative. It is anticipated that groundwater use would be similar and
10 sustainable groundwater management plans would not be fully implemented until
11 the 2040s, as discussed in Chapter 12, Agricultural Resources.

12 The agricultural production value under long-term average conditions would be
13 the same under Alternative 5 as the No Action Alternative. The agricultural
14 production value under dry and critical dry conditions also would be reduced by
15 less than 1 percent (\$0.8 million/year increase in the Sacramento Valley and \$2.7
16 million/year decrease in the San Joaquin Valley), although groundwater pumping
17 is not anticipated to change.

18 The overall decrease in agricultural production values are less than 0.05 percent
19 under long-term conditions; and, changes in employment and regional economic
20 output would be minimal. Therefore, the analysis of employment and regional
21 economic output is focused on dry and critical dry years.

22 The direct changes in agricultural production would result in changes to
23 employment and regional economic output in the Sacramento and San Joaquin
24 valleys, as summarized in Tables 19.108 and 19.109, respectively.

25 **Table 19.108 Changes in Agricultural-Related Employment and Regional Economic**
26 **Output for the Sacramento Valley under Alternative 5 as compared to the No**
27 **Action Alternative in Dry and Critical Dry Years**

Economic Sectors	Employment				Economic Output (\$ millions)			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agriculture	3	2	0	4	0.8	0.1	0.0	0.9
Mining & Logging	0	0	0	0	0.0	0.0	0.0	0.0
Construction	0	0	0	0	0.0	0.0	0.0	0.0
Manufacturing	0	0	0	0	0.0	0.0	0.0	0.0
Transportation, Warehousing & Utilities	0	0	0	0	0.0	0.0	0.0	0.0
Wholesale Trade	0	0	0	0	0.0	0.0	0.0	0.0
Retail Trade	0	0	0	0	0.0	0.0	0.0	0.0
Information	0	0	0	0	0.0	0.0	0.0	0.0
Financial Activities	0	0	0	0	0.0	0.1	0.1	0.2
Services	0	0	1	2	0.0	0.0	0.1	0.1
Government	0	0	0	0	0.0	0.0	0.0	0.0
Total	3	2	2	7	0.8	0.2	0.3	1.3

28 Note: In 2012 dollars

1 **Table 19.109 Changes in Agricultural-Related Employment and Regional Economic**
 2 **Output for the San Joaquin Valley under Alternative 5 as compared to the No**
 3 **Action Alternative in Dry and Critical Dry Years**

Economic Sectors	Employment				Economic Output (\$ millions)			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agriculture	-5	-9	0	-14	-2.7	-0.4	0.0	-3.0
Mining & Logging	0	0	0	0	0.0	0.0	0.0	0.0
Construction	0	0	0	0	0.0	0.0	0.0	0.0
Manufacturing	0	0	0	0	0.0	-0.2	-0.1	-0.2
Transportation, Warehousing & Utilities	0	0	0	-1	0.0	-0.1	0.0	-0.1
Wholesale Trade	0	0	0	0	0.0	0.0	0.0	-0.1
Retail Trade	0	0	-2	-2	0.0	0.0	-0.1	-0.1
Information	0	0	0	0	0.0	0.0	0.0	0.0
Financial Activities	0	-1	-1	-1	0.0	-0.2	-0.3	-0.5
Services	0	-1	-4	-5	0.0	-0.1	-0.4	-0.4
Government	0	0	0	0	0.0	0.0	0.0	0.0
Total	-5	-11	-7	-24	-2.7	-0.9	-1.0	-4.6

4 Note: In 2012 dollars

5 As described in Chapter 11, Geology and Soils Resources, increased groundwater
 6 pumping under the long-term average conditions may result in an additional
 7 increment of subsidence in those areas within the Central Valley. The additional
 8 amount of subsidence and the economic costs associated with it have not been
 9 quantified in this EIS. However, total subsidence-related costs have been shown
 10 to be substantial, as reported by Borchers et al. (2014) who estimated that the cost
 11 of subsidence in San Joaquin Valley between 1955 and 1972 was more than
 12 \$1.3 billion (in 2013 dollars). These estimates are based on the impacts to major
 13 infrastructure in the region including the San Joaquin River, Delta Mendota
 14 Canal, Friant-Kern Canal and San Luis Canal in addition to privately owned
 15 infrastructure. The incremental subsidence-related costs, expressed on an annual
 16 basis, could be an unknown fraction of that cumulative cost.

17 *Regional Changes to Municipal and Industrial Water Supplies*

18 As described in Chapter 5, Surface Water Resources and Water Supplies, CVP
 19 and SWP water supplies would be similar in the Sacramento Valley and lower in
 20 the San Joaquin Valley under Alternative 5 and the No Action Alternative. The
 21 analysis assumed CVP and SWP water deliveries, as described in Chapter 5, and
 22 determined the need for new water supplies, changes in water storage and
 23 groundwater pumping, water transfers, water shortage costs, and excess water
 24 savings. The factors and basis of the analysis is described in detail in
 25 Appendix 19A, CWEST Model. The analysis assumes that no new annual
 26 transfer supplies would be implemented until shortages were greater than
 27 5 percent. The costs of these shortages are included in the analysis. It is assumed
 28 that some communities that do not have alternative water supplies would utilize
 29 water transfers.

1 The average annual water supply costs over the 81-year hydrologic period for
 2 M&I water supplies are presented in Tables 19.110 and 19.111 for the
 3 Sacramento and San Joaquin Valley, respectively. Average annual water supply
 4 operating expenses would be similar (within 0.05 percent change) for the
 5 Sacramento Valley, and increase by 0.07 percent in the San Joaquin Valley; and
 6 therefore, the results would be similar under Alternative 5 and the No Action
 7 Alternative.

8 **Table 19.110 Changes in Municipal and Industrial Water Supply Costs for the**
 9 **Sacramento Valley under Alternative 5 as compared to the No Action Alternative**

Differences in Total	Alternative 5	No Action Alternative	Changes
Average Annual CVP/SWP Deliveries (TAF)	447	447	-1
Delivery Cost (\$1,000)	\$8,022	\$8,031	-\$8
Assumed New Supply Deliveries (TAF)	0	0	0
Annualized New Supply Costs (\$1,000)	\$0	\$0	\$0
Water Storage Costs (\$1,000)	\$0	\$0	\$0
Lost Water Sales Revenues (\$1,000)	\$204	\$213	-\$9
Transfer Costs (\$1,000)	\$752	\$739	\$12
Shortage Costs (\$1,000)	\$68	\$69	-\$2
Groundwater Pumping Savings (due to reductions in Groundwater Pumping) (\$1,000)	-\$3,856	-\$3,858	\$1
Excess Water Savings (\$1,000)	-\$2,266	-\$2,275	\$10
Average Annual Changes in Water Supply Costs (\$1,000)	\$2,924	\$2,919	\$5

10 Note: In 2012 dollars

11 **Table 19.111 Changes in Municipal and Industrial Water Supply Costs for the San**
 12 **Joaquin Valley under Alternative 5 as compared to the No Action Alternative**

Differences in Total	Alternative 5	No Action Alternative	Changes
Average Annual CVP/SWP Deliveries (TAF)	211	214	-3
Delivery Cost (\$1,000)	\$3,411	\$3,460	-\$49
Assumed New Supply Deliveries (TAF)	2	2	1
Annualized New Supply Costs (\$1,000)	\$601	\$429	\$171
Water Storage Costs (\$1,000)	\$966	\$942	\$24
Lost Water Sales Revenues (\$1,000)	\$361	\$361	\$0
Transfer Costs (\$1,000)	\$2,661	\$2,673	-\$12
Shortage Costs (\$1,000)	\$115	\$115	\$0
Groundwater Pumping Savings (due to reductions in Groundwater Pumping) (\$1,000)	-\$15,329	-\$15,377	\$49
Excess Water Savings (\$1,000)	-\$996	-\$1,029	\$33
Average Annual Changes in Water Supply Costs (\$1,000)	-\$8,211	-\$8,427	\$215

13 Note: In 2012 dollars

14 The changes in M&I water supply costs would result in changes to employment
 15 and regional economic output in the Sacramento and San Joaquin valleys, as
 16 summarized in Tables 19.112 and 19.113, respectively.

1 **Table 19.112 Changes in Municipal and Industrial Water Supply Related**
 2 **Employment and Regional Economic Output for the Sacramento Valley under**
 3 **Alternative 5 as compared to the No Action Alternative**

Economic Sectors	Employment				Economic Output (\$ thousands)			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agriculture	0	0	0	0	0.0	0.0	0.0	0.0
Mining & Logging	0	0	0	0	0.0	0.0	0.0	0.0
Construction	0	0	0	0	0.0	-0.8	0.1	-0.7
Manufacturing	0	0	0	0	0.0	-0.1	0.6	0.5
Transportation, Warehousing & Utilities	0	0	0	0	-7.8	-0.1	0.5	-7.4
Wholesale Trade	0	0	0	0	0.0	0.0	0.7	0.7
Retail Trade	0	0	0	0	0.0	0.0	1.2	1.1
Information	0	0	0	0	0.0	-0.1	0.5	0.4
Financial Activities	0	0	0	0	0.0	-0.4	3.7	3.4
Services	0	0	0	0	0.0	-0.8	3.9	3.0
Government	0	0	0	0	0.0	0.0	0.1	0.1
Total	0	0	0	0	-7.8	-2.3	11.2	1.1

4 Note: In 2012 dollars

5 **Table 19.113 Changes in Municipal and Industrial Water Supply Related**
 6 **Employment and Regional Economic Output for the San Joaquin Valley under**
 7 **Alternative 5 as compared to the No Action Alternative**

Economic Sectors	Employment				Economic Output (\$ thousands)			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agriculture	0	0	0	0	0.0	0.1	0.7	0.8
Mining & Logging	0	0	0	0	0.0	0.4	0.7	1.0
Construction	0	0	0	0	0.0	13.9	0.6	14.5
Manufacturing	0	0	0	0	0.0	1.4	4.8	6.2
Transportation, Warehousing & Utilities	1	0	0	1	146.6	1.4	4.6	152.6
Wholesale Trade	0	0	0	0	0.0	0.4	3.9	4.3
Retail Trade	0	0	0	0	0.0	0.4	10.6	11.0
Information	0	0	0	0	0.0	1.0	2.8	3.8
Financial Activities	0	0	0	0	0.0	4.5	27.7	32.3
Services	0	0	0	0	0.0	12.2	31.1	43.3
Government	0	0	0	0	0.0	0.1	1.3	1.5
Total	1	0	1	1	146.6	35.8	88.8	271.2

8 Note: In 2012 dollars

9 *Regional Changes to Recreational Opportunities*

10 Recreational opportunities at San Luis Reservoir would be similar under
 11 Alternative 5 as compared to the No Action Alternative, as described in
 12 Chapter 15, Recreation Resources. Therefore, it is anticipated that recreational

1 economic factors would be similar under Alternative 5 as compared to the No
2 Action Alternative.

3 *Effects Related to Cross Delta Water Transfers*

4 Potential effects to socioeconomic factors could be similar to those identified in a
5 recent environmental analysis conducted by Reclamation for long-term water
6 transfers from the Sacramento to San Joaquin valleys (Reclamation 2014c) as
7 described above under the No Action Alternative compared to the Second Basis
8 of Comparison. For the purposes of this EIS, it is anticipated that similar
9 conditions would occur during implementation of cross Delta water transfers
10 under Alternative 5 and the No Action Alternative, and that impacts on
11 socioeconomic factors could be adverse in the seller's service area.

12 Under Alternative 5 and the No Action Alternative, the timing of cross Delta
13 water transfers would be limited to July through September and include annual
14 volumetric limits, in accordance with the 2008 USFWS BO and 2009 NMFS BO.
15 Overall, the potential for cross Delta water transfers would be similar under
16 Alternative 5 and the No Action Alternative.

17 *San Francisco Bay Area Region*

18 *Regional Changes to Irrigated Agriculture*

19 It is anticipated that as in the Central Valley Region, CVP and SWP water
20 supplies within the San Francisco Bay Area Region would be similar under
21 Alternative 5 and the No Action Alternative, and would not result in changes in
22 irrigated acreage or land use changes due to the use of other water supplies.

23 *Regional Changes to Municipal and Industrial Water Supplies*

24 As described in Chapter 5, Surface Water Resources and Water Supplies, CVP
25 and SWP water supplies would be lower under Alternative 5 and the No Action
26 Alternative. The analysis assumed CVP and SWP water deliveries, as described
27 in Chapter 5, and determined the need for new water supplies, changes in water
28 storage and groundwater pumping, water transfers, water shortage costs, and
29 excess water savings. The factors and basis of the analysis is described in detail
30 in Appendix 19A, CWEST Model. The analysis assumes that no new annual
31 transfer supplies would be implemented until shortages were greater than
32 5 percent. The costs of these shortages are included in the analysis.

33 The average annual water supply operating expenses over the 81-year hydrologic
34 period for M&I water supplies would be increase by 0.1 percent, as presented in
35 Table 19.114; and therefore, the results would be similar under Alternative 5 and
36 the No Action Alternative.

1 **Table 19.114 Changes in Municipal and Industrial Water Supply Costs for the San**
 2 **Francisco Bay Area Region under Alternative 5 as compared to the No Action**
 3 **Alternative**

Differences in Total	Alternative 5	No Action Alternative	Changes
Average Annual CVP/SWP Deliveries (TAF)	394	396	-3
Delivery Cost (\$1,000)	\$10,962	\$11,044	-\$82
Assumed New Supply Deliveries (TAF)	18	18	0
Annualized New Supply Costs (\$1,000)	\$599	\$599	\$0
Water Storage Costs (\$1,000)	\$1,495	\$1,577	-\$81
Lost Water Sales Revenues (\$1,000)	\$4,360	\$4,286	\$74
Transfer Costs (\$1,000)	\$6,156	\$5,722	\$434
Shortage Costs (\$1,000)	\$1,450	\$1,410	\$40
Groundwater Pumping Savings (due to reductions in Groundwater Pumping) (\$1,000)	-\$470	-\$493	\$24
Excess Water Savings (\$1,000)	-\$225	-\$225	\$0
Average Annual Changes in Water Supply Costs (\$1,000)	\$24,328	\$23,919	\$409

4 Note: In 2012 dollars

5 The changes in M&I water supply costs would result in changes to employment
 6 and regional economic output, as summarized in Table 19.115.

7 **Table 19.115 Changes in Municipal and Industrial Water Supply Related**
 8 **Employment and Regional Economic Output for the San Francisco Bay Area**
 9 **Region under Alternative 5 as compared to the No Action Alternative**

Economic Sectors	Employment				Economic Output (\$ thousands)			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agriculture	0	0	0	0	0.0	0.0	0.5	0.5
Mining & Logging	0	0	0	0	0.0	-0.2	0.3	0.1
Construction	0	0	0	0	0.0	-17.4	2.4	-15.0
Manufacturing	0	0	0	0	0.0	-3.2	30.9	27.8
Transportation, Warehousing & Utilities	-1	0	0	-1	-163.1	-1.2	11.8	-152.5
Wholesale Trade	0	0	0	0	0.0	-0.5	22.9	22.4
Retail Trade	0	0	0	0	0.0	-0.5	36.4	35.9
Information	0	0	0	0	0.0	-1.8	19.8	18.0
Financial Activities	0	0	0	0	0.0	-6.1	112.3	106.2
Services	0	0	1	1	0.0	-14.6	139.4	124.8
Government	0	0	0	0	0.0	-0.1	3.6	3.5
Total	-1	0	2	1	-163.1	-45.5	380.3	171.7

10 Note: In 2012 dollars

1 *Regional Changes to Recreational Opportunities*

2 Changes in CVP and SWP water supplies and operations under Alternative 5 as
3 compared to the No Action Alternative generally would result in similar reservoir
4 elevations in reservoirs that store CVP and SWP water and similar recreational
5 economic factors under Alternative 5 as compared o the No Action Alternative.

6 *Regional Changes to Salmon Fishing*

7 Changes in commercial and sport ocean salmon fishing primarily would be
8 related to the presence of fall-run Chinook Salmon from Central Valley
9 hatcheries. It is assumed that the production of hatchery fish would be similar
10 under Alternative 15 and the No Action Alternative. However, survival of the
11 fall-run Chinook Salmon hatchery fish to the Pacific Ocean could be related to
12 changes in CVP and SWP operations. As described in Chapter 9, Fish and
13 Aquatic Resources, there would be little change in through-Delta survival by
14 emigrating natural juvenile fall-run Chinook Salmon under Alternative 5 and the
15 No Action Alternative. It is assumed that the survival of the hatchery juvenile
16 fall-run Chinook Salmon would be similar to the survival of the natural juvenile
17 fall-run Chinook Salmon. Therefore, the availability of fish for commercial and
18 sport ocean salmon fishing and the associated economic conditions for the fishing
19 industry would be similar under Alternative 5 and the No Action Alternative.

20 *Central Coast Region*

21 *Regional Changes to Irrigated Agriculture*

22 It is anticipated that as in the Central Valley Region, increases in CVP and SWP
23 water supplies within the Central Coast Region would be lower under
24 Alternative 5 and the No Action Alternative, and would not result in changes in
25 irrigated acreage or land use changes due to the use of other water supplies.

26 *Regional Changes to Municipal and Industrial Water Supplies*

27 As described in Chapter 5, Surface Water Resources and Water Supplies, CVP
28 and SWP water supplies would be similar under Alternative 5 and the No Action
29 Alternative. The analysis assumed CVP and SWP water deliveries, as described
30 in Chapter 5, and determined the need for new water supplies, changes in water
31 storage and groundwater pumping, water transfers, water shortage costs, and
32 excess water savings. The factors and basis of the analysis is described in detail
33 in Appendix 19A, CWEST Model. The analysis assumes that no new annual
34 transfer supplies would be implemented until shortages were greater than
35 5 percent. The costs of these shortages are included in the analysis. It is assumed
36 that some communities that do not have alternative water supplies would utilize
37 water transfers.

38 The average annual water supply operating expenses over the 81-year hydrologic
39 period for M&I water supplies would increase by 0.06 percent, as presented in
40 Table 19.116; and therefore, the results would be similar under Alternative 5 and
41 the No Action Alternative.

1 **Table 19.116 Changes in Municipal and Industrial Water Supply Costs for the**
 2 **Central Coast Region under Alternative 5 as compared to the No Action Alternative**

Differences in Total	Alternative 5	No Action Alternative	Changes
Average Annual CVP/SWP Deliveries (TAF)	43	44	-1
Delivery Cost (\$1,000)	\$6,567	\$6,663	-\$97
Assumed New Supply Deliveries (TAF)	0	0	0
Annualized New Supply Costs (\$1,000)	\$0	\$0	\$0
Water Storage Costs (\$1,000)	\$0	\$0	\$0
Lost Water Sales Revenues (\$1,000)	\$0	\$0	\$0
Transfer Costs (\$1,000)	\$0	\$0	\$0
Shortage Costs (\$1,000)	\$0	\$0	\$0
Groundwater Pumping Savings (due to reductions in Groundwater Pumping) (\$1,000)	-\$8,018	-\$8,068	\$50
Excess Water Savings (\$1,000)	-\$2,899	-\$2,970	\$70
Average Annual Changes in Water Supply Costs (\$1,000)	-\$4,350	-\$4,374	\$23

3 Note: In 2012 dollars

4 The changes in M&I water supply costs would result in changes to employment
 5 and regional economic output, as summarized in Table 19.117.

6 **Table 19.117 Changes in Municipal and Industrial Water Supply Related**
 7 **Employment and Regional Economic Output for the Central Coast Region under**
 8 **Alternative 5 as compared to the No Action Alternative**

Economic Sectors	Employment				Economic Output (\$ thousands)			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agriculture	0	0	0	0	0.0	0.0	0.3	0.2
Mining & Logging	0	0	0	0	0.0	-0.4	0.6	0.2
Construction	0	0	0	0	0.0	-13.0	0.7	-12.3
Manufacturing	0	0	0	0	0.0	-1.7	3.5	1.8
Transportation, Warehousing & Utilities	0	0	0	0	-97.1	-1.1	3.9	-94.3
Wholesale Trade	0	0	0	0	0.0	-0.3	4.0	3.7
Retail Trade	0	0	0	0	0.0	-0.4	8.1	7.8
Information	0	0	0	0	0.0	-0.8	2.7	1.9
Financial Activities	0	0	0	0	0.0	-4.4	24.1	19.7
Services	0	0	0	0	0.0	-10.7	30.7	19.9
Government	0	0	0	0	0.0	-0.1	0.9	0.8
Total	0	0	1	0	-97.1	-32.9	79.5	-50.5

9 Note: In 2012 dollars

10 *Regional Changes to Recreational Opportunities*

11 Changes in CVP and SWP water supplies and operations under Alternative 5 as
 12 compared to the No Action Alternative generally would result in similar reservoir

1 elevations in reservoirs that store CVP and SWP water and similar recreational
 2 economic factors under Alternative 5 as compared to the No Action Alternative.

3 *Southern California Region*

4 *Regional Changes to Irrigated Agriculture*

5 It is anticipated that as in the Central Valley Region, increases in CVP and SWP
 6 water supplies within the Southern California Region would be similar under
 7 Alternative 5 and the No Action Alternative, and would not result in changes in
 8 irrigated acreage or land use changes due to the use of other water supplies.

9 *Regional Changes to Municipal and Industrial Water Supplies*

10 As described in Chapter 5, Surface Water Resources and Water Supplies, CVP
 11 and SWP water supplies would be lower under Alternative 5 and the No Action
 12 Alternative. The analysis assumed CVP and SWP water deliveries, as described
 13 in Chapter 5, and determined the need for new water supplies, changes in water
 14 storage and groundwater pumping, water transfers, water shortage costs, and
 15 excess water savings. The factors and basis of the analysis is described in detail
 16 in Appendix 19A, CWEST Model. The analysis assumes that no new annual
 17 transfer supplies would be implemented until shortages were greater than
 18 5 percent. The costs of these shortages are included in the analysis. It is assumed
 19 that some communities that do not have alternative water supplies would utilize
 20 water transfers.

21 The average annual water supply operating expenses over the 81-year hydrologic
 22 period for M&I water supplies would be increase by 0.37 percent, as presented in
 23 Table 19.118; and therefore, the results would be similar under Alternative 5 and
 24 the No Action Alternative.

25 **Table 19.118 Changes in Municipal and Industrial Water Supply Costs for the**
 26 **Southern California Region under Alternative 5 as compared to the No Action**
 27 **Alternative**

Differences in Total	Alternative 5	No Action Alternative	Changes
Average Annual CVP/SWP Deliveries (TAF)	1,912	1,932	-20
Delivery Cost (\$1,000)	\$237,118	\$239,692	-\$2,575
Assumed New Supply Deliveries (TAF)	81	47	34
Annualized New Supply Costs (\$1,000)	\$24,191	\$12,688	\$11,503
Water Storage Costs (\$1,000)	\$7,474	\$7,598	-\$124
Lost Water Sales Revenues (\$1,000)	\$14,206	\$14,614	-\$408
Transfer Costs (\$1,000)	\$10,505	\$11,484	-\$979
Shortage Costs (\$1,000)	\$16,662	\$17,319	-\$657
Groundwater Pumping Savings (due to reductions in Groundwater Pumping) (\$1,000)	-\$58,323	-\$57,474	-\$849
Excess Water Savings (\$1,000)	-\$4,588	-\$4,629	\$41
Average Annual Changes in Water Supply Costs (\$1,000)	\$247,243	\$241,291	\$5,952

28 Note: In 2012 dollars

1 The changes in M&I water supply costs would result in changes to employment
 2 and regional economic output, as summarized in Table 19.119.

3 **Table 19.119 Changes in Municipal and Industrial Water Supply Related**
 4 **Employment and Regional Economic Output for the Southern California under**
 5 **Alternative 5 as compared to the No Action Alternative**

Economic Sectors	Employment				Economic Output (\$ thousands)			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agriculture	0	0	0	0	0.0	2.5	3.3	5.9
Mining & Logging	0	0	0	0	0.0	33.1	3.3	36.4
Construction	0	9	0	9	0.0	1,049.4	5.1	1,054.5
Manufacturing	0	0	0	1	0.0	292.8	80.2	373.0
Transportation, Warehousing & Utilities	35	0	0	36	8,804.2	119.3	37.0	8,960.5
Wholesale Trade	0	0	0	0	0.0	55.5	-0.2	55.3
Retail Trade	0	0	1	2	0.0	34.4	99.3	133.7
Information	0	0	0	0	0.0	128.5	32.2	160.8
Financial Activities	0	2	1	2	0.0	509.8	257.7	767.4
Services	0	9	3	13	0.0	1,117.3	301.8	1,419.1
Government	0	0	0	0	0.0	6.0	7.6	13.6
Total	35	22	6	63	8,804.2	3,348.6	827.3	12,980.1

6 Note: In 2012 dollars

7 *Regional Changes to Recreational Opportunities*

8 Changes in CVP and SWP water supplies and operations under Alternative 5 as
 9 compared to the No Action Alternative generally would result in similar reservoir
 10 elevations in reservoirs that store CVP and SWP water and similar recreational
 11 economic factors under Alternative 5 as compared to the No Action Alternative.

12 **19.4.3.6.2 Alternative 5 Compared to the Second Basis of Comparison**

13 *Trinity River Region*

14 *Regional Changes to Irrigated Agriculture*

15 There are no agricultural lands irrigated with CVP and SWP water supplies in the
 16 Trinity River Region. Therefore, there would be no changes in irrigated lands
 17 under Alternative 5 as compared to the Second Basis of Comparison.

18 *Regional Changes to Municipal and Industrial Water Supplies*

19 The CVP would continue to release water in Trinity River for downstream
 20 beneficial uses, including water supplies under Alternative 5 and the Second Basis
 21 of Comparison. There are no CVP or SWP water contractors in the Trinity River
 22 Region.

23 *Regional Changes to Recreational Opportunities*

24 Recreational opportunities would be similar in the Trinity River Region under
 25 Alternative 5 as compared to the Second Basis of Comparison as described in
 26 Chapter 15, Recreational Resources.

1 *Regional Changes to Salmon Fishing*

2 Trinity River flows would be similar under Alternative 5 as compared to the
3 Second Basis of Comparison. This could result in similar salmon harvest
4 conditions by the Yurok and Hoopa Valley tribes.

5 *Central Valley Region*

6 *Regional Changes to Irrigated Agriculture*

7 As described in Chapter 5, Surface Water Resources and Water Supplies, CVP
8 and SWP water supplies would be less under Alternative 5 than under the Second
9 Basis of Comparison. It is anticipated that groundwater use would increase in
10 response to reduced CVP and SWP water supplies in 2030 because sustainable
11 groundwater management plans would not be fully implemented until the 2040s,
12 as discussed in Chapter 12, Agricultural Resources.

13 The agricultural production value under long-term average conditions would be
14 reduced by less than 1 percent (\$1.5 million/year in the Sacramento Valley and
15 \$0.7 million/year in the San Joaquin Valley) primarily due to an increase in
16 groundwater pumping of approximately 6 percent. The agricultural production
17 value under dry and critical dry conditions also would be reduced by less than
18 1 percent (\$10.5 million/year in the Sacramento Valley and \$22.9 million/year in
19 the San Joaquin Valley) primarily due to an increase in groundwater pumping.

20 The overall reduction in agricultural production values are less than 0.05 percent
21 under long-term conditions; and, changes in employment and regional economic
22 output would be minimal. Therefore, the analysis of employment and regional
23 economic output is focused on dry and critical dry years.

24 The direct changes in agricultural production would result in changes to
25 employment and regional economic output in the Sacramento and San Joaquin
26 valleys, as summarized in Tables 19.120 and 19.121, respectively.

1 **Table 19.120 Changes in Agricultural-Related Employment and Regional Economic**
 2 **Output for the Sacramento Valley under Alternative 5 as Compared to the Second**
 3 **Basis of Comparison in Dry and Critical Dry Years**

Economic Sectors	Employment				Economic Output (\$ millions)			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agriculture	-84	-20	0	-104	-10.5	-1.2	0.0	-11.8
Mining & Logging	0	0	0	0	0.0	0.0	0.0	0.0
Construction	0	-1	0	-1	0.0	-0.1	0.0	-0.1
Manufacturing	0	0	0	0	0.0	-0.1	0.0	-0.1
Transportation, Warehousing & Utilities	0	-1	0	-2	0.0	-0.3	-0.1	-0.5
Wholesale Trade	0	-1	0	-1	0.0	-0.2	-0.1	-0.3
Retail Trade	0	0	-3	-4	0.0	0.0	-0.3	-0.3
Information	0	0	0	0	0.0	0.0	-0.1	-0.1
Financial Activities	0	-7	-2	-8	0.0	-1.6	-0.7	-2.3
Services	0	-3	-10	-13	0.0	-0.3	-0.9	-1.1
Government	0	0	0	0	0.0	-0.1	0.0	-0.1
Total	-84	-34	-17	-135	-10.5	-4.0	-2.2	-16.8

4 Note: In 2012 dollars

5 **Table 19.121 Changes in Agricultural-Related Employment and Regional Economic**
 6 **Output for the San Joaquin Valley under Alternative 5 as Compared to the Second**
 7 **Basis of Comparison in Dry and Critical Dry Years**

Economic Sectors	Employment				Economic Output (\$ millions)			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agriculture	-145	-61	0	-206	-22.9	-2.7	-0.1	-25.7
Mining & Logging	0	-1	0	-1	0.0	-0.3	0.0	-0.4
Construction	0	-2	0	-2	0.0	-0.2	0.0	-0.2
Manufacturing	0	-1	-1	-2	0.0	-2.0	-0.4	-2.4
Transportation, Warehousing & Utilities	0	-3	-1	-4	0.0	-0.9	-0.3	-1.2
Wholesale Trade	0	-2	-1	-3	0.0	-0.4	-0.2	-0.6
Retail Trade	0	0	-9	-9	0.0	0.0	-0.7	-0.8
Information	0	0	0	-1	0.0	-0.1	-0.2	-0.2
Financial Activities	0	-13	-4	-16	0.0	-2.8	-1.8	-4.6
Services	0	-6	-25	-31	0.0	-0.6	-2.1	-2.7
Government	0	-1	0	-1	0.0	-0.2	-0.1	-0.3
Total	-145	-90	-42	-277	-22.9	-10.2	-5.9	-39.0

8 Note: In 2012 dollars

9 As described in Chapter 11, Geology and Soils Resources, increased groundwater
 10 pumping under the long-term average conditions may result in an additional
 11 increment of subsidence in those areas within the Central Valley. The additional

1 amount of subsidence and the economic costs associated with it have not been
 2 quantified in this EIS. However, total subsidence-related costs have been shown
 3 to be substantial, as reported by Borchers et al. (2014) who estimated that the cost
 4 of subsidence in San Joaquin Valley between 1955 and 1972 was more than
 5 \$1.3 billion (in 2013 dollars). These estimates are based on the impacts to major
 6 infrastructure in the region including the San Joaquin River, Delta Mendota
 7 Canal, Friant-Kern Canal and San Luis Canal in addition to privately owned
 8 infrastructure. The incremental subsidence-related costs, expressed on an annual
 9 basis, could be an unknown fraction of that cumulative cost.

10 *Regional Changes to Municipal and Industrial Water Supplies*

11 As described in Chapter 5, Surface Water Resources and Water Supplies, CVP
 12 and SWP water supplies would be less under Alternative 5 than under the Second
 13 Basis of Comparison. The analysis assumed CVP and SWP water deliveries, as
 14 described in Chapter 5, and determined the need for new water supplies, changes
 15 in water storage and groundwater pumping, water transfers, water shortage costs,
 16 and excess water savings. The factors and basis of the analysis is described in
 17 detail in Appendix 19A, CWEST Model. The analysis assumes that no new
 18 annual transfer supplies would be implemented until shortages were greater than
 19 5 percent. The costs of these shortages are included in the analysis. It is assumed
 20 that some communities that do not have alternative water supplies would utilize
 21 water transfers.

22 The average annual water supply costs over the 81-year hydrologic period for
 23 M&I water supplies are presented in Tables 19.122 and 19.123 for the
 24 Sacramento and San Joaquin Valley, respectively. Average annual water supply
 25 operating expenses would increase by 0.11 and 0.47 percent in the Sacramento
 26 Valley and the San Joaquin Valley, respectively; and therefore, the results would
 27 be similar under Alternative 5 and the Second Basis of Comparison.

28 **Table 19.122 Changes in Municipal and Industrial Water Supply Costs for the**
 29 **Sacramento Valley under Alternative 5 as Compared to the Second Basis of**
 30 **Comparison**

Differences in Total	Alternative 5	Second Basis of Comparison	Changes
Average Annual CVP/SWP Deliveries (TAF)	447	463	-16
Delivery Cost (\$1,000)	\$8,022	\$8,317	-\$295
Assumed New Supply Deliveries (TAF)	0	0	0
Annualized New Supply Costs (\$1,000)	\$0	\$0	\$0
Water Storage Costs (\$1,000)	\$0	\$0	\$0
Lost Water Sales Revenues (\$1,000)	\$204	\$207	-\$3
Transfer Costs (\$1,000)	\$752	\$517	\$235
Shortage Costs (\$1,000)	\$68	\$68	-\$1
Groundwater Pumping Savings (due to reductions in Groundwater Pumping) (\$1,000)	-\$3,856	-\$3,916	\$60
Excess Water Savings (\$1,000)	-\$2,266	-\$2,563	\$298
Average Annual Changes in Water Supply Costs (\$1,000)	\$2,924	\$2,630	\$293

31 Note: In 2012 dollars

1 **Table 19.123 Changes in Municipal and Industrial Water Supply Costs for the San**
 2 **Joaquin Valley under Alternative 5 as Compared to the Second Basis of**
 3 **Comparison**

Differences in Total	Alternative 5	Second Basis of Comparison	Changes
Average Annual CVP/SWP Deliveries (TAF)	211	237	-26
Delivery Cost (\$1,000)	\$3,411	\$3,854	-\$443
Assumed New Supply Deliveries (TAF)	2	0	2
Annualized New Supply Costs (\$1,000)	\$601	\$15	\$585
Water Storage Costs (\$1,000)	\$966	\$820	\$146
Lost Water Sales Revenues (\$1,000)	\$361	\$322	\$39
Transfer Costs (\$1,000)	\$2,661	\$2,623	\$38
Shortage Costs (\$1,000)	\$115	\$102	\$13
Groundwater Pumping Savings (due to reductions in Groundwater Pumping) (\$1,000)	-\$15,329	-\$16,011	\$683
Excess Water Savings (\$1,000)	-\$996	-\$1,318	\$322
Average Annual Changes in Water Supply Costs (\$1,000)	-\$8,211	-\$9,593	\$1,381

4 Note: In 2012 dollars

5 The changes in M&I water supply costs would result in changes to employment
 6 and regional economic output in the Sacramento and San Joaquin valleys, as
 7 summarized in Tables 19.124 and 19.125, respectively.

8 **Table 19.124 Changes in Municipal and Industrial Water Supply Related**
 9 **Employment and Regional Economic Output for the Sacramento Valley under**
 10 **Alternative 5 as Compared to the Second Basis of Comparison**

Economic Sectors	Employment				Economic Output (\$ thousands)			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agriculture	0	0	0	0	0.0	-0.1	1.7	1.6
Mining & Logging	0	0	0	0	0.0	-0.4	0.3	-0.1
Construction	0	0	0	0	0.0	-29.9	2.6	-27.3
Manufacturing	0	0	0	0	0.0	-3.2	22.7	19.5
Transportation, Warehousing & Utilities	-1	0	0	-1	-295.2	-2.9	18.4	-279.6
Wholesale Trade	0	0	0	0	0.0	-1.0	27.8	26.8
Retail Trade	0	0	1	1	0.0	-0.9	47.7	46.8
Information	0	0	0	0	0.0	-3.5	21.1	17.6
Financial Activities	0	0	0	0	0.0	-13.4	151.3	137.9
Services	0	0	2	1	0.0	-31.8	158.5	126.8
Government	0	0	0	0	0.0	-0.2	3.9	3.8
Total	-1	-1	3	1	-295.2	-87.3	456.1	73.6

11 Note: In 2012 dollars

1 **Table 19.125 Changes in Municipal and Industrial Water Supply Related**
 2 **Employment and Regional Economic Output for the San Joaquin Valley under**
 3 **Alternative 5 as Compared to the Second Basis of Comparison**

Economic Sectors	Employment				Economic Output (\$ thousands)			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agriculture	0	0	0	0	0.0	0.1	7.4	7.5
Mining & Logging	0	0	0	0	0.0	0.8	7.1	7.8
Construction	0	0	0	0	0.0	27.2	6.1	33.4
Manufacturing	0	0	0	0	0.0	2.8	51.3	54.1
Transportation, Warehousing & Utilities	1	0	0	1	287.4	2.8	49.4	339.5
Wholesale Trade	0	0	0	0	0.0	0.7	42.9	43.6
Retail Trade	0	0	1	1	0.0	0.8	107.9	108.7
Information	0	0	0	0	0.0	2.0	29.8	31.8
Financial Activities	0	0	1	1	0.0	8.9	291.4	300.3
Services	0	0	4	4	0.0	23.9	323.4	347.2
Government	0	0	0	0	0.0	0.2	14.2	14.5
Total	1	1	6	8	287.4	70.1	930.8	1,288.4

4 Note: In 2012 dollars

5 *Regional Changes to Recreational Opportunities*

6 Recreational opportunities would decrease by 6 to 9 percent under Alternative 5
 7 as compared to the Second Basis of Comparison, depending upon water year type,
 8 , as described in Chapter 15, Recreation Resources. Therefore, it is anticipated
 9 that recreational economic factors would be reduced under Alternative 5 as
 10 compared to the Second Basis of Comparison.

11 *Effects Related to Cross Delta Water Transfers*

12 Potential effects to socioeconomic factors could be similar to those identified in a
 13 recent environmental analysis conducted by Reclamation for long-term water
 14 transfers from the Sacramento to San Joaquin valleys (Reclamation 2014c) as
 15 described above under the No Action Alternative compared to the Second Basis
 16 of Comparison. For the purposes of this EIS, it is anticipated that similar
 17 conditions would occur during implementation of cross Delta water transfers
 18 under Alternative 5 and the Second Basis of Comparison, and that impacts on
 19 socioeconomic factors could be adverse in the seller's service area.

20 Under Alternative 5, the timing of cross Delta water transfers would be limited to
 21 July through September and include annual volumetric limits, in accordance with
 22 the 2008 USFWS BO and 2009 NMFS BO. Under Second Basis of Comparison,
 23 water could be transferred throughout the year without an annual volumetric limit.
 24 Overall, the potential for cross Delta water transfers would be decreased under
 25 Alternative 5 as compared to the Second Basis of Comparison.

1 *San Francisco Bay Area Region*

2 *Regional Changes to Irrigated Agriculture*

3 It is anticipated that as in the Central Valley Region, reductions in CVP and SWP
 4 water supplies within the San Francisco Bay Area Region would not result in
 5 reductions in long-term irrigated acreage or land use changes due to the use of
 6 other water supplies. However, there could be a reduction in irrigated acreage in
 7 dry and critical dry years under Alternative 5 as compared to the Second Basis of
 8 Comparison.

9 *Regional Changes to Municipal and Industrial Water Supplies*

10 As described in Chapter 5, Surface Water Resources and Water Supplies, CVP
 11 and SWP water supplies would be less under Alternative 5 than under the Second
 12 Basis of Comparison. The analysis assumed CVP and SWP water deliveries, as
 13 described in Chapter 5, and determined the need for new water supplies, changes
 14 in water storage and groundwater pumping, water transfers, water shortage costs,
 15 and excess water savings. The factors and basis of the analysis is described in
 16 detail in Appendix 19A, CWEST Model. The analysis assumes that no new
 17 annual transfer supplies would be implemented until shortages were greater than
 18 5 percent. The costs of these shortages are included in the analysis.

19 The average annual water supply costs over the 81-year hydrologic period for
 20 M&I water supplies would increase by 1.85 percent, as presented in Table 19.126;
 21 and therefore, the results would be similar under Alternative 5 and the Second
 22 Basis of Comparison.

23 **Table 19.126 Changes in Municipal and Industrial Water Supply Costs for the San**
 24 **Francisco Bay Area Region under Alternative 5 as Compared to the Second Basis**
 25 **of Comparison**

Differences in Total	Alternative 5	Second Basis of Comparison	Changes
Average Annual CVP/SWP Deliveries (TAF)	394	445	-51
Delivery Cost (\$1,000)	\$10,962	\$12,515	-\$1,553
Assumed New Supply Deliveries (TAF)	18	16	2
Annualized New Supply Costs (\$1,000)	\$599	\$234	\$365
Water Storage Costs (\$1,000)	\$1,495	\$1,963	-\$467
Lost Water Sales Revenues (\$1,000)	\$4,360	\$1,595	\$2,765
Transfer Costs (\$1,000)	\$6,156	\$1,154	\$5,002
Shortage Costs (\$1,000)	\$1,450	\$523	\$927
Groundwater Pumping Savings (due to reductions in Groundwater Pumping) (\$1,000)	-\$470	-\$792	\$322
Excess Water Savings (\$1,000)	-\$225	-\$549	\$324
Average Annual Changes in Water Supply Costs (\$1,000)	\$24,328	\$16,643	\$7,686

26 Note: In 2012 dollars

27 The changes in M&I water supply costs would result in changes to employment
 28 and regional economic output, as summarized in Table 19.127.

1 **Table 19.127 Changes in Municipal and Industrial Water Supply Related**
 2 **Employment and Regional Economic Output for the San Francisco Bay Area**
 3 **Region under Alternative 5 as Compared to the Second Basis of Comparison**

Economic Sectors	Employment				Economic Output (\$ thousands)			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agriculture	0	0	0	0	0.0	-0.1	8.4	8.3
Mining & Logging	0	0	0	0	0.0	-1.7	5.3	3.5
Construction	0	-1	0	-1	0.0	-176.1	39.5	-136.6
Manufacturing	0	0	1	0	0.0	-32.0	509.0	477.0
Transportation, Warehousing & Utilities	-6	0	1	-5	-1,654.5	-12.4	195.3	-1,471.6
Wholesale Trade	0	0	2	1	0.0	-5.5	373.6	368.1
Retail Trade	0	0	7	7	0.0	-4.7	603.7	599.0
Information	0	0	1	1	0.0	-18.6	326.5	307.9
Financial Activities	0	0	5	5	0.0	-61.9	1,853.1	1,791.2
Services	0	-1	22	20	0.0	-148.2	2,302.6	2,154.4
Government	0	0	0	0	0.0	-0.7	58.7	57.9
Total	-6	-3	37	29	-1,654.5	-462.0	6,275.6	4,159.1

4 Note: In 2012 dollars

5 *Regional Changes to Recreational Opportunities*

6 Changes in CVP and SWP water supplies and operations under Alternative 5 as
 7 compared to the Second Basis of Comparison generally would result in lower
 8 reservoir elevations in reservoirs that store CVP and SWP water (up to 10 to
 9 18 percent); and would result in decreased recreational economic factors under
 10 Alternative 5 as compared to the Second Basis of Comparison.

11 *Regional Changes to Salmon Fishing*

12 Changes in commercial and sport ocean salmon fishing primarily would be
 13 related to the presence of fall-run Chinook Salmon from Central Valley
 14 hatcheries. It is assumed that the production of hatchery fish would be similar
 15 under Alternative 5 and the Second Basis of Comparison. However, survival of
 16 the fall-run Chinook Salmon hatchery fish to the Pacific Ocean could be related to
 17 changes in CVP and SWP operations. As described in Chapter 9, Fish and
 18 Aquatic Resources, there would be little change in through-Delta survival by
 19 emigrating natural juvenile fall-run Chinook Salmon under Alternative 5 as
 20 compared to the Second Basis of Comparison. It is assumed that the survival of
 21 the hatchery juvenile fall-run Chinook Salmon would be similar to the survival of
 22 the natural juvenile fall-run Chinook Salmon. Therefore, the availability of fish
 23 for commercial and sport ocean salmon fishing and the associated economic
 24 conditions for the fishing industry would be similar under Alternative 5 and the
 25 Second Basis of Comparison.

1 *Central Coast Region*

2 *Regional Changes to Irrigated Agriculture*

3 It is anticipated that as in the Central Valley Region, reductions in CVP and SWP
 4 water supplies within the Central Coast Region would not result in reductions in
 5 long-term irrigated acreage or land use changes due to the use of other water
 6 supplies. However, there could be a reduction in irrigated acreage in dry and
 7 critical dry years under Alternative 5 as compared to the Second Basis of
 8 Comparison.

9 *Regional Changes to Municipal and Industrial Water Supplies*

10 As described in Chapter 5, Surface Water Resources and Water Supplies, CVP
 11 and SWP water supplies would be less under Alternative 5 than under the Second
 12 Basis of Comparison. The analysis assumed CVP and SWP water deliveries, as
 13 described in Chapter 5, and determined the need for new water supplies, changes
 14 in water storage and groundwater pumping, water transfers, water shortage costs,
 15 and excess water savings. The factors and basis of the analysis is described in
 16 detail in Appendix 19A, CWEST Model. The analysis assumes that no new
 17 annual transfer supplies would be implemented until shortages were greater than
 18 5 percent. The costs of these shortages are included in the analysis. It is assumed
 19 that some communities that do not have alternative water supplies would utilize
 20 water transfers.

21 The average annual water supply operating expenses over the 81-year hydrologic
 22 period for M&I water supplies would increase by 0.77 percent, as presented in
 23 Table 19.128; and therefore, the results would be similar under Alternative 5 and
 24 the Second Basis of Comparison.

25 **Table 19.128 Changes in Municipal and Industrial Water Supply Costs for the**
 26 **Central Coast Region under Alternative 5 as Compared to the Second Basis of**
 27 **Comparison**

Differences in Total	Alternative 5	Second Basis of Comparison	Changes
Average Annual CVP/SWP Deliveries (TAF)	43	54	-11
Delivery Cost (\$1,000)	\$6,567	\$8,174	-\$1,607
Assumed New Supply Deliveries (TAF)	0	0	0
Annualized New Supply Costs (\$1,000)	\$0	\$0	\$0
Water Storage Costs (\$1,000)	\$0	\$0	\$0
Lost Water Sales Revenues (\$1,000)	\$0	\$0	\$0
Transfer Costs (\$1,000)	\$0	\$0	\$0
Shortage Costs (\$1,000)	\$0	\$0	\$0
Groundwater Pumping Savings (due to reductions in Groundwater Pumping) (\$1,000)	-\$8,018	-\$8,643	\$625
Excess Water Savings (\$1,000)	-\$2,899	-\$4,176	\$1,277
Average Annual Changes in Water Supply Costs (\$1,000)	-\$4,350	-\$4,645	\$295

28 Note: In 2012 dollars

1 The changes in M&I water supply costs would result in changes to employment
2 and regional economic output, as summarized in Table 19.129.

3 **Table 19.129 Changes in Municipal and Industrial Water Supply Related**
4 **Employment and Regional Economic Output for the Central Coast Region under**
5 **Alternative 5 as Compared to the Second Basis of Comparison**

Economic Sectors	Employment				Economic Output (\$ thousands)			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agriculture	0	0	0	0	0.0	-0.6	4.3	3.7
Mining & Logging	0	0	0	0	0.0	-6.8	9.9	3.1
Construction	0	-2	0	-2	0.0	-214.8	10.4	-204.4
Manufacturing	0	0	0	0	0.0	-28.6	55.4	26.8
Transportation, Warehousing & Utilities	-7	0	0	-7	-1,606.9	-18.1	60.1	-1,565.0
Wholesale Trade	0	0	0	0	0.0	-5.1	62.7	57.5
Retail Trade	0	0	1	1	0.0	-6.5	126.7	120.2
Information	0	0	0	0	0.0	-12.8	41.7	29.0
Financial Activities	0	0	1	1	0.0	-73.3	376.2	303.0
Services	0	-2	5	3	0.0	-177.8	478.2	300.4
Government	0	0	0	0	0.0	-1.0	14.1	13.1
Total	-7	-4	9	-2	-1,606.9	-545.3	1,239.6	-912.6

6 Note: In 2012 dollars

7 *Regional Changes to Recreational Opportunities*

8 Changes in CVP and SWP water supplies and operations under Alternative 5 as
9 compared to the Second Basis of Comparison generally would result in lower
10 reservoir elevations in reservoirs that store CVP and SWP water (up to 10 to
11 18 percent); and would result in decreased recreational economic factors under
12 Alternative 5 as compared to the Second Basis of Comparison.

13 *Southern California Region*

14 *Regional Changes to Irrigated Agriculture*

15 It is anticipated that as in the Central Valley Region, reductions in CVP and SWP
16 water supplies within the Southern California Region would not result in
17 reductions in long-term irrigated acreage or land use changes due to the use of
18 other water supplies. However, there could be a reduction in irrigated acreage in
19 dry and critical dry years under Alternative 5 as compared to the Second Basis of
20 Comparison.

21 *Regional Changes to Municipal and Industrial Water Supplies*

22 As described in Chapter 5, Surface Water Resources and Water Supplies, CVP
23 and SWP water supplies would be less under Alternative 5 than under the Second
24 Basis of Comparison. The analysis assumed CVP and SWP water deliveries, as
25 described in Chapter 5, and determined the need for new water supplies, changes
26 in water storage and groundwater pumping, water transfers, water shortage costs,
27 and excess water savings. The factors and basis of the analysis is described in
28 detail in Appendix 19A, CWEST Model. The analysis assumes that no new

1 annual transfer supplies would be implemented until shortages were greater than
 2 5 percent. The costs of these shortages are included in the analysis. It is assumed
 3 that some communities that do not have alternative water supplies would utilize
 4 water transfers.

5 The average annual water supply operating expenses over the 81-year hydrologic
 6 period for M&I water supplies would increase by 2.5 percent, as presented in
 7 Table 19.130; and therefore, the results would be similar under Alternative 5 and
 8 the Second Basis of Comparison.

9 **Table 19.130 Changes in Municipal and Industrial Water Supply Costs for the**
 10 **Southern California Region under Alternative 5 as Compared to the Second Basis**
 11 **of Comparison**

Differences in Total	Alternative 5	Second Basis of Comparison	Changes
Average Annual CVP/SWP Deliveries (TAF)	1,912	2,394	-482
Delivery Cost (\$1,000)	\$237,118	\$296,795	-\$59,677
Assumed New Supply Deliveries (TAF)	81	11	70
Annualized New Supply Costs (\$1,000)	\$24,191	\$4,032	\$20,159
Water Storage Costs (\$1,000)	\$7,474	\$2,824	\$4,649
Lost Water Sales Revenues (\$1,000)	\$14,206	\$1,119	\$13,087
Transfer Costs (\$1,000)	\$10,505	\$3,705	\$6,800
Shortage Costs (\$1,000)	\$16,662	\$353	\$16,309
Groundwater Pumping Savings (due to reductions in Groundwater Pumping) (\$1,000)	-\$58,323	-\$91,507	\$33,183
Excess Water Savings (\$1,000)	-\$4,588	-\$10,573	\$5,985
Average Annual Changes in Water Supply Costs (\$1,000)	\$247,243	\$206,749	\$40,495

12 Note: In 2012 dollars

13 The changes in M&I water supply costs would result in changes to employment
 14 and regional economic output, as summarized in Table 19.131.

1 **Table 19.131 Changes in Municipal and Industrial Water Supply Related**
 2 **Employment and Regional Economic Output for the Southern California Region**
 3 **under Alternative 5 as Compared to the Second Basis of Comparison**

Economic Sectors	Employment				Economic Output (\$ thousands)			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
Agriculture	0	0	2	1	0.0	-10.0	276.1	266.1
Mining & Logging	0	0	1	1	0.0	-131.1	372.3	241.2
Construction	0	-35	3	-32	0.0	-4,156.1	400.7	-3,755.4
Manufacturing	0	-2	10	9	0.0	-1,159.8	6,894.7	5,734.9
Transportation, Warehousing & Utilities	-140	-2	12	-130	-34,869.2	-472.7	2,639.9	-32,702.0
Wholesale Trade	0	-1	20	19	0.0	-219.8	4,338.8	4,119.1
Retail Trade	0	-2	59	58	0.0	-136.2	5,205.5	5,069.3
Information	0	-1	7	6	0.0	-509.0	2,994.4	2,485.4
Financial Activities	0	-7	52	45	0.0	-2,019.0	18,055.5	16,036.5
Services	0	-37	215	178	0.0	-4,424.9	20,732.4	16,307.5
Government	0	0	3	3	0.0	-23.8	594.9	571.1
Total	-140	-86	384	158	-34,869.2	-13,262.4	62,505.2	14,373.6

4 Note: In 2012 dollars

5 *Regional Changes to Recreational Opportunities*

6 Changes in CVP and SWP water supplies and operations under Alternative 5 as
 7 compared to the Second Basis of Comparison generally would result in lower
 8 reservoir elevations in reservoirs that store CVP and SWP water (up to 10 to
 9 18 percent); and would result in decreased recreational economic factors under
 10 Alternative 5 as compared to the Second Basis of Comparison.

11 **19.4.3.7 Summary of Environmental Consequences**

12 The results of the environmental consequences of implementation of Alternatives
 13 1 through 5 as compared to the No Action Alternative and the Second Basis of
 14 Comparison are presented in Tables 19.132 and 19.133.

1 **Table 19.132 Comparison of Alternatives 1 through 5 to No Action Alternative**

Alternative	Potential Change	Consideration for Mitigation Measures
Alternative 1	Agricultural and M&I water-related employment would be similar. M&I water supply operating expenses would be similar. Recreational economic factors would increase or be similar related to use of reservoirs that store CVP and SWP water.	None needed
Alternative 2	No effects on socioeconomic factors.	None needed
Alternative 3	Agricultural and M&I water-related employment would be similar. M&I water supply operating expenses would be similar. Recreational economic factors would increase or be similar related to use of reservoirs that store CVP and SWP water. Reduced recreational economic factors related to Striped Bass fishing. Reduced commercial and sport ocean salmon fishing due to increased harvest limitations.	None identified at this time to reduce economic effects of reduced Striped Bass fishing and ocean salmon.
Alternative 4	Same effects as described for Alternative 1 compared to the No Action Alternative for non-recreational economic factors. Reduced recreational economic factors related to Striped Bass fishing. Reduced commercial and sport ocean salmon fishing due to increased harvest limitations.	None identified at this time to reduce economic effects of reduced Striped Bass fishing or ocean salmon fishing.
Alternative 5	Agricultural and M&I water-related employment would be similar. M&I water supply operating expenses would be similar. Recreational economic factors would be similar related to use of reservoirs that store CVP and SWP water.	None needed

2 Note: Due to the limitations and uncertainty in the CalSim II monthly model and other analytical tools,
 3 incremental differences of 5 percent or less between alternatives and the No Action Alternative are considered
 4 to be "similar."

1 **Table 19.133 Comparison of No Action Alternative and Alternatives 1 through 5 to**
 2 **Second Basis of Comparison**

Alternative	Potential Change	Consideration for Mitigation Measures
No Action Alternative	Agricultural and M&I water-related employment would be similar. M&I water supply operating expenses would be similar. Recreational economic factors would decrease at San Luis Reservoir and at of reservoirs that store CVP and SWP water in the San Francisco Bay Area and Central Coast regions.	Not considered for this comparison.
Alternative 1	No effects on socioeconomic factors.	Not considered for this comparison.
Alternative 2	Same effects as described for No Action Alternative as compared to the Second Basis of Comparison.	Not considered for this comparison.
Alternative 3	Agricultural and M&I water-related employment would be similar. M&I water supply operating expenses would be similar. Recreational economic factors would be similar related to use of reservoirs that store CVP and SWP water. Reduced recreational economic factors related to Striped Bass fishing. Reduced commercial and sport ocean salmon fishing due to increased harvest limitations. Recreational economic factors would be similar.	Not considered for this comparison.
Alternative 4	No effects on non-recreational socioeconomic factors. Reduced recreational economic factors related to Striped Bass fishing. Reduced commercial and sport ocean salmon fishing due to increased harvest limitations.	Not considered for this comparison.
Alternative 5	Agricultural and M&I water-related employment would be similar. M&I water supply operating expenses would be similar. Recreational economic factors would decrease at San Luis Reservoir and at of reservoirs that store CVP and SWP water in the San Francisco Bay Area, Central Coast, and Southern California regions. Reduced recreational economic factors related to Striped Bass fishing. Reduced commercial and sport ocean salmon fishing due to increased harvest limitations.	Not considered for this comparison.

3 Note: Due to the limitations and uncertainty in the CalSim II monthly model and other analytical tools,
 4 incremental differences of 5 percent or less between alternatives and the No Action Alternative are considered
 5 to be "similar."

1 **19.4.3.8 Potential Mitigation Measures**

2 Mitigation measures are presented in this section to avoid, minimize, rectify,
3 reduce, eliminate, or compensate for adverse environmental effects of
4 Alternatives 1 through 5 as compared to the No Action Alternative. Mitigation
5 measures were not included to address adverse impacts under the alternatives as
6 compared to the Second Basis of Comparison because this analysis was included
7 in this EIS for information purposes only.

8 Changes in CVP and SWP operations under Alternatives 1 through 5 as compared
9 to the No Action Alternative would not result in adverse changes in
10 socioeconomic factors related to the average annual agricultural production or
11 M&I water supply operating expenses as compared to the No Action Alternative.
12 However, implementation of Alternatives 3 and 4 would result in adverse changes
13 in recreational Striped Bass and sport ocean salmon fishing opportunities.

14 **19.4.3.8.1 Recreational Fishing Opportunities**

15 Under Alternatives 3 and 4, fishing opportunities for Striped Bass and commercial
16 and sport ocean salmon fishing would be reduced as compared to the No Action
17 Alternative. Mitigation measures are not identified at this time to reduce the
18 impact to the Striped Bass and ocean salmon fishing opportunities.

19 **19.4.3.9 Cumulative Effects Analysis**

20 As described in Chapter 3, the cumulative effects analysis considers projects,
21 programs, and policies that are not speculative; and are based upon known or
22 reasonably foreseeable long-range plans, regulations, operating agreements, or
23 other information that establishes them as reasonably foreseeable.

24 The cumulative effects analysis Alternatives 1 through 5 for Socioeconomics are
25 summarized in Table 19.134.

1 **Table 19.134 Summary of Cumulative Effects on Socioeconomics of Alternatives 1**
 2 **through 5 as Compared to the No Action Alternative**

Scenarios	Actions	Cumulative Effects of Actions
<p>Past & Present, and Future Actions included in the No Action Alternative and in all Alternatives in Year 2030</p>	<p>Consistent with Affected Environment conditions plus:</p> <p>Actions in the 2008 USFWS BO and 2009 NMFS BO that would have occurred without implementation of the Biological Opinions, as described in Section 3.3.1.2 (of Chapter 3, Descriptions of Alternatives), including climate change and sea level rise</p> <p>Actions not included in the 2008 USFWS BO and 2009 NMFS BO that would have occurred without implementation of the Biological Opinions, as described in Section 3.3.1.3 (of Chapter 3, Descriptions of Alternatives):</p> <ul style="list-style-type: none"> • Implementation of Federal and state policies and programs, including Clean Water Act (e.g., Total Maximum Daily Loads); Safe Drinking Water Act; Clean Air Act; and flood management programs • General plans for 2030. • Trinity River Restoration Program. • Central Valley Project Improvement Act programs • Folsom Dam Water Control Manual Update • FERC Relicensing for the Middle Fork of the American River Project • San Joaquin River Restoration Program • Contra Loma Recreation Resource Management Plan • San Luis Reservoir State Recreation Area Resource Management Plan/General Plan 	<p><u>These effects would be the same in all alternatives.</u></p> <p>Climate change and sea level rise and development under the general plans are anticipated to reduce carryover storage in reservoirs in a manner that would reduce CVP and SWP water supply availability and recreational opportunities at some reservoirs that store CVP and SWP water, and could reduce the opportunities for ocean salmon fishing.</p> <p>Other actions, including restoration projects, FERC relicensing projects, and some future projects to improve water quality and/or habitat are anticipated to improve recreational opportunities and salmon populations that could improve ocean salmon fishing.</p>
<p>Future Actions considered as Cumulative Effects Actions in all Alternatives in Year 2030</p>	<p>Actions as described in Section 3.5 (of Chapter 3, Descriptions of Alternatives):</p> <ul style="list-style-type: none"> • Bay-Delta Water Quality Control Plan Update • FERC Relicensing Projects • Bay Delta Conservation Plan (including the California WaterFix alternative) • Shasta Lake Water Resources, North-of-the-Delta Offstream Storage, Los Vaqueros Reservoir Expansion Phase 2, and Upper San Joaquin River Basin Storage Investigations 	<p><u>These effects would be the same in all alternatives.</u></p> <p>Some of the future reasonably foreseeable actions to improve water quality and FERC Relicensing projects could improve recreational opportunities and salmon populations that could improve ocean salmon fishing.</p> <p>Other actions, such as expanded or new reservoirs would improve water supply availability and recreational opportunities.</p>

Scenarios	Actions	Cumulative Effects of Actions
	<ul style="list-style-type: none"> • El Dorado Water and Power Authority Supplemental Water Rights Project • Semitropic Water Storage District Delta Wetlands • North Bay Aqueduct Alternative Intake • Irrigated Lands Regulatory Program 	
<p>No Action Alternative with Associated Cumulative Effects Actions in Year 2030</p>	<p>Full implementation of the 2008 USFWS BO and 2009 NMFS BO</p>	<p>Implementation of No Action Alternative would result in changes stream flows. Changes in stream flows would in turn in changes in water supply availability, recreational opportunities, and salmon populations. Changes in salmon populations would affect ocean salmon fishing as compared to historical conditions prior to the BOs.</p>
<p>Alternative 1 with Associated Cumulative Effects Actions in Year 2030</p>	<p>No implementation of the 2008 USFWS BO and 2009 NMFS BO actions unless the actions would have been implemented without the BO (e.g., Red Bluff Pumping Plant)</p>	<p>Implementation of Alternative 1 with reasonably foreseeable actions would result in similar agricultural and M&I water supply economics, and similar or improved reservoir recreational opportunities compared to the No Action Alternative with these added actions.</p>
<p>Alternative 2 with Associated Cumulative Effects Actions in Year 2030</p>	<p>Full implementation of the 2008 USFWS BO and 2009 NMFS BO CVP and SWP operational actions No implementation of structural improvements or other actions that require further study to develop a more detailed action description.</p>	<p>Implementation of Alternative 2 with reasonably foreseeable actions for recreational opportunities would be the same as for the No Action Alternative with these added actions.</p>
<p>Alternative 3 with Associated Cumulative Effects Actions in Year 2030</p>	<p>No implementation of the 2008 USFWS BO and 2009 NMFS BO actions unless the actions would have been implemented without the BO (e.g., Red Bluff Pumping Plant) Slight increase in positive Old and Middle River flows in the winter and spring months Increased bag limits for Striped Bass and Pikeminnow Increased ocean salmon fishing harvest limitations</p>	<p>Implementation of Alternative 3 with reasonably foreseeable actions would result in similar agricultural and M&I water supply economics, and similar or improved reservoir recreational opportunities as for the No Action Alternative with these added actions. Recreational opportunities related to Striped Bass fishing would initially be increased; however by 2030 recreational fishing related to Striped Bass would be reduced. Opportunities related to commercial and sport ocean salmon fishing would be reduced.</p>

Scenarios	Actions	Cumulative Effects of Actions
Alternative 4 with Associated Cumulative Effects in Year 2030	<p>No implementation of the 2008 USFWS BO and 2009 NMFS BO actions unless the actions would have been implemented without the BO (e.g., Red Bluff Pumping Plant)</p> <p>Increased bag limits for Striped Bass and Pikeminnow</p> <p>Increased ocean salmon fishing harvest limitations</p>	<p>Implementation of Alternative with these reasonably foreseeable actions would result in similar agricultural and M&I water supply economics, and similar or improved reservoir recreational opportunities as for the No Action Alternative with these added actions.</p> <p>Recreational opportunities related to Striped Bass fishing would initially be increased; however by 2030 recreational fishing related to Striped Bass would be reduced.</p> <p>Opportunities related to commercial and sport ocean salmon fishing would be reduced.</p>
Alternative 5 with Associated Cumulative Effects in Year 2030	<p>Full implementation of the 2008 USFWS BO and 2009 NMFS BO</p> <p>Positive Old and Middle River flows and increased Delta outflow in spring months</p>	<p>Implementation of Alternative 5 with reasonably foreseeable actions would result in similar agricultural and M&I water supply economics, and similar reservoir recreational opportunities as for the No Action Alternative with these added actions.</p>

1

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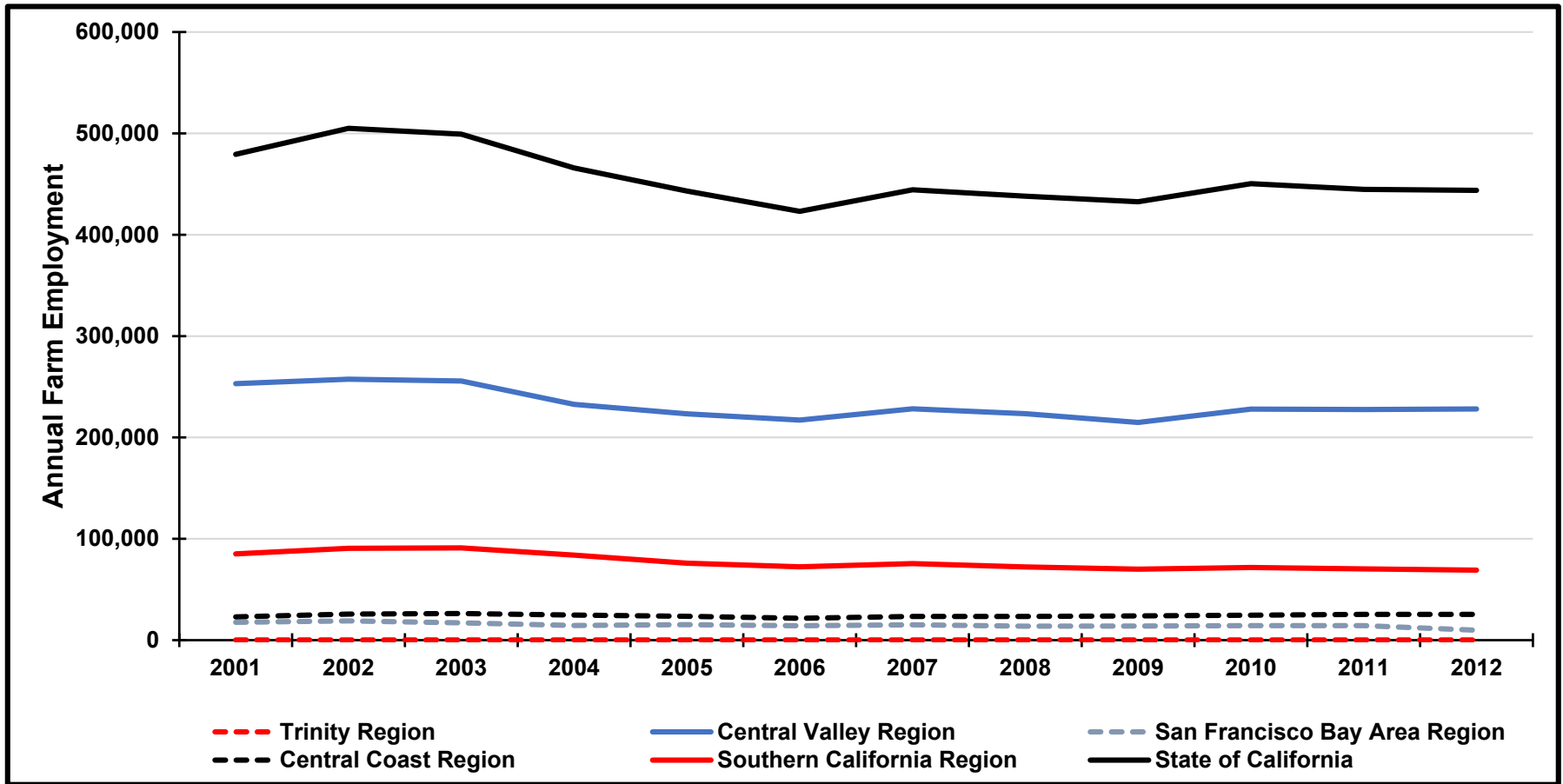


Figure 19.1 Farm Employment in Counties within the Study Area

Source: BEA 2014a

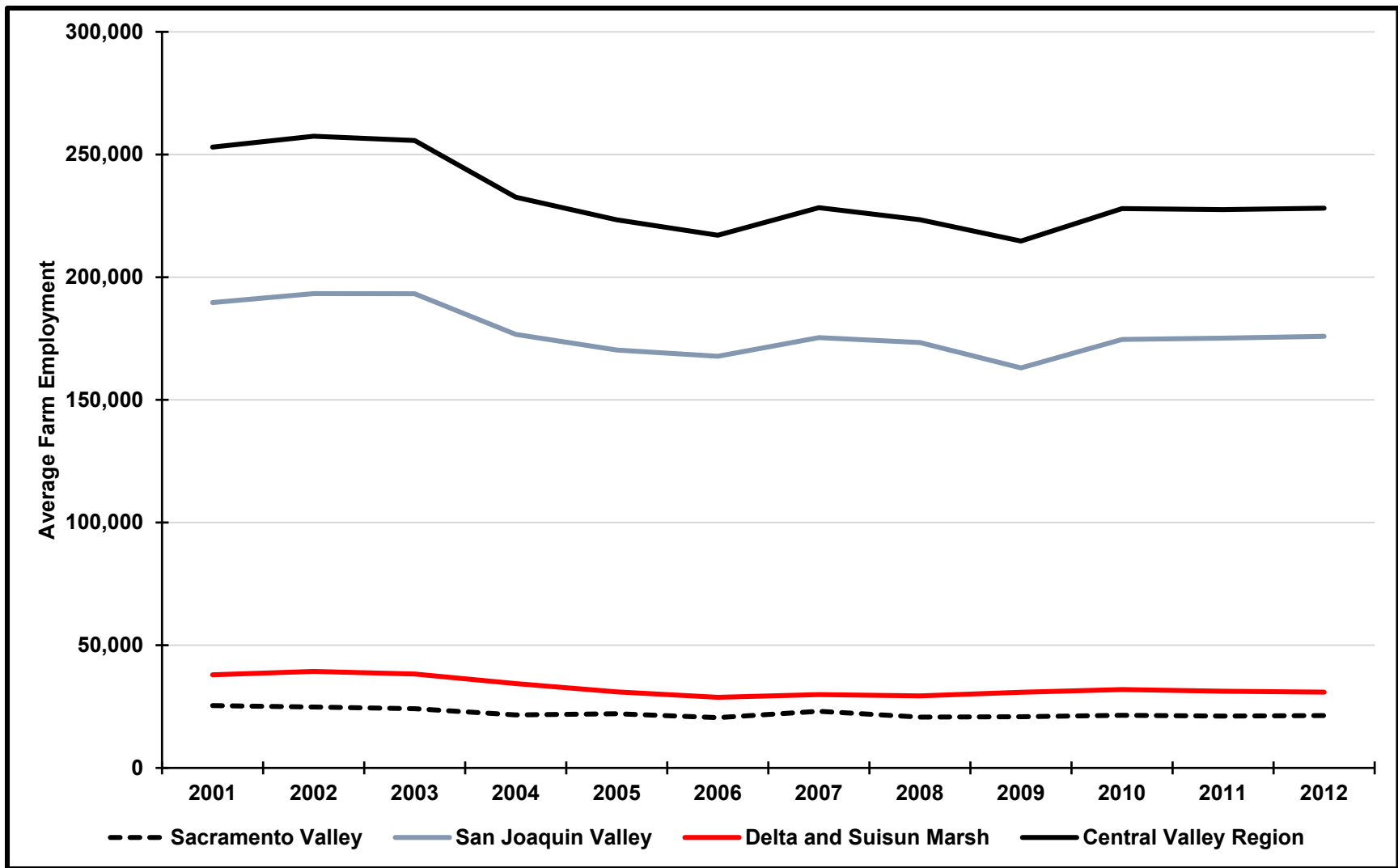


Figure 19.2 Farm Employment in Counties within the Central Valley Region

Source: BEA 2014a

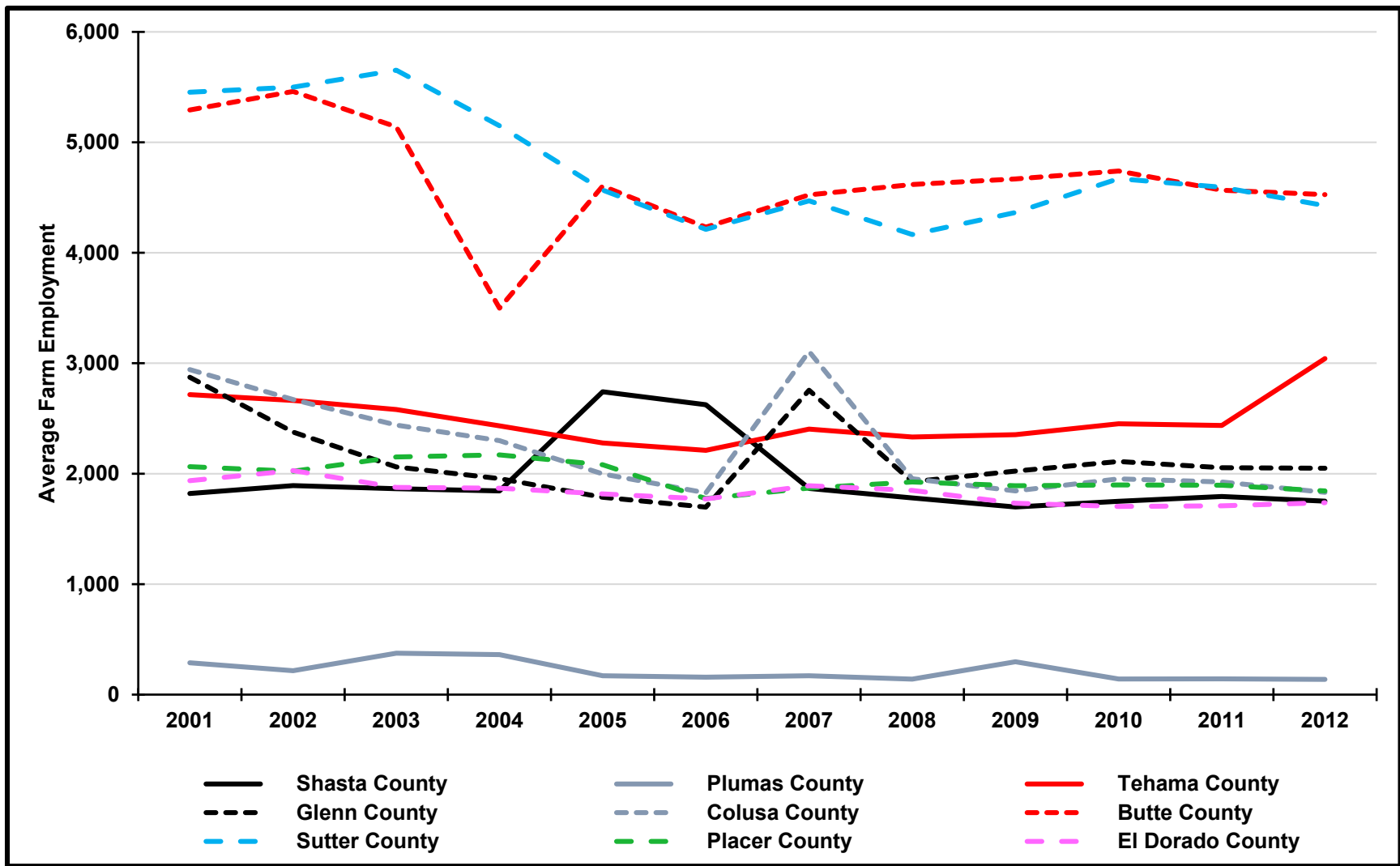


Figure 19.3 Farm Employment in Counties within the Sacramento Valley Portion of the Central Valley Region

Source: BEA 2014a

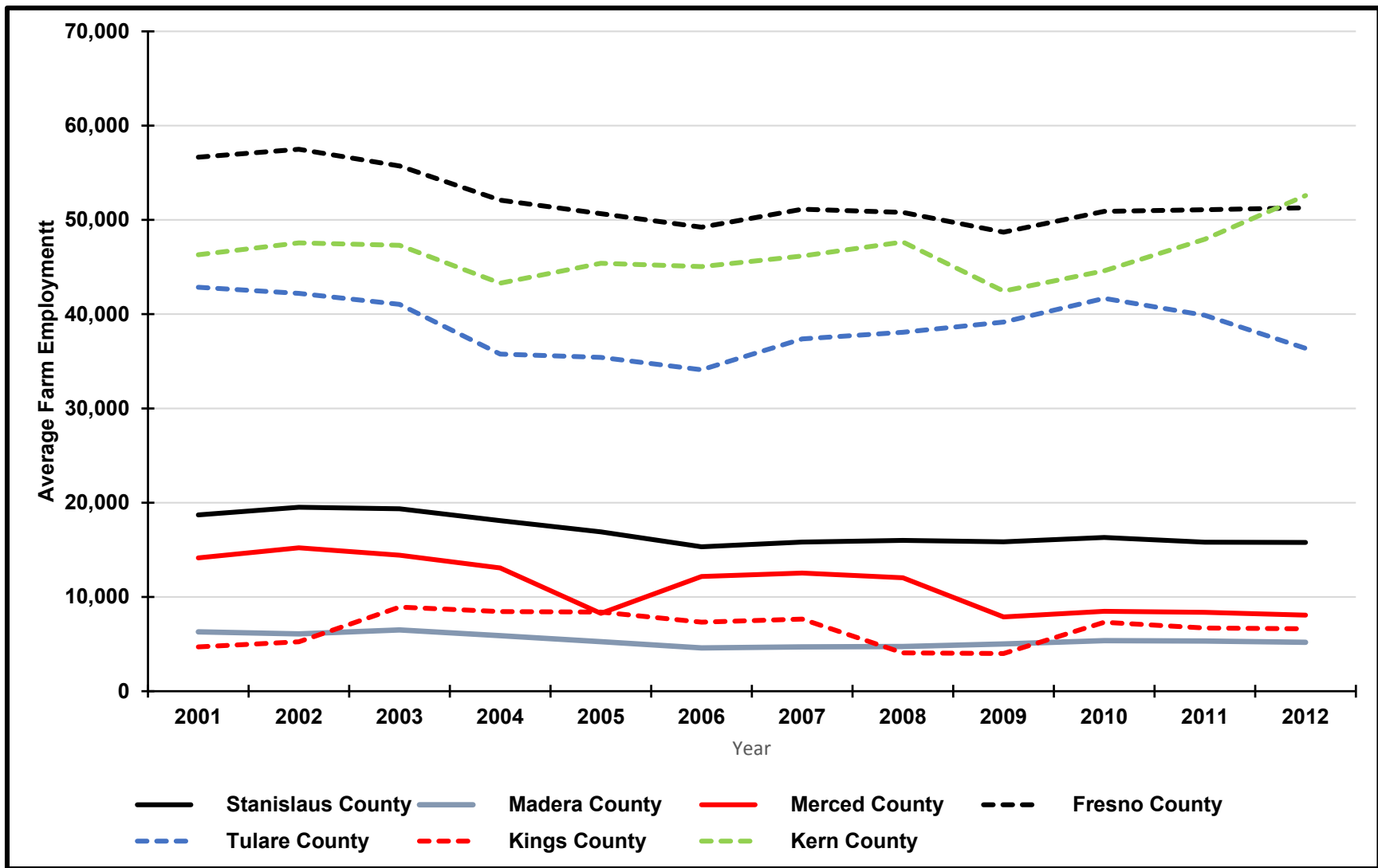


Figure 19.4 Farm Employment in Counties within the San Joaquin Valley Portion of the Central Valley Region

Source: BEA 2014a

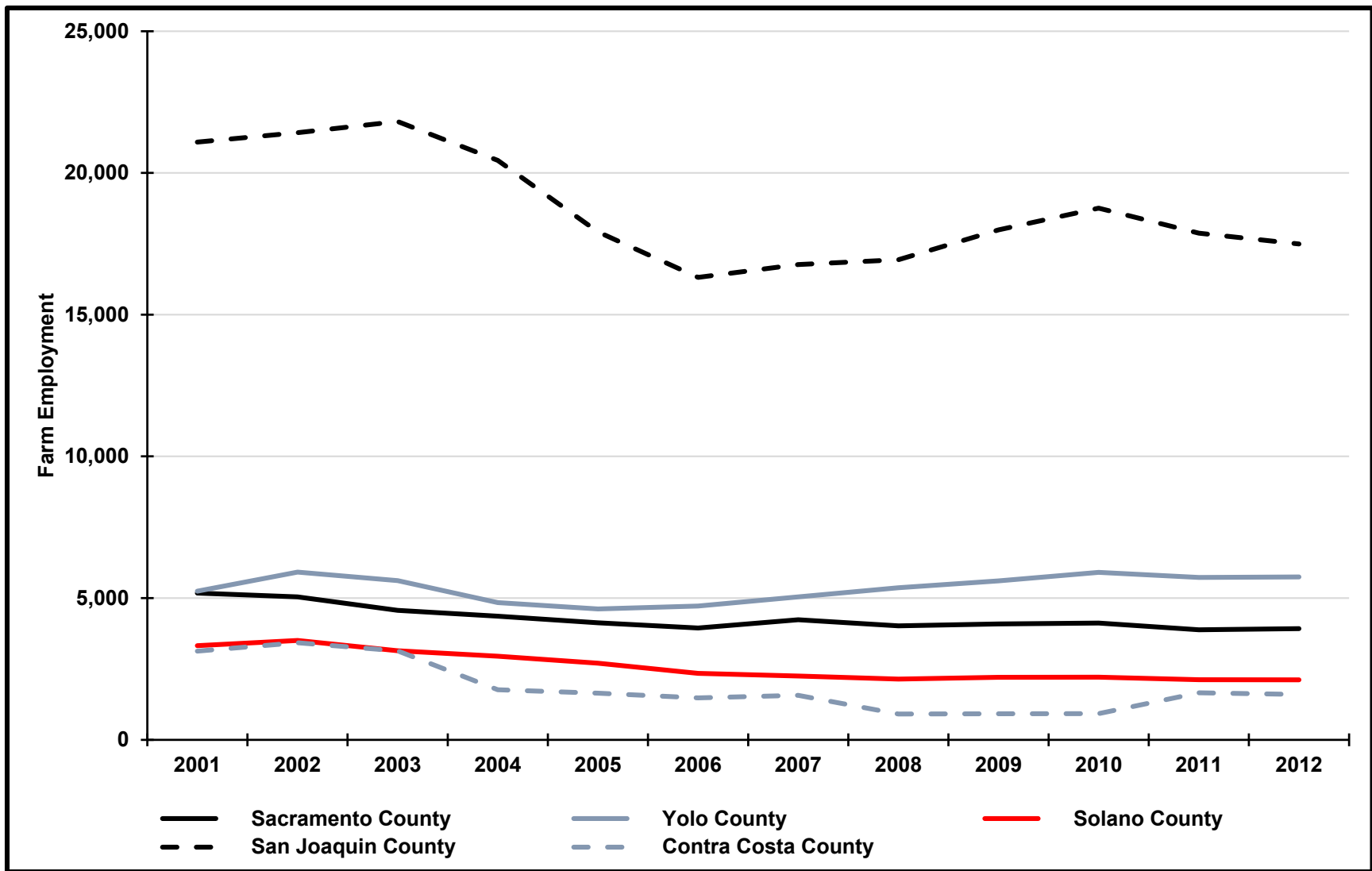


Figure 19.5 Farm Employment in Counties within the Delta and Suisun Marsh Portion of the Central Valley Region

Source: BEA 2014a

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Chapter 20

1 Indian Trust Assets

2 20.1 Introduction

3 This chapter describes Indian Trust Assets (ITAs) in the study area and potential
 4 changes that could occur as a result of implementing the alternatives evaluated in
 5 this Environmental Impact Statement (EIS). Implementation of the alternatives
 6 could affect ITAs through potential changes to the operation of the Central Valley
 7 Project (CVP) and State Water Project (SWP) and ecosystem restoration.

8 20.2 Regulatory Environment and Compliance 9 Requirements

10 Potential actions that could be implemented under the alternatives evaluated in
 11 this EIS could affect ITAs in the areas along the rivers and reservoirs directly
 12 impacted by changes in the operation of CVP or SWP reservoirs and in the
 13 vicinity of lands served by CVP and SWP water supplies. Actions located on
 14 public agency lands, or implemented, funded, or approved by Federal and state
 15 agencies, would need to be compliant with appropriate Federal and state agency
 16 policies and regulations, as summarized in Chapter 4, Approach to Environmental
 17 Analyses.

18 The Federal Indian Trust Asset policies, summarized below and in Chapter 4,
 19 have been used to identify potential areas of change to ITAs that could occur due
 20 to changes in long-term operation of the CVP and/or SWP facilities.

21 The ITAs are legal interests in property held in trust by the U.S. for federally-
 22 recognized Indian tribes or individual Indians. An Indian trust has three
 23 components: (1) the trustee, (2) the beneficiary, and (3) the trust asset. ITAs can
 24 include land, minerals, federally-reserved hunting and fishing rights, federally-
 25 reserved water rights, and in-stream flows associated with trust land.
 26 Beneficiaries of the Indian trust relationship are federally-recognized Indian tribes
 27 with trust land; the U.S. is the trustee. By definition, ITAs cannot be sold, leased,
 28 or otherwise encumbered without approval of the U.S. The characterization and
 29 application of the U.S. trust relationship have been defined by case law that
 30 interprets Congressional acts, executive orders, and historic treaty provisions.

31 The federal government, through treaty, statute or regulation, may take on
 32 specific, enforceable fiduciary obligations that give rise to a trust responsibility to
 33 federally recognized tribes and individual Indians possessing trust assets. Courts
 34 have recognized an enforceable federal fiduciary duty with respect to federal
 35 supervision of Indian money or natural resources, held in trust by the federal
 36 government, where specific treaties, statutes or regulations create such a
 37 fiduciary duty.

1 Consistent with President William J. Clinton’s 1994 memorandum, “Government-
 2 to-Government Relations with Native American Tribal Governments,” Bureau of
 3 Reclamation (Reclamation) assesses the effect of its programs on tribal trust
 4 resources and federally-recognized tribal governments. Reclamation is tasked to
 5 actively engage federally-recognized tribal governments and consult with such
 6 tribes on government-to-government level when its actions affect ITAs (Federal
 7 Register, Vol. 59, No. 85, May 4, 1994, pages 22951-22952). The U.S.
 8 Department of the Interior (DOI) Departmental Manual Part 512.2 ascribes the
 9 responsibility for ensuring protection of ITAs to the heads of bureaus and offices.
 10 DOI is required to carry out activities in a manner that protects ITAs and avoids
 11 adverse effects whenever possible.

12 **20.3 Affected Environment**

13 The U.S. Government's trust responsibility for Indian resources requires
 14 Reclamation and other agencies to take measures to protect and maintain trust
 15 resources. These responsibilities include taking reasonable actions to preserve
 16 and restore tribal resources.

17 In compliance with 36 Code of Federal Register 800.4(a) (4), Reclamation sent
 18 letters to the federally-recognized Indian tribes in the study area, including most
 19 of the tribes listed in Table 20.1, to request their input regarding the identification
 20 of any properties to which they might attach religious and cultural significance to
 21 within the area of potential effect.

22 **Table 20.1 Federally Recognized Tribes in the Vicinity of the Study Area**

Federally Recognized Tribe	EIS Geographical Region	County	In the Vicinity of this Community
Hoopa Valley Tribal Council	Trinity River	Trinity and Humboldt	Hoopa
Resighini Rancheria Tribe	Trinity River	Del Norte	Klamath
Yurok Tribe of the Yurok Reservation	Trinity River	Trinity, Humboldt, and Del Norte	Klamath
Pit River Tribe	Central Valley	Shasta	Burney
Redding Rancheria Tribe	Central Valley	Shasta	Redding
Paskenta Band of Nomlaki Indians of California	Central Valley	Tehama and Glenn	Corning and Orland
Grindstone Indian Rancheria of Wintun-Wailaki Indians of California	Central Valley	Glenn	Elk Creek

Federally Recognized Tribe	EIS Geographical Region	County	In the Vicinity of this Community
Cachil Dehe Band of Wintun Indians of the Colusa Indian Community of the Colusa Rancheria	Central Valley	Colusa	Colusa
Cortina Indian Rancheria of Wintun Indians of California	Central Valley	Colusa	Williams
Tyme Maidu of Berry Creek Rancheria	Central Valley	Butte	Oroville
Konkow Maidu of Mooretown Rancheria	Central Valley	Butte	Oroville
Enterprise Rancheria of Maidu Indians of California	Central Valley	Butte	Oroville
Mechoopda Indian Tribe of Chico Rancheria	Central Valley	Butte	Chico
Miwok Maidu United Auburn Indian Community of the Auburn Rancheria	Central Valley	Placer	Placer
United Auburn Indian Community of the Auburn Rancheria of California	Central Valley	Placer	Rocklin
Shingle Springs Band of Miwok Indians, including Shingle Springs Rancheria	Central Valley	El Dorado and Nevada County	Shingle Springs
Buena Vista Rancheria of Me-Wuk	Central Valley	Sacramento	Sacramento
Wilton Miwok Indians of the Wilton Rancheria	Central Valley	Sacramento	Elk Grove
Yocha Dehe Wintun Nation	Central Valley	Yolo	Brooks
Northfork Rancheria of Mono Indians of California	Central Valley	Madera	North Fork
Picayune Rancheria of Chukchansi Indians of California	Central Valley	Madera	Coarsegold
California Valley Miwok Tribe	Central Valley	San Joaquin	Stockton
Big Sandy Rancheria of Mono Indians of California	Central Valley	Fresno	Auberry

Chapter 20: Indian Trust Assets

Federally Recognized Tribe	EIS Geographical Region	County	In the Vicinity of this Community
Table Mountain Rancheria	Central Valley	Fresno	Friant
Santa Rosa Indian Community of Santa Rosa Rancheria	Central Valley	Kings	Lemoore
Tule River Indian Tribe of the Tule River Reservation of the Yokut Indians	Central Valley	Tulare	Porterville
Santa Ynez Band of Chumash Mission Indians of Santa Ynez Reservation	Central Coast	Santa Barbara	Santa Ynez
Cahuilla Band of Mission Indians of the Cahuilla Reservation	Southern California	San Diego	Anza
Campo Band of Diegueno Mission Indians of the Campo Indian Reservation	Southern California	San Diego	Campo
Capitan Grande Band of Diegueno Mission Indians of California (Barona Reservation and Viejas Reservation)	Southern California	San Diego	Alpine
Ewiiapaayp Band of Kumeyaay Indians	Southern California	San Diego	Alpine
Iipay Nation of Santa Ysabel	Southern California	San Diego	Santa Ysabel
Inaja Band of Diegueno Mission Indians of the Inaja and Cosmit Reservation	Southern California	San Diego	Escondido
Jamul Indian Village of California	Southern California	San Diego	Jamul
La Jolla Band of Luiseño Indians	Southern California	San Diego	Pauma Valley
La Posta Band of Diegueno Mission Indians of the La Posta Indian Reservation	Southern California	San Diego	Boulevard
Los Coyotes Band of Cahuilla and Cupeno Indians	Southern California	San Diego	Warner Springs

Federally Recognized Tribe	EIS Geographical Region	County	In the Vicinity of this Community
Manzanita Band of Diegueno Mission Indians of the Manzanita Reservation	Southern California	San Diego	Boulevard
Mesa Grande Band of Diegueno Mission Indians of the Mesa Grande Reservation	Southern California	San Diego	Santa Ysabel
Pala Band of Luiseño Mission Indians of the Pala Reservation	Southern California	San Diego	Pala
Pauma Band of Luiseño Mission Indians of the Pauma & Yuima Reservation	Southern California	San Diego	Pauma Valley
Rincon Band of Luiseño Mission Indians of the Rincon Reservation	Southern California	San Diego	Valley Center
San Pasqual Band of Diegueno Mission Indians of California	Southern California	San Diego	Valley Center
Sycuan Band of the Kumeyaay Nation	Southern California	San Diego	El Cajon
Agua Caliente Band of Cahuilla Indians of the Agua Caliente Indian Reservation	Southern California	Riverside	Palm Springs
Augustine Band of Cahuilla Indians	Southern California	Riverside	Coachella
Cabazon Band of Mission Indians	Southern California	Riverside	Indio
Morongo Band of Mission Indians	Southern California	Riverside	Banning
Pechanga Band of Luiseño Mission Indians of the Pechanga Reservation	Southern California	Riverside	Temecula
Ramona Band of Cahuilla	Southern California	Riverside	Anza
Santa Rosa Band of Cahuilla Indians	Southern California	Riverside	Mountain Center
Soboba Band of Luiseño Indians	Southern California	Riverside	San Jacinto

Federally Recognized Tribe	EIS Geographical Region	County	In the Vicinity of this Community
Torres-Martinez Desert Cahuilla Indians	Southern California	Riverside	Thermal
Twenty-Nine Palms Band of Mission Indians of California	Southern California	Riverside and San Bernardino	Coachella
Chemehuevi Indian Tribe of the Chemehuevi Reservation	Southern California	San Bernardino	Needles
San Manuel Band of Mission Indians	Southern California	San Bernardino	Highland
Big Lagoon Rancheria	Not within study area	Humboldt	Arcata
Blue Lake Rancheria	Not within study area	Humboldt	Blue Lake
Karuk Tribe	Not within study area	Siskiyou	Happy Camp
Greenville Rancheria of Maidu Indians	Not within study area	Plumas and Tehama	Greenville
Susanville Indian Rancheria	Not within study area	Lassen	Susanville
Lytton Rancheria	Not within study area	Sonoma	Santa Rosa
Chicken Ranch Rancheria of Me-Wuk Indians of California	Not within study area	Tuolumne	Jamestown
Cold Springs Rancheria of Mono Indians	Not within study area	Fresno	Tollhouse
Colorado River Indian Tribes of the Colorado River Indian Reservation	Not within study area	Riverside	Parker, Arizona

1 **20.4 Impact Analysis**

2 This section describes the potential mechanisms for change to ITAs, quantitative
 3 and qualitative analytical methods, effects of the analyses, potential mitigation
 4 measures, and cumulative effects.

20.4.1 Potential Mechanisms for Change and Analytical Tools

As described in Chapter 4, Approach to Environmental Analysis, the environmental consequences assessment considers changes in conditions related to changes in CVP and SWP operation under the alternatives as compared to the No Action Alternative and Second Basis of Comparison.

Changes in CVP and SWP operation under the alternatives as compared to the No Action Alternative and Second Basis of Comparison could change water elevations within the CVP and SWP reservoirs, flow patterns in the rivers downstream of CVP and SWP reservoirs, and CVP and SWP water deliveries. Impacts to existing ITAs would be considered adverse if the action:

- Interfered with the exercise of a federally reserved water right, or degrade water quality where there is a federally reserved water right
- Interfered with the use, value, occupancy, character or enjoyment of an ITA
- Failed to protect ITAs from loss, damage, waste, depletion, or other negative effects

20.4.1.1 Changes in CVP and SWP Reservoir Elevation

There are no ITAs within any of the reservoir inundation areas (DWR 2005; Reclamation 2010, 2012, 2013a, 2014a; Reclamation et al. 2011; USACE et al. 2012). Therefore, the changes in reservoir elevations would not affect ITAs and are not analyzed in this EIS.

20.4.1.2 Changes in Rivers Downstream of CVP and SWP Reservoirs

There are no ITAs within the rivers downstream of CVP and SWP reservoirs (DWR 2005; Reclamation 2010, 2012, 2013a, 2014a; Reclamation et al. 2011; USACE et al. 2012). Therefore, changes in river flow patterns would not directly affect any ITAs. However, changes in river flow patterns in the Trinity River could indirectly affect several ITAs, including the Hoopa Valley Tribe, Resighini Rancheria Tribe, and Yurok Tribe of the Yurok Reservation. Changes in the river flow patterns could affect use of the Trinity River for boats, access to adjacent lands, and fish in the Trinity River that are important to the tribes.

As described in Chapter 5, Surface Water Resources and Water Supplies, implementation of Alternatives 1 through 5 as compared to the No Action Alternative and the Second Basis of Comparison, and the No Action Alternative as compared to the Second Basis of Comparison could affect change river flow patterns in the Trinity River.

20.4.1.3 Changes due to CVP and SWP Water Deliveries

There are no ITAs that directly receive CVP or SWP water. As described in Chapter 19, Socioeconomics, municipalities that use CVP or SWP water supplies, including agencies that serve ITAs, would continue to meet water demands in 2030 if CVP and SWP water supplies are reduced through the increased use of non-CVP and SWP water supplies. Therefore, changes in CVP and SWP water

1 deliveries would not affect water supplies to ITAs and are not analyzed in this
2 EIS.

3 **20.4.1.4 Effects Related to Cross Delta Water Transfers**

4 Cross Delta water transfers involving the CVP and SWP facilities or water
5 supplies would be required to be implemented in accordance with all existing
6 regulations and requirements, including not causing adverse impacts to other
7 water users in accordance with the requirements of Reclamation, California
8 Department of Water Resources (DWR), and the State Water Resources Control
9 Board (SWRCB).

10 Reclamation recently prepared a long-term regional water transfer environmental
11 document which evaluated potential changes in surface water conditions related to
12 water transfer actions (Reclamation 2014d). Results from this analysis were used
13 to inform the impact assessment of potential effects of water transfers under the
14 alternatives as compared to the No Action Alternative and the Second Basis of
15 Comparison.

16 The transfers could change flow patterns in rivers downstream of CVP and SWP
17 reservoirs. Surface water elevations in CVP and SWP reservoirs due to transfer
18 programs under the alternatives and Second Basis of Comparison could be
19 affected for a short-time during a water year; however, because the transferred
20 water would have been released for the seller's use, the end of September storage
21 elevations would be similar with or without the transfer.

22 **20.4.2 Conditions in Year 2030 without Implementation of**
23 **Alternatives 1 through 5**

24 The impact analysis in this EIS is based upon the comparison of the alternatives to
25 the No Action Alternative and the Second Basis of Comparison in the Year 2030.
26 Many of the changed conditions would occur in the same manner under both the
27 No Action Alternative and the Second Basis of Comparison (e.g., climate change,
28 sea-level rise, general plan development, and implementation of reasonable and
29 foreseeable projects). Due to these changes, especially climate change and sea-
30 level rise, it is anticipated that reservoir elevations at the end of September would
31 be lower and flows patterns in the rivers downstream of the reservoirs would be
32 different than under recent condition, as described in Chapter 5, Surface Water
33 Resources and Water Supplies.

34 **20.4.3 Evaluation of Alternatives**

35 As described in Chapter 4, Approach to Environmental Analysis, Alternatives 1
36 through 5 have been compared to the No Action Alternative, and the No Action
37 Alternative and Alternatives 1 through 5 have been compared to the Second Basis
38 of Comparison. The evaluation of alternatives is focused on the Trinity River
39 Region because, as discussed above, potential changes that could affect ITAs are
40 located along the Trinity River.

41 During review of the numerical modeling analyses used in this EIS, an error was
42 determined in the CalSim II model assumptions related to the Stanislaus River

1 operation for the Second Basis of Comparison, Alternative 1, and Alternative 4
 2 model runs. Appendix 5C includes a comparison of the CalSim II model run
 3 results presented in this chapter and CalSim II model run results with the error
 4 corrected. Appendix 5C also includes a discussion of changes in the comparison
 5 of four alternative analyses:

- 6 • No Action Alternative compared to the Second Basis of Comparison
- 7 • Alternative 1 compared to the No Action Alternative
- 8 • Alternative 3 compared to the Second Basis of Comparison
- 9 • Alternative 5 compared to the Second Basis of Comparison

10 **20.4.3.1 No Action Alternative**

11 As described in Chapter 4, Approach to Environmental Analysis, the No Action
 12 Alternative is compared to the Second Basis of Comparison.

13 **20.4.3.1.1 Potential Changes in Trinity River downstream of Lewiston Dam**

14 As described in Chapter 5, Surface Water Resources and Water Supplies, the
 15 following changes would occur on the Trinity River under the No Action
 16 Alternative as compared to the Second Basis of Comparison.

- 17 • Over long-term conditions (over the 82-year analysis period), flows would be
 18 similar (within 5 percent) from March through November, and reduced from
 19 December through February (up to 9.5 percent; 70 cubic feet per second
 20 [cfs]).
- 21 • In wet years, flows would be similar from April through November, and
 22 reduced from December through March (up to 11.2 percent; 160 cfs).
- 23 • In above normal years, flows would be similar from March through
 24 November, and reduced in January and February (up to 19.9 percent; 74 cfs).
- 25 • In below normal years, flows would be similar from March through January,
 26 and reduced in February (30.4 percent, 192 cfs).
- 27 • In dry and Critical dry years, flows would be similar all months.

28 The changes in river flows would occur in the winter months of wetter years when
 29 potential use of the rivers would be less for transportation and ceremonies
 30 (USFWS et al. 1999). As described in Chapter 9, Fish and Aquatic Resources,
 31 these changes in river flows would result in similar conditions for salmonids using
 32 Trinity River. Therefore, there would be no effect the ITAs.

33 **20.4.3.1.2 Effects Related to Cross Delta Water Transfers**

34 As described in Chapter 5, Surface Water Resources and Water Supplies, and
 35 Chapter 7, Groundwater Resources and Groundwater Quality, potential effects on
 36 surface water resources could be similar to those identified in a recent
 37 environmental analysis conducted by Reclamation for long-term water transfers
 38 from the Sacramento Valley to San Joaquin Valley (Reclamation 2014d).
 39 Potential effects were identified as reduced surface water storage in upstream
 40 reservoirs; changes in flow patterns in rivers downstream of the reservoirs if water

1 was released from the reservoirs in patterns that were different than would have
2 been used by the sellers; and groundwater elevation reductions if groundwater
3 substitution was used to provide the water for the transfers. All water transfers
4 would be required to avoid adverse impacts on other water users and biological
5 resources; and water transfer programs would include groundwater mitigation and
6 monitoring plans (see Section 3.A.6.3, Transfers). Therefore, water transfer
7 programs would need to be implemented in a manner that would avoid impacts
8 associated with changes in Trinity Lake storage, Trinity River flow patterns, and
9 groundwater elevation reductions in the Central Valley that could affect ITAs.
10 For the purposes of this EIS, it is anticipated that similar conditions would occur
11 due to cross Delta water transfers under the No Action Alternative as compared to
12 the Second Basis of Comparison, and there would be no effect on the ITAs due to
13 cross Delta water transfers.

14 **20.4.3.2 Alternative 1**

15 Alternative 1 is identical to the Second Basis of Comparison. Alternative 1 is
16 compared to the No Action Alternative and the Second Basis of Comparison.
17 However, because conditions under Alternative 1 are identical to conditions under
18 the Second Basis of Comparison, Alternative 1 is only compared to the No Action
19 Alternative.

20 **20.4.3.2.1 Alternative 1 Compared to the No Action Alternative**

21 *Potential Changes in Trinity River downstream of Lewiston Dam*

22 As described in Chapter 5, Surface Water Resources and Water Supplies, the
23 following changes would occur on the Trinity River under Alternative 1 and the
24 No Action Alternative.

- 25 • Over long-term conditions, flows would be similar from March through
26 November, and increased from December through February (up to
27 10.5 percent, 86 cfs).
- 28 • In wet years, flows would be similar from April through November, and
29 increased from December through March (up to 12.6 percent, 160 cfs).
- 30 • In above normal years, flows would be similar from March through
31 November, and increased in January and February (up to 24.8 percent; 74 cfs).
- 32 • In below normal years, flows would be similar from March through January,
33 and increased in February (30.4 percent, 192 cfs).
- 34 • In dry and critical dry years, flows would be similar all months.

35 The changes in river flows would increase flows in the Trinity River under
36 Alternative 1 as compared to the No Action Alternative. As described in
37 Chapter 9, Fish and Aquatic Resources, these changes in river flows would result
38 in similar conditions for salmonids using Trinity River. Therefore, there would be
39 no effect on the ITAs.

1 *Effects Related to Cross Delta Water Transfers*
 2 As described in Chapter 5, Surface Water Resources and Water Supplies, and
 3 Chapter 7, Groundwater Resources and Groundwater Quality, potential effects on
 4 surface water resources could be similar to those identified in a recent
 5 environmental analysis conducted by Reclamation for long-term water transfers
 6 from the Sacramento to San Joaquin valleys (Reclamation 2014d). Potential
 7 effects were identified as reduced surface water storage in upstream reservoirs;
 8 changes in flow patterns in rivers downstream of the reservoirs if water was
 9 released from the reservoirs in patterns that were different than would have been
 10 used by the seller; and groundwater elevation reductions if groundwater
 11 substitution was used to provide the water for the transfers. All water transfers
 12 would be required to avoid adverse impacts on other water users and biological
 13 resources; and water transfer programs would include groundwater mitigation and
 14 monitoring plans (see Section 3.A.6.3, Transfers). Therefore, water transfer
 15 programs would need to be implemented in a manner that would avoid impacts
 16 associated with changes in Trinity Lake storage, Trinity River flow patterns, and
 17 groundwater elevation reductions in the Central Valley that could affect ITAs.
 18 For the purposes of this EIS, it is anticipated that similar conditions would occur
 19 due to cross Delta water transfers under Alternative 1 as compared to the No
 20 Action Alternative, and there would be no effect on the ITAs due to cross Delta
 21 water transfers.

22 **20.4.3.2.2 Alternative 1 Compared to the Second Basis of Comparison**

23 Alternative 1 is identical to the Second Basis of Comparison.

24 **20.4.3.3 Alternative 2**

25 The ITA conditions under Alternative 2 would be identical to the conditions under
 26 the No Action Alternative; therefore, Alternative 2 is only compared to the
 27 Second Basis of Comparison.

28 **20.4.3.3.1 Alternative 2 Compared to the Second Basis of Comparison**

29 Changes to ITAs under Alternative 2 as compared to the Second Basis of
 30 Comparison would be the same as the impacts described in Section 20.4.3.1,
 31 No Action Alternative.

32 **20.4.3.4 Alternative 3**

33 CVP and SWP operation under Alternative 3 are similar to the Second Basis of
 34 Comparison with modified Old and Middle River flow criteria and New Melones
 35 Reservoir operation.

36 Alternative 3 would include changed water demands for American River water
 37 supplies as compared to the No Action Alternative and Second Basis of
 38 Comparison. Alternative 3 would provide water supplies of up to 17 thousand
 39 acre feet (TAF)/year under a Warren Act Contract for El Dorado Irrigation
 40 District and 15 TAF/year under a CVP water service contract for El Dorado
 41 County Water Agency. These demands are not included in the analysis presented

1 in this section of the EIS. A sensitivity analysis comparing the results of the
2 analysis with and without these demands is presented in Appendix 5B of this EIS.

3 **20.4.3.4.1 Alternative 3 Compared to the No Action Alternative**

4 *Potential Changes in Trinity River downstream of Lewiston Dam*

5 As described in Chapter 5, Surface Water Resources and Water Supplies, the
6 following changes would occur on the Trinity River under Alternative 3 as
7 compared to the No Action Alternative.

- 8 • Over long-term conditions, flows would be similar from March through
9 November, and increased from December through February (up to
10 11.8 percent, 79 cfs).
- 11 • In wet years, flows would be similar from April through October, reduced in
12 November (7.0 percent, 36 cfs), and increased from December through March
13 (up to 15.0 percent, 193 cfs).
- 14 • In above normal years, flows would be similar from March through
15 November, and increased in January and February (up to 24.8 percent; 74 cfs).
- 16 • In dry years, flows would be similar in all months.

17 However, as described in Chapter 9, Fish and Aquatic Resources, these changes
18 in river flows would result in similar conditions for salmonids using Trinity River,
19 and there would be no effect on the ITAs.

- 20 • In above normal years, flows would be similar from March through
21 December, and increased in January and February (up to 22.5 percent; 67 cfs).
- 22 • In below normal years, flows would be similar from March through January,
23 and increased in February (43.3 percent, 192 cfs).
- 24 • In dry years, flows would be similar all months.
- 25 • In Critical dry years, flows would be similar from December through October,
26 and increased in November (20.0 percent, 50 cfs).

27 The changes in river flows would increase flows in the Trinity River under
28 Alternative 3 as compared to the No Action Alternative. As described in
29 Chapter 9, Fish and Aquatic Resources, these changes in river flows would result
30 in similar conditions for salmonids using Trinity River. Therefore, there would be
31 no effect on the ITAs.

32 *Effects Related to Cross Delta Water Transfers*

33 As described in Chapter 5, Surface Water Resources and Water Supplies, and
34 Chapter 7, Groundwater Resources and Groundwater Quality, potential effects on
35 surface water resources could be similar to those identified in a recent
36 environmental analysis conducted by Reclamation for long-term water transfers
37 from the Sacramento to San Joaquin valleys (Reclamation 2014d). Potential
38 effects were identified as: reduced surface water storage in upstream reservoirs;
39 changes in flow patterns in river downstream of the reservoirs if water was
40 released from the reservoirs in patterns that were different than would have been

1 used by the sellers; and groundwater elevation reductions if groundwater
 2 substitution was used to provide the water for the transfers. All water transfers
 3 would be required to avoid adverse impacts on other water users and biological
 4 resources; and water transfer programs would include groundwater mitigation and
 5 monitoring plans (see Section 3.A.6.3, Transfers). Therefore, water transfer
 6 programs would need to be implemented in a manner that would avoid impacts
 7 associated with changes in Trinity Lake storage, Trinity River flow patterns, and
 8 groundwater elevation reductions in the Central Valley that could affect ITAs.
 9 For the purposes of this EIS, it is anticipated that similar conditions would occur
 10 due to cross Delta water transfers under Alternative 3 as compared to the No
 11 Action Alternative, and there would be no effect on the ITAs due to cross Delta
 12 water transfers.

13 **20.4.3.4.2 Alternative 3 Compared to the Second Basis of Comparison**

14 *Potential Changes in Trinity River downstream of Lewiston Dam*

15 As described in Chapter 5, Surface Water Resources and Water Supplies, under
 16 Alternative 3 as compared to the Second Basis of Comparison, flows would be
 17 similar under long-term conditions and all water year types. As described in
 18 Chapter 9, Fish and Aquatic Resources, there would be similar conditions for
 19 salmonids using Trinity River. Therefore, there would be no effect on the ITAs.

20 *Effects Related to Cross Delta Water Transfers*

21 As described in Chapter 5, Surface Water Resources and Water Supplies, and
 22 Chapter 7, Groundwater Resources and Groundwater Quality, potential effects on
 23 surface water resources could be similar to those identified in a recent
 24 environmental analysis conducted by Reclamation for long-term water transfers
 25 from the Sacramento to San Joaquin valleys (Reclamation 2014d). Potential
 26 effects were identified as: reduced surface water storage in upstream reservoirs;
 27 changes in flow patterns in river downstream of the reservoirs if water was
 28 released from the reservoirs in patterns that were different than would have been
 29 used by the sellers; and groundwater elevation reductions if groundwater
 30 substitution was used to provide the water for the transfers. All water transfers
 31 would be required to avoid adverse impacts on other water users and biological
 32 resources; and water transfer programs would include groundwater mitigation and
 33 monitoring plans (see Section 3.A.6.3, Transfers). Therefore, water transfer
 34 programs would need to be implemented in a manner that would avoid impacts
 35 associated with changes in Trinity Lake storage, Trinity River flow patterns, and
 36 groundwater elevation reductions in the Central Valley that could affect ITAs.
 37 For the purposes of this EIS, it is anticipated that similar conditions would occur
 38 due to cross Delta water transfers under Alternative 3 as compared to the Second
 39 Basis of Comparison, and there would be no effect on the ITAs due to cross Delta
 40 water transfers.

41 **20.4.3.5 Alternative 4**

42 The ITA conditions under Alternative 4 would be identical to the ITA conditions
 43 under the Second Basis of Comparison; therefore, Alternative 4 is only compared
 44 to the No Action Alternative.

1 **20.4.3.5.1 Alternative 4 Compared to the No Action Alternative**

2 Changes in ITA conditions under Alternative 4 as compared to the No Action
3 Alternative would be the same as the impacts described in Section 20.4.3.2.1,
4 Alternative 1 Compared to the No Action Alternative.

5 **20.4.3.6 Alternative 5**

6 The CVP and SWP operation under Alternative 5 are similar to the No Action
7 Alternative with modified Old and Middle River flow criteria and New Melones
8 Reservoir operation. Alternative 5 would include changed water demands for
9 American River water supplies as compared to the No Action Alternative or
10 Second Basis of Comparison. Alternative 5 would provide water supplies of up to
11 17 TAF/year under a Warren Act Contract for El Dorado Irrigation District and
12 15 TAF/year under a CVP water service contract for El Dorado County Water
13 Agency. These demands are not included in the analysis presented in this section
14 of the EIS. A sensitivity analysis comparing the results of the analysis with and
15 without these demands is presented in Appendix 5B of this EIS.

16 **20.4.3.6.1 Alternative 5 Compared to the No Action Alternative**

17 *Potential Changes in Trinity River downstream of Lewiston Dam*

18 As described in Chapter 5, Surface Water Resources and Water Supplies, flows
19 under Alternative 5 and the No Action Alternative would be similar under
20 long-term conditions and all water year types. As described in Chapter 9, Fish
21 and Aquatic Resources, there would be similar conditions for salmonids using
22 Trinity River. Therefore, there would be no effect on the ITAs.

23 *Effects Related to Cross Delta Water Transfers*

24 As described in Chapter 5, Surface Water Resources and Water Supplies, and
25 Chapter 7, Groundwater Resources and Groundwater Quality, potential effects on
26 surface water resources could be similar to those identified in a recent
27 environmental analysis conducted by Reclamation for long-term water transfers
28 from the Sacramento to San Joaquin valleys (Reclamation 2014d). Potential
29 effects were identified as: reduced surface water storage in upstream reservoirs;
30 changes in flow patterns in river downstream of the reservoirs if water was
31 released from the reservoirs in patterns that were different than would have been
32 used by the sellers; and groundwater elevation reductions if groundwater
33 substitution was used to provide the water for the transfers. All water transfers
34 would be required to avoid adverse impacts on other water users and biological
35 resources; and water transfer programs would include groundwater mitigation and
36 monitoring plans (see Section 3.A.6.3, Transfers). Therefore, water transfer
37 programs would need to be implemented in a manner that would avoid impacts
38 associated with changes in Trinity Lake storage, Trinity River flow patterns, and
39 groundwater elevation reductions in the Central Valley that could affect ITAs.
40 For the purposes of this EIS, it is anticipated that similar conditions would occur
41 due to cross Delta water transfers under Alternative 5 as compared to the No
42 Action Alternative, and there would be no effect on the ITAs due to cross Delta
43 water transfers.

1 **20.4.3.6.2 Alternative 5 Compared to the Second Basis of Comparison**

2 *Potential Changes in Trinity River downstream of Lewiston Dam*

3 As described in Chapter 5, Surface Water Resources and Water Supplies, the
4 following changes would occur on the Trinity River flows under Alternative 5 and
5 Second Basis of Comparison

- 6 • Over long-term conditions, flows would be similar from March through
7 November and January, and reduced in December and February (up to
8 9.6 percent, 200 cfs).
- 9 • In wet years, flows would be similar from April through November, and
10 reduced in December through March (up to 13.9 percent).
- 11 • In above normal years, flows would be similar from April through December,
12 and reduced in January and February (up to 19.9 percent, 74 cfs).
- 13 • In below normal years, flows would be similar from March through January,
14 and reduced in February (up to 21.5 percent, 135 cfs).
- 15 • In dry and critical dry years, flows would be similar in all months.

16 However, as described in Chapter 9, Fish and Aquatic Resources, these changes
17 in river flows would result in similar conditions for salmonids using Trinity River;
18 and there would be no effect the ITAs.

19 *Effects Related to Cross Delta Water Transfers*

20 As described in Chapter 5, Surface Water Resources and Water Supplies, and
21 Chapter 7, Groundwater Resources and Groundwater Quality, potential effects on
22 surface water resources could be similar to those identified in a recent
23 environmental analysis conducted by Reclamation for long-term water transfers
24 from the Sacramento to San Joaquin valleys (Reclamation 2014d). Potential
25 effects were identified as reduced surface water storage in upstream reservoirs
26 and changes in flow patterns in river downstream of the reservoirs if water was
27 released from the reservoirs in patterns that were different than would have been
28 used by the water seller's; and groundwater elevation reductions if groundwater
29 substitution was used to provide the water for the transfers. All water transfers
30 would be required to avoid adverse impacts on other water users and biological
31 resources; and water transfer programs would include groundwater mitigation and
32 monitoring plans (see Section 3.A.6.3, Transfers). Therefore, water transfer
33 programs would need to be implemented in a manner that would avoid impacts
34 associated with changes in Trinity Lake storage, Trinity River flow patterns, and
35 groundwater elevation reductions in the Central Valley that could affect ITAs.
36 For the purposes of this EIS, it is anticipated that similar conditions would occur
37 due to cross Delta water transfers under Alternative 5 as compared to the Second
38 Basis of Comparison, and there would be no effect on the ITAs due to cross Delta
39 water transfers.

1 **20.4.3.7 Summary of Impact Analysis**

2 The results of the impact analysis of implementation of Alternatives 1 through 5
 3 as compared to the No Action Alternative and the Second Basis of Comparison
 4 are presented in Tables 20.2 and 20.3.

5 **Table 20.2 Comparison of Alternatives 1 through 5 to No Action Alternative**

Alternative	Potential Change	Consideration for Mitigation Measures
Alternative 1	No effects to ITAs	None needed
Alternative 2	No effects to ITAs	None needed
Alternative 3	No effects to ITAs	None needed
Alternative 4	No effects to ITAs	None needed
Alternative 5	No effects to ITAs	None needed

6 **Table 20.3 Comparison of No Action Alternative and Alternatives 1 through 5 to**
 7 **Second Basis of Comparison**

Alternative	Potential Change	Consideration for Mitigation Measures
No Action Alternative	No effects to ITAs	None needed
Alternative 1	No effects to ITAs	None needed
Alternative 2	No effects to ITAs	None needed
Alternative 3	No effects to ITAs	None needed
Alternative 4	No effects to ITAs	None needed
Alternative 5	No effects to ITAs	None needed

8 **20.4.3.8 Potential Mitigation Measures**

9 Mitigation measures are presented in this section to avoid, minimize, rectify,
 10 reduce, eliminate, or compensate for adverse environmental effects of
 11 Alternatives 1 through 5 as compared to the No Action Alternative. Mitigation
 12 measures were not included to address adverse impacts under the alternatives as
 13 compared to the Second Basis of Comparison because this analysis was included
 14 in this EIS for information purposes only.

15 Changes under Alternatives 1 through 5 as compared to the No Action Alternative
 16 would result in similar or increased flows in the Trinity River, and
 17 implementation of cross Delta water transfers would not result in adverse impacts
 18 to ITAs. Therefore, there would be no adverse impacts to ITAs, and no
 19 mitigation measures are needed.

20 **20.4.3.9 Cumulative Effects Analysis**

21 As described in Chapter 3, the cumulative effects analysis considers projects,
 22 programs, and policies that are not speculative, and are based upon known or

1 reasonably foreseeable long-range plans, regulations, operating agreements, or
 2 other information that establishes them as reasonably foreseeable.
 3 The cumulative effects analysis for Alternatives 1 through 5 to Indian Trust
 4 Assets are summarized in Table 20.4. As described in this chapter, potential
 5 changes to Indian Trust Assets would be associated with changes in flows in the
 6 Trinity River.

7 **Table 20.4 Summary of Cumulative Effects on Indian Trust Assets with**
 8 **Implementation of Alternatives 1 through 5 as Compared to the No Action**
 9 **Alternative**

Scenarios	Actions	Cumulative Effects of Actions
Past & Present, and Future Actions included in the No Action Alternative and All Alternatives in Year 2030	Consistent with Affected Environment conditions plus: Actions in the 2008 USFWS BO and 2009 NMFS BO that would have occurred without implementation of the BOs, as described in Section 3.3.1.2 (of Chapter 3, Descriptions of Alternatives), including climate change and sea level rise Actions not included in the 2008 USFWS BO and 2009 NMFS BO that would have occurred without implementation of the BOs, as described in Section 3.3.1.3 (of Chapter 3, Descriptions of Alternatives): - Trinity River Restoration Program. - Central Valley Project Improvement Act programs	<u>These effects would be the same under all alternatives.</u> Climate change and sea level rise are anticipated to reduce carryover storage in reservoirs, including Trinity Lake, and changes in stream flow patterns, including Trinity River, in a manner that would change beneficial use of the Trinity River, including salmon fishing. Other ongoing actions, including Trinity River Restoration Program, would improve water quality and/or habitat along the Trinity River.
Future Actions considered as Cumulative Effects Actions in All Alternatives in Year 2030	Actions as described in Section 3.5 (of Chapter 3, Descriptions of Alternatives): - Bay-Delta Water Quality Control Plan Update - FERC Relicensing Projects - Bay Delta Conservation Plan (including the California WaterFix alternative) - Shasta Lake Water Resources, North-of-the-Delta Offstream Storage, Los Vaqueros Reservoir Expansion Phase 2, and Upper San Joaquin River Basin Storage Investigations - El Dorado Water and Power Authority Supplemental Water Rights Project - Semitropic Water Storage District Delta Wetlands - North Bay Aqueduct Alternative Intake	<u>These effects would be the same under all alternatives.</u> Based upon environmental documents prepared for these programs, changes to the Trinity River flows are not anticipated due to implementation of these programs.

Scenarios	Actions	Cumulative Effects of Actions
No Action Alternative with Associated Cumulative Effects Actions in Year 2030	Full implementation of the 2008 USFWS BO and 2009 NMFS BO	Implementation of No Action Alternative with reasonably foreseeable actions would result in changes Trinity Lake carryover storage and Trinity River flows which would result in changes to beneficial use opportunities for Indian Trust Assets as compared to historical conditions prior to the BOs.
Alternative 1 with Associated Cumulative Effects Actions in Year 2030	No implementation of the 2008 USFWS BO and 2009 NMFS BO actions unless the actions would have been implemented without the BO (e.g., Red Bluff Pumping Plant)	Implementation of Alternative 1 with reasonably foreseeable actions would result in similar conditions for Indian Trust Assets as for the No Action Alternative with the added actions.
Alternative 2 with Associated Cumulative Effects Actions in Year 2030	Full implementation of the 2008 USFWS BO and 2009 NMFS BO CVP and SWP operational actions No implementation of structural improvements or other actions that require further study to develop a more detailed action description.	Implementation of Alternative 2 with reasonably foreseeable actions would result in similar conditions for Indian Trust Assets as for the No Action Alternative with the added actions.
Alternative 3 with Associated Cumulative Effects Actions in Year 2030	No implementation of the 2008 USFWS BO and 2009 NMFS BO actions unless the actions would have been implemented without the BO (e.g., Red Bluff Pumping Plant) Slight increase in positive Old and Middle River flows in the winter and spring months	Implementation of Alternative 3 with reasonably foreseeable actions would result in similar conditions for Indian Trust Assets as for the No Action Alternative with the added actions.
Alternative 4 with Associated Cumulative Effects Actions in Year 2030	No implementation of the 2008 USFWS BO and 2009 NMFS BO actions unless the actions would have been implemented without the BO (e.g., Red Bluff Pumping Plant)	Implementation of Alternative 4 with reasonably foreseeable actions would result in similar conditions for Indian Trust Assets as for the No Action Alternative with the added actions.
Alternative 5 with Associated Cumulative Effects Actions in Year 20530	Full implementation of the 2008 USFWS BO and 2009 NMFS BO Positive Old and Middle River flows and increased Delta outflow in spring months	Implementation of Alternative 5 with reasonably foreseeable actions would result in similar conditions for Indian Trust Assets as for the No Action Alternative with the added actions.

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7 Valley Tribe, and Trinity County). 1999. *Trinity River Mainstem Fishery*
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Chapter 21

1 Environmental Justice

2 21.1 Introduction

3 This chapter describes the presence of environmental justice populations in the
 4 study area and potential changes that could have disproportionately high and
 5 adverse human health or environmental effects on minority and/or low-income
 6 populations as a result of implementing the alternatives evaluated in this
 7 Environmental Impact Statement (EIS). Implementation of the alternatives could
 8 affect conditions through potential changes in operation of the Central Valley
 9 Project (CVP) and State Water Project (SWP) and ecosystem restoration.

10 21.2 Regulatory Environment and Compliance 11 Requirements

12 This chapter was prepared in compliance with Presidential Executive Order
 13 12898, *Federal Actions to Address Environmental Justice in Minority Populations*
 14 *and Low-Income Populations*, dated February 11, 1994 and Title VI of the Civil
 15 Rights Act of 1964.

16 Potential actions that could be implemented under the alternatives evaluated in
 17 this EIS could have disproportionately high and adverse human health or
 18 environmental effects on minority and/or low-income populations. Actions
 19 located on public agency lands; or implemented, funded, or approved by Federal
 20 and state agencies would need to be compliant with appropriate Federal and state
 21 agency policies and regulations, as summarized in Chapter 4, Approach to
 22 Environmental Analyses.

23 21.3 Affected Environment

24 This section describes changes that could result in disproportionately high and
 25 adverse human health or environmental effects on minority and/or low-income
 26 populations due to changes in CVP and SWP operations. The conditions
 27 described in this chapter are related to the distribution of minority populations and
 28 populations below poverty levels.

29 21.3.1 Area of Analysis

30 A summary of conditions are described in this section of the EIS for the following
 31 regions that could be affected by implementation of alternatives analyzed in this
 32 EIS, as described in Chapter 4, Approach to Environmental Analysis.

- 33 • Trinity River Region
- 34 • Central Valley Region

- 1 • San Francisco Bay Area Region
- 2 • Central Coast Region
- 3 • Southern California Region

4 **21.3.2 Characterization of Conditions Considered in the** 5 **Environmental Justice Analysis**

6 Characterization of the conditions within the Study Area is based upon publically
7 available data from government websites and other data sources. The data
8 sources used include the 2010 U.S. Census Bureau data on minority populations
9 and the 2010 American Community Survey (ACS) 5-year population estimates on
10 populations below the poverty level.

11 **21.3.2.1 Determination of Minority Populations**

12 The U.S. Census Bureau provides a total population value for each county, which
13 are also used by the State Department of Finance, as presented in Chapter 14,
14 Socioeconomics. The U.S. Census Bureau also provides a definition of minority
15 and low income populations. Minority populations are defined by the
16 U.S. Census as racial and ethnic minorities. Racial minorities, as defined by the
17 U.S. Census, include people who identified themselves in the census as belonging
18 to one of the following categories:

- 19 • Single Race
 - 20 – Black/African American
 - 21 – American Indian and Alaskan Native
 - 22 – Asian
 - 23 – Native Hawaiian and Other Pacific Islander
 - 24 – Some Other Race
- 25 • Two or More Races (inclusive the races listed above and White).

26 Ethnic minorities, as defined by the U.S. Census, include individuals who
27 identified themselves as being of Hispanic or Latino origin by responding to one
28 of the following categories in the census:

- 29 • Mexican
- 30 • Mexican American
- 31 • Chicano
- 32 • Puerto Rican
- 33 • Cuban
- 34 • Other Spanish/Hispanic/Latino

35 Individuals who identified themselves of Hispanic or Latino origin maybe of one
36 or more races according to the U.S. Census.

37 **21.3.2.2 Determination of Populations below the Poverty Level**

38 Populations below the Federal poverty level can be identified using several
39 methodologies. The information presented in this chapter has been developed in
40 ACS reports by the U.S. Census Bureau based upon 48 different sets of dollar

1 value thresholds related to family size and ages. The poverty level is assigned at
 2 the family-level and affects every member of the family. The thresholds are
 3 consistent throughout the United States and do not consider geographic
 4 differentials. The thresholds are updated each year based on the Consumer Price
 5 Index. For the five-year ACS reporting period used in this chapter, separate
 6 thresholds are applied to each year in this continuous survey. Other federal
 7 agencies rely upon different poverty statistics including the Current Population
 8 Survey Annual Social and Economic Supplement and the U.S. Department of
 9 Health and Human Services poverty guidelines.

10 The population for whom poverty level is estimated by ACS is smaller value than
 11 the total population values presented in Chapter 14, Socioeconomics, for each
 12 county and the equivalent population values used for the distribution of the
 13 population by race and ethnicity. The population values to determine poverty
 14 rates do not include institutionalized individuals (e.g., military personnel that live
 15 in group quarters, students that live in college dormitories, and prison inmates.
 16 The U.S. Census Bureau designates geographical areas with poverty rates at and
 17 above 20 percent as “poverty areas.”

18 **21.3.2.3 Social Services**

19 The need for and delivery of social services within each county is another
 20 indication of social conditions, including Federal grants to the state and local
 21 agencies for Medicaid, other health related activities, and nutrition and family
 22 welfare; and Federal direct payments made to individuals under the CalFresh
 23 (previously referred to as “Food Stamps”) and supplemental social security
 24 income.

25 **21.3.2.4 Limited English Proficiency**

26 Another consideration related to environmental justice is the ability of the Federal
 27 government to provide access to federally conducted and assisted programs and
 28 activities to all people who, as a result of their national origin, are limited in their
 29 English proficiency (LEP). These individuals are not able to speak, read, write, or
 30 understand the English language at a level that permits them to interact effectively
 31 with Federal employees who provide Federal services. Therefore, these
 32 individuals are often excluded from Federal programs, do not receive all available
 33 Federal services, and/or experience delays when interacting with Federal
 34 programs. The Executive Order 13166 became effective on August 11, 2000 to
 35 ensure meaningful participation by individuals who have limited English
 36 proficiency in federally conducted and federally assisted programs and activities.
 37 This information is compiled and reported by the U.S. Census Bureau.

38 **21.3.3 Trinity River Region**

39 The Trinity River Region includes the area in Trinity County along the Trinity
 40 River from Trinity Lake to the confluence with the Klamath River; and in
 41 Humboldt and Del Norte counties along the Lower Klamath River from the
 42 confluence with the Trinity River to the Pacific Ocean. Tribal lands along the
 43 Trinity or Lower Klamath River within the Trinity River Region include the

1 Hoopa Valley Indian Reservation, Yurok Indian Reservation, and Resighini
2 Rancheria.

3 **21.3.3.1 Minority Populations**

4 As recorded in the 2010 Census, the Trinity River Region had a total population
5 of 177,019 (U.S. Census 2014a). About 24.3 percent of this population identified
6 themselves as a racial minority and/or of Hispanic or Latino origin, regardless of
7 race, as presented in Table 21.1 (U.S. Census 2014a, 2014b, 2014c, 2014d).
8 There are fewer minorities in the Trinity River Region than in the entire State of
9 California.

10 **21.3.3.2 Poverty Levels**

11 Poverty levels presented in Table 21.2 are calculated on a subset of the total
12 population of a county, as described above in section 21.3.2, Characterization of
13 Conditions Considered in the Environmental Justice Analysis. Of the total
14 population for whom poverty is determined in the Trinity River Region,
15 167,987 individuals (or 18.2 percent) were below the poverty level based on the
16 2006–2010 ACS 5-year dataset (U.S. Census 2014e). The U.S. Census Bureau
17 defines geographical areas with more than 20 percent of the population below the
18 poverty level as a “poverty areas.” Both Humboldt and Del Norte counties are
19 defined as poverty areas.

20 Poverty rates based upon the 2000 census were reported as 40 percent for Indians
21 on the Yurok Indian Reservation, 34 percent of the Indians on the Hoopa Valley
22 Indian Reservation, and 54 percent of the Indians on and off Karuk Reservation
23 trust lands (NMFS 2012a, 2012b, 2012c). The Yurok Tribe has reported an
24 average poverty rate of 80 percent of the Indians on the Yurok Indian Reservation
25 (Yurok Tribe 2014a). Average per capita income of residents on the Resighini
26 Rancheria (not limited to Resighini Rancheria members) in 1999 was reported to
27 be approximately 46 percent of the average per capita income in Del Norte
28 County (NMFS 2012d).

29 **21.3.3.3 Social Services**

30 Federal grants to the state and local agencies for Medicaid, other health related
31 activities, and nutrition and family welfare; and Federal direct payments made to
32 individuals under the CalFresh (previously referred to as “Food Stamps”) and
33 supplemental social security income within counties in the Trinity River Region
34 are summarized in Table 21.3.

35 Social services to tribal members are funded by the tribe and/or the federal
36 government (DOI and DFG 2012). The Hoopa Valley Tribe provides food
37 distribution and other social services, including Temporary Assistance for Needy
38 Families (TANF) which receives some assistance from Humboldt County social
39 services to provide cash assistance, utility billing assistance, childcare,
40 educational assistance, job development, substance abuse assistance, and family
41 assistance (Hoopa Tribe 2014 a, 2014b). The Yurok Tribe provides a wide range
42 of services, including general assistance, food distribution, Indian Child welfare,
43 low income energy assistance, Yurok Youth Program, emergency and temporary

1 assistance, and Yurok Domestic Violence/Sexual Assault Project (Yurok
2 Tribe 2014b).

3 **21.3.3.4 Limited English Proficiency**

4 The percent of the population that speaks English and other languages at home
5 and the percent of the population that speak English “less than very well” based
6 on the language they speak at home are presented in Tables 21.4 and 21.5.

7 **21.3.4 Central Valley Region**

8 The Central Valley Region includes the Sacramento Valley, San Joaquin Valley,
9 and Delta and Suisun Marsh subregions.

10 **21.3.4.1 Sacramento Valley**

11 The Sacramento Valley includes the counties of Shasta, Plumas, Tehama, Glenn,
12 Colusa, Butte, Sutter, Yuba, Nevada, Placer, and El Dorado counties.
13 Sacramento, Yolo, and Solano counties also are located within the Sacramento
14 Valley; however, these counties are discussed below as part of the Delta and
15 Suisun Marsh subsection. Other counties in this region are not anticipated to be
16 affected by changes in CVP and SWP operations, and are not discussed here,
17 including: Alpine, Sierra, Lassen, and Amador counties.

18 **21.3.4.1.1 Minority Populations**

19 As recorded in the 2010 U.S. Census, the Sacramento Valley portion of the
20 Central Valley Region had a total population of 1,325,380 in 2010. About
21 25.8 percent of this population identified themselves as a racial minority and/or of
22 Hispanic or Latino origin, regardless of race, as presented in Table 21.6. The
23 table also shows the minority population distribution for the entire Central Valley
24 Region and the State of California.

1 **Table 21.1 Minority Population Distribution in Trinity River Region in 2010**

Areas	Total Population	Races							Hispanic or Latino Origin	Total Minority ^a
		White	Black/ African American	American Indian and Native Alaskan	Asian	Native Hawaiian and Other Pacific Islander	Some Other Race	Two or More Races		
Trinity County	13,786	87.3%	0.4%	4.8%	0.7%	0.1%	1.6%	5.2%	7.0%	16.5%
Humboldt County	134,623	81.7%	1.1%	5.7%	2.2%	0.3%	3.7%	5.3%	9.8%	22.8%
Del Norte County	28,610	73.7%	3.5%	7.8%	3.4%	0.1%	6.9%	4.5%	17.8%	35.3%
Trinity River Region	177,019	80.8%	1.4%	6.0%	2.3%	0.2%	4.1%	5.2%	10.9%	24.3%
STATE OF CALIFORNIA	37,253,956	57.6%	6.2%	1.0%	13.0%	0.4%	17.0%	4.9%	40.1%	59.9%

2 Sources: U.S. Census 2014a, 2014b, 2014c, 2014d

3 Note:

4 a. Total Minority is an aggregation of all non-white racial groups and includes all individuals of Hispanic or Latino origin, regardless of race.

1 **Table 21.2 Population below Poverty Level in Trinity River Region, 2006–2010**

Areas	Total Population ^a	Population Below Poverty Level	Percent of Population Below Poverty Level
Trinity County	13,225	1,993	15.1%
Humboldt County	129,592	22,973	17.7%
Del Norte County	25,170	5,526	22.0%
Trinity River Region	167,987	30,492	18.2%
STATE OF CALIFORNIA	35,877,036	4,919,945	13.7%

2 Source: U.S. Census 2014e

3 Note: a. Population numbers are only those for whom poverty status was determined and exclude institutionalized individuals

4 **Table 21.3 Federal Funds Distributed for Social Programs in Trinity River Region in 2010**

Areas	Grants (millions of dollars)		Distributed to Individuals (millions of dollars)
	Medicaid and Other Health-Related Items	Nutrition and Family Welfare	CalFresh Benefits and Supplemental Security Income
Trinity County	\$12.5	\$4.9	\$6.6
Humboldt County	\$167.8	\$36.0	\$65.6
Del Norte County	\$28.8	\$10.1	\$19.1
Trinity River Region	\$209.1	\$51.0	\$91.3
STATE OF CALIFORNIA	\$41,931.1	\$11,743.7	\$12,469.4

5 Source: Gaquin and Ryan 2013

1 **Table 21.4 Top Five Non-English Languages Spoken at Home as a Proportion of the Total Population Five Years and Older in the Trinity**
 2 **River Region, 2006–2010**

Areas	Only English	Spanish/ Spanish Creole	Portuguese/ Portuguese Creole	German	Tagalog	Hmong	Total Excluding English
Trinity County	93.9%	3.8%	0.0%	0.3%	0.1%	0.0%	4.2%
Humboldt County	90.8%	5.7%	0.4%	0.3%	0.3%	0.0%	6.8%
Del Norte County	83.3%	11.6%	0.1%	0.5%	0.5%	1.6%	14.2%
Trinity River Region	89.8%	6.5%	0.4%	0.3%	0.3%	0.3%	7.8%
STATE OF CALIFORNIA	57.0%	28.5%	0.2%	0.3%	2.2%	0.2%	31.4%

3 Source: U.S. Census 2014f

4 **Table 21.5 Percent of Population Speaking One of the Top Five Non-English Languages Spoken at Home in the Trinity River Region that**
 5 **Speaks English “Less than Very Well” as a Proportion of the Total Population Five Years and Older, 2006–2010**

Areas	Spanish/ Spanish Creole	Portuguese/ Portuguese Creole	German	Tagalog	Hmong
Trinity County	1.4%	0.0%	0.0%	0.0%	0.0%
Humboldt County	2.3%	0.2%	0.1%	0.1%	0.0%
Del Norte County	3.1%	0.0%	0.1%	0.1%	0.6%
Trinity River Region	2.4%	0.1%	0.1%	0.1%	0.1%
STATE OF CALIFORNIA	13.6%	0.1%	0.05%	0.7%	0.1%

6 Source: U.S. Census 2014f

1 **Table 21.6 Minority Population Distribution in the Central Valley Region–Sacramento Valley in 2010**

Areas	Total Population	Races							Hispanic or Latino Origin	Total Minority ^a
		White	Black/ African American	American Indian and Native Alaskan	Asian	Native Hawaiian and Other Pacific Islander	Some Other Race	Two or More Races		
Shasta County	177,223	86.7%	0.9%	2.8%	2.5%	0.2%	2.5%	4.4%	8.4%	17.6%
Plumas County	20,007	89.0%	1.0%	2.7%	0.7%	0.1%	3.0%	3.6%	8.0%	15.0%
Tehama County	63,463	81.5%	0.6%	2.6%	1.0%	0.1%	9.9%	4.3%	21.9%	28.1%
Glenn County	28,122	71.1%	0.8%	2.2%	2.6%	0.1%	19.6%	3.6%	37.5%	44.1%
Colusa County	21,419	64.7%	0.9%	2.0%	1.3%	0.3%	27.3%	3.6%	55.1%	60.2%
Butte County	220,000	81.9%	1.6%	2.0%	4.1%	0.2%	5.5%	4.7%	14.1%	24.8%
Yuba County	72,155	68.4%	3.3%	2.3%	6.7%	0.4%	11.8%	7.1%	25.0%	41.2%
Nevada County	98,764	91.4%	0.4%	1.1%	1.2%	0.1%	2.7%	3.2%	8.5%	13.5%
Sutter County	94,737	61.0%	2.0%	1.4%	14.4%	0.3%	15.3%	5.6%	28.8%	49.6%
Placer County	348,432	83.5%	1.4%	0.9%	5.9%	0.2%	3.8%	4.3%	12.8%	23.9%
El Dorado County	181,058	86.6%	0.8%	1.1%	3.5%	0.2%	4.0%	3.8%	12.1%	20.1%
Sacramento Valley Subtotal	1,325,380	81.7%	1.3%	1.6%	4.7%	0.2%	6.1%	4.5%	23.1%	25.8%
Central Valley Region	8,379,045	61.4%	6.3%	1.3%	9.5%	0.4%	15.7%	5.4%	42.6%	53.5%
STATE OF CALIFORNIA	37,253,956	57.6%	6.2%	1.0%	13.0%	0.4%	17.0%	4.9%	37.6%	59.9%

2 Sources: U.S. Census 2014a, 2014g, 2014h, 2014i, 2014j, 2014k, 2014l, 2014m, 2014n, 2014o, 2014p, 2014q

3 Note:

4 a. Total Minority is an aggregation of all non-white racial groups and includes all individuals of Hispanic or Latino origin, regardless of race.

1 **21.3.4.1.2 Poverty Levels**

2 Poverty levels presented in Table 21.7 are calculated on a subset of the total
3 population of a county, as described above in section 21.3.2, Characterization of
4 Conditions Considered in the Environmental Justice Analysis. Of the total
5 population for whom poverty status is determined within the Sacramento Valley
6 portion of the Central Valley Region, 1,288,594 individuals, 12.6 percent were
7 below the poverty level based on the 2006–2010 ACS 5-year dataset (U.S. Census
8 2014e).

9 The U.S. Census Bureau defines geographical areas with more than 20 percent of
10 the population below the poverty level as a “poverty areas.” There are no
11 counties in this area defined as poverty areas; although, 20 percent of the
12 populations in Tehama and Yuba counties are below the poverty level.

13 **21.3.4.1.3 Social Services**

14 Federal grants to the state and local agencies for Medicaid, other health related
15 activities, and nutrition and family welfare; and Federal direct payments made to
16 individuals under the CalFresh and supplemental social security income within
17 counties in the Sacramento Valley portion of the Central Valley Region are
18 summarized in Table 21.8.

19 **21.3.4.1.4 Limited English Proficiency**

20 The percent of the population that speaks English and other languages at home
21 and the percent of the population that speak English “less than very well” based
22 on the language they speak at home are presented in Tables 21.9 and 21.10.

23 **21.3.4.2 San Joaquin Valley**

24 The San Joaquin Valley includes the counties of Stanislaus, Merced, Madera,
25 Fresno, Kings, Tulare, and Kern counties. San Joaquin County also is located
26 within the San Joaquin Valley; however, this county is discussed below as part of
27 the Delta and Suisun Marsh subsection. Other counties in this region are not
28 anticipated to be affected by changes in CVP and SWP operations, and are not
29 discussed here, including: Calaveras, Mariposa, and Tuolumne counties.

30 **21.3.4.2.1 Minority Populations**

31 As recorded in the 2010 U.S. Census, the San Joaquin Valley portion of the
32 Central Valley Region had a total population of 3,286,353 in 2010. About
33 63.3 percent of this population identified themselves as a racial minority and/or of
34 Hispanic or Latino origin, regardless of race, as presented in Table 21.11. The
35 table also shows the minority population distribution for the entire Central Valley
36 Region and the State of California.

1 **Table 21.7 Population below Poverty Level in the Central Valley Region–**
 2 **Sacramento Valley, 2006–2010**

Areas	Total Population ^a	Population Below Poverty Level	Percent of Population Below Poverty Level
Shasta County	174,180	28,772	16.5%
Plumas County	20,179	2,437	12.1%
Tehama County	61,201	12,397	20.3%
Glenn County	27,853	4,875	17.5%
Colusa County	20,768	3,107	15.0%
Butte County	213,501	39,290	18.4%
Yuba County	68,848	13,760	20.0%
Nevada County	97,209	8,740	9.0%
Sutter County	92,477	13,194	14.3%
Placer County	334,718	22,090	6.6%
El Dorado County	177,660	14,003	7.9%
Sacramento Valley Subtotal	1,288,594	162,665	12.6%
Central Valley Region	8,025,054	1,268,984	15.8%
STATE OF CALIFORNIA	35,877,036	4,919,945	13.7%

3 Source: U.S. Census 2014e

4 Note: a. Population numbers are only those for whom poverty status was determined and exclude
 5 institutionalized individuals

1 **Table 21.8 Federal Funds Distributed for Social Programs in the Central Valley**
 2 **Region – Sacramento Valley in 2010**

Areas	Grants (millions of dollars)		Distributed to Individuals (millions of dollars)
	Medicaid and Other Health- Related Items	Nutrition and Family Welfare	CalFresh Benefits and Supplemental Security Income
Shasta County	\$199.0	\$50.8	\$93.5
Plumas County	\$19.3	\$7.9	\$5.9
Tehama County	\$61.6	\$17.5	\$23.1
Glenn County	\$25.3	\$10.6	\$11.3
Colusa County	\$18.6	\$8.2	\$6.5
Butte County	\$263.4	\$44.7	\$104.9
Yuba County	\$125.0	\$21.8	\$45.2
Nevada County	\$53.8	\$15.4	\$16.1
Sutter County	\$76.4	\$20.1	\$28.8
Placer County	\$139.2	\$44.8	\$43.2
El Dorado County	\$62.5	\$32.4	\$29.0
Sacramento Valley Subtotal	\$1,044.1	\$274.2	\$407.5
Central Valley Region	\$8,759.9	\$4,308.9	\$3,179.8
STATE OF CALIFORNIA	\$41,931.1	\$11,743.7	\$12,469.4

3 Source: Gaquin and Ryan 2013

1 **Table 21.9 Top Five Non-English Languages Spoken at Home as a Proportion of the Total Population Five Years and Older in the Central**
 2 **Valley Region – Sacramento Valley, 2006–2010**

Areas	Only English	Spanish/ Spanish Creole	Tagalog	German	Chinese	Hmong	Total Excluding English
Shasta County	91.5%	4.6%	0.3%	0.6%	0.3%	0.01%	5.7%
Plumas County	92.4%	5.9%	0.1%	0.4%	0.6%	0.0%	7.0%
Tehama County	80.4%	16.9%	0.1%	0.4%	0.2%	0.02%	17.7%
Glenn County	67.4%	29.6%	0.1%	0.2%	0.0%	0.0%	29.8%
Colusa County	54.3%	44.1%	0.4%	0.1%	0.3%	0.0%	44.8%
Butte County	85.4%	9.3%	0.3%	0.3%	0.5%	1.3%	11.7%
Yuba County	74.4%	17.8%	0.8%	0.4%	0.3%	3.1%	22.3%
Nevada County	93.4%	4.1%	0.1%	0.8%	0.1%	0.0%	5.1%
Sutter County	65.5%	20.5%	0.5%	0.4%	0.5%	0.1%	21.9%
Placer County	86.1%	6.3%	1.3%	0.4%	0.7%	0.1%	8.7%
El Dorado County	88.2%	7.3%	0.4%	0.6%	0.5%	0.02%	9.0%
Sacramento Valley Subtotal	84.4%	9.7%	0.6%	0.5%	0.5%	0.4%	11.6%
Central Valley Region	66.2%	23.1%	1.7%	0.3%	1.2%	0.8%	27.1%
STATE OF CALIFORNIA	57.0%	28.5%	2.2%	0.3%	2.9%	0.2%	34.1%

3 Source: U.S. Census 2014f

1 **Table 21.10 Percent of Population Speaking One of the Top Five Non-English Languages Spoken at Home in the Central Valley Region –**
 2 **Sacramento Valley that Speaks English “Less than Very Well” as a Proportion of the Total Population Five Years and Older, 2006–2010**

Areas	Spanish/ Spanish Creole	Tagalog	German	Chinese	Hmong
Shasta County	1.4%	0.1%	0.05%	0.1%	0.01%
Plumas County	1.8%	0.0%	0.00%	0.6%	0.0%
Tehama County	8.0%	0.1%	0.04%	0.1%	0.0%
Glenn County	13.3%	0.0%	0.1%	0.0%	0.0%
Colusa County	24.7%	0.0%	0.02%	0.3%	0.0%
Butte County	3.8%	0.1%	0.04%	0.4%	0.8%
Yuba County	9.2%	0.2%	0.1%	0.2%	2.1%
Nevada County	2.1%	0.1%	0.1%	0.06%	0.0%
Sutter County	12.3%	0.1%	0.02%	0.2%	0.03%
Placer County	2.7%	0.4%	0.05%	0.3%	0.07%
El Dorado County	3.3%	0.1%	0.1%	0.2%	0.0%
Sacramento Valley Subtotal	4.6%	0.2%	0.06%	0.2%	0.3%
Central Valley Region	10.8%	0.5%	0.04%	0.06%	0.4%
STATE OF CALIFORNIA	13.6%	0.7%	0.04%	1.6%	0.1%

3 Source: U.S. Census 2014f

1 **Table 21.11 Minority Population Distribution in the Central Valley Region – San Joaquin Valley in 2010**

Areas	Total Population	Races							Hispanic or Latino Origin	Total Minority ^a
		White	Black/ African American	American Indian and Native Alaskan	Asian	Native Hawaiian and Other Pacific Islander	Some Other Race	Two or More Races		
Stanislaus County	514,453	65.6%	2.9%	1.1%	5.1%	0.7%	19.3%	5.4%	41.9%	53.3%
Madera County	150,865	62.6%	3.7%	2.7%	1.9%	0.1%	24.8%	4.2%	53.7%	62.0%
Merced County	255,793	58.0%	3.9%	1.4%	7.4%	0.2%	24.5%	4.7%	54.9%	68.1%
Fresno County	930,450	55.4%	5.3%	1.7%	9.6%	0.2%	23.3%	4.5%	50.3%	67.3%
Tulare County	442,179	60.1%	1.6%	1.6%	3.4%	0.1%	29.0%	4.2%	60.6%	67.4%
Kings County	152,982	54.3%	7.2%	1.7%	3.7%	0.2%	28.1%	4.9%	50.9%	64.8%
Kern County	839,631	59.5%	5.8%	1.5%	4.2%	0.1%	24.3%	4.5%	49.2%	61.4%
San Joaquin Valley Subtotal	3,286,353	59.1%	4.5%	1.6%	5.9%	0.2%	24.1%	4.6%	50.6%	63.3%
Central Valley Region	8,379,045	61.4%	6.3%	1.3%	9.5%	0.4%	15.7%	5.4%	42.6%	53.5%
STATE OF CALIFORNIA	37,253,956	57.6%	6.2%	1.0%	13.0%	0.4%	17.0%	4.9%	37.6%	59.9%

2 Sources: U.S. Census 2014a, 2014r, 2014s, 2014t, 2014u, 2014v, 2014w, 2014x

3 Note:

4 a. Total Minority is an aggregation of all non-white racial groups and includes all individuals of Hispanic or Latino origin, regardless of race.

1 **21.3.4.2.2 Poverty Levels**

2 Poverty levels presented in Table 21.12 are calculated on a subset of the total
3 population of a county, as described above in section 21.3.2, Characterization of
4 Conditions Considered in the Environmental Justice Analysis. Of the total
5 population for whom poverty status is determined within the San Joaquin Valley
6 portion of the Central Valley Region, 3,111,943 individuals, 20.8 percent, were
7 below the poverty level based on the 2006–2010 ACS 5-year dataset (U.S. Census
8 2014e). The U.S. Census Bureau defines geographical areas with more than
9 20 percent of the population below the poverty level as a “poverty areas.”
10 Merced, Fresno, Tulare, and Kern counties are defined as poverty areas because
11 more than 20 percent of the populations in these counties are below the
12 poverty level.

13 **21.3.4.2.3 Social Services**

14 Distribution of social services varies for each county. Federal grants to the state
15 and local agencies for Medicaid, other health related activities, and nutrition and
16 family welfare; and Federal direct payments made to individuals under the
17 CalFresh and supplemental social security income within counties in the San
18 Joaquin Valley portion of the Central Valley Region are summarized in
19 Table 21.13.

20 **21.3.4.2.4 Limited English Proficiency**

21 The percent of the population that speaks English and other languages at home
22 and the percent of the population that speak English “less than very well” based
23 on the language they speak at home are presented in Tables 21.14 and 21.15.

24 **21.3.4.2.5 Effects of Recent Drought in Two San Joaquin Valley**
25 **Communities**

26 The San Joaquin Valley portion of the Central Valley Region includes about
27 8.8 percent of the state’s total population, 9.3 percent of the state’s population that
28 identified themselves as a racial minority and/or of Hispanic or Latino origin, and
29 about 13.1 percent of the state’s population below the poverty level. Merced,
30 Fresno, and Tulare counties had the highest concentration of total minority
31 populations and the highest concentration of individuals living below the poverty
32 level. There are communities within these counties that have higher
33 concentrations of minority populations and/or populations below the poverty
34 level. These communities are mainly farming communities that have been
35 impacted by loss in agricultural employment, as described in Chapter 12,
36 Agricultural Resources, and Chapter 19, Socioeconomics. The impacts have
37 increased recently during the current drought.

1 **Table 21.12 Population below Poverty Level in the Central Valley Region – San**
 2 **Joaquin Valley, 2006–2010**

Areas	Total Population ^a	Population Below Poverty Level	Percent of Population Below Poverty Level
Stanislaus County	502,108	82,480	16.4%
Madera County	138,151	26,656	19.3%
Merced County	246,260	53,738	21.8%
Fresno County	890,694	200,288	22.5%
Tulare County	423,902	97,012	22.9%
Kings County	133,206	25,713	19.3%
Kern County	777,622	159,967	20.6%
San Joaquin Valley Subtotal	3,111,943	645,854	20.8%
Central Valley Region	8,025,054	1,268,984	15.8%
STATE OF CALIFORNIA	35,877,036	4,919,945	13.7%

3 Source: U.S. Census 2014e

4 Note:

5 a. Population numbers are only those for whom poverty status was determined and exclude
 6 institutionalized individuals

7 **Table 21.13 Federal Funds Distributed for Social Programs in the Central Valley**
 8 **Region – San Joaquin Valley in 2010**

Areas	Grants (millions of dollars)		Distributed to Individuals (millions of dollars)
	Medicaid and Other Health-Related Items	Nutrition and Family Welfare	CalFresh Benefits and Supplemental Security Income
Stanislaus County	\$535.9	\$145.3	\$198.7
Madera County	\$144.3	\$33.6	\$45.6
Merced County	\$260.0	\$73.7	\$126.0
Fresno County	\$992.0	\$274.8	\$468.5
Tulare County	\$569.1	\$116.0	\$196.5
Kings County	\$129.2	\$37.8	\$49.3
Kern County	\$712.0	\$203.4	\$328.6
San Joaquin Valley Subtotal	\$3,342.5	\$884.6	\$1,413.2
Central Valley Region	\$8,759.9	\$4,308.9	\$3,179.8
STATE OF CALIFORNIA	\$41,931.1	\$11,743.7	\$12,469.4

9 Source: Gaquin and Ryan 2013

1 **Table 21.14 Top Five Non-English Languages Spoken at Home as a Proportion of the Total Population Five Years and Older in the**
 2 **Central Valley Region – San Joaquin Valley, 2006–2010**

Areas	Speaks Only English	Spanish and Spanish Creole	Tagalog	Chinese	Portuguese/ Portuguese Creole	Hmong	Total Excluding English
Stanislaus County	59.8%	30.6%	0.7%	0.4%	0.9%	0.1%	32.8%
Madera County	58.0%	38.6%	0.3%	0.1%	0.2%	0.3%	39.5%
Merced County	48.5%	41.5%	0.7%	0.5%	2.2%	2.5%	47.4%
Fresno County	57.4%	32.5%	0.7%	0.6%	0.1%	2.7%	36.6%
Tulare County	53.2%	42.5%	0.7%	0.2%	0.7%	0.2%	44.4%
Kings County	57.4%	37.9%	1.6%	0.4%	1.0%	0.0%	40.9%
Kern County	59.0%	36.4%	1.1%	0.3%	0.0%	0.0%	37.8%
San Joaquin Valley Subtotal	57.0%	35.8%	0.8%	0.4%	0.5%	1.0%	38.5%
Central Valley Region	66.2%	23.1%	1.7%	1.2%	0.3%	0.8%	27.1%
STATE OF CALIFORNIA	57.0%	28.5%	2.2%	2.9%	0.2%	0.2%	34.0%

3 Source: U.S. Census 2014f

1 **Table 21.15 Percent of Population Speaking One of the Top Five Non-English Languages Spoken at Home in the Central Valley Region –**
 2 **San Joaquin Valley that Speaks English “Less than Very Well” as a Proportion of the Total Population Five Years and Older, 2006–2010**

Areas	Spanish and Spanish Creole	Tagalog	Chinese	Portuguese/ Portuguese Creole	Hmong
Stanislaus County	13.1%	0.2%	0.3%	0.4%	0.0%
Madera County	17.7%	0.1%	0.0%	0.1%	0.1%
Merced County	19.4%	0.2%	0.2%	0.9%	1.2%
Fresno County	14.7%	0.2%	0.3%	0.0%	1.3%
Tulare County	21.4%	0.3%	0.1%	0.3%	0.1%
Kings County	19.4%	0.6%	0.3%	0.3%	0.0%
Kern County	16.4%	0.4%	0.2%	0.0%	0.0%
San Joaquin Valley Subtotal	16.5%	0.3%	0.2%	0.2%	0.5%
Central Valley Region	10.8%	0.5%	0.6%	0.1%	0.4%
STATE OF CALIFORNIA	13.6%	0.7%	1.6%	0.1%	0.1%

3 Source: U.S. Census 2014f

1 Conditions in this geographic area have been the focus of recent newspaper
2 articles describing conditions in these communities. According to AgAlert
3 (2014), a weekly newspaper for California agriculture, increased levels of land
4 fallowing on irrigated cropland in the San Joaquin Valley has resulted in
5 significant economic losses in small farming communities. Higher than typical
6 unemployment rates has resulted in increased food insecurity. As a result, food
7 banks are facing increased demand. Another article in the Fresno Bee Newspaper
8 (2014) described the food insecurity issue in the City of Mendota, a community in
9 Fresno County.

10 Although there are emergency programs such as those administered through the
11 U.S. Department of Agriculture (USDA), many of these programs are specific in
12 their targets, require a long time to implement, or are of limited duration. For
13 example, the 2014 Farm Bill includes \$100 million in livestock disaster
14 assistance; \$15 million in assistance to farmers and ranchers to implement water
15 conservation practices; and \$60 million for food banks in the State of California
16 (USDA 2014a). The USDA February 14, 2014 news release announcing these
17 programs acknowledges that previous implementation of assistance programs
18 were hampered by long processing times and emphasizes that the USDA is
19 committed to reduce the response times by more than 80 percent. The USDA also
20 is working with California Department of Education to expand the number of
21 Summer Food Service Program meal sites. The U.S. Department of Homeland
22 Security also provides assistance with food and related expenses through the
23 Emergency Food and Shelter National Board Program (USDHS 2014); however
24 this assistance is limited to one month. There also are many California-based
25 programs, including the California Department of Social Services that provided in
26 2014 up to \$25 million in food assistance for counties affected by employment
27 losses due to the drought that has reduced agriculturally-related jobs
28 (CDSS 2014). This program is specifically targeted for counties where the
29 unemployment rate in 2013 was higher than the statewide average, including
30 Fresno, Merced, and Tulare counties. This aid includes pre-packaged food boxes
31 to be delivered to local food banks. Families and individuals that expected to
32 experience long-term impacts due to the drought also were provided assistance to
33 apply for the CalFresh Program to supplement funding for the food budget.

34 *Huron and Mendota*

35 The cities of Huron and Mendota are both located in Fresno County. Economic
36 activities in both cities and surrounding communities are based on agriculture. Of
37 the 25 major employers in Fresno County, only one, Stamoules Produce
38 Company, is located in the City of Mendota (CEDD 2013). None of the 25 major
39 employers in Fresno County are located in Huron. Another major employer in the
40 City of Mendota is a medium security Federal prison for men (BOP 2014).

41 In 2010, the number of people that identified themselves as a racial minority
42 and/or of Hispanic or Latino origin and the portion of the population below the
43 poverty level in these two cities were significantly higher than the distribution of
44 these populations in Fresno County and the State of California, as presented in
45 Tables 21.16 and 21.17. Although the two communities became more racially

1 diverse in 2010 than they were in the 2000 Census, both communities became
 2 poorer. While Huron and Mendota have experienced increases in poverty levels,
 3 the proportion of the population below the poverty level has been relatively stable
 4 in Fresno County.

5 **Table 21.16 Racial and Ethnic Minority Population in Huron and Mendota in 2010**

Areas	Total Population	Racial Minority	Hispanic or Latino Origin	Below Poverty Level
Huron City	6,754	65.9%	96.6%	54.5%
Mendota City	11,014	47.1%	96.6%	44.6%
Fresno County	930,450	44.6%	50.3%	22.5%
State of California	37,253,956	42.4%	37.6%	13.7%

6 Source: U.S. Census Bureau, 2013a, 2013b, 2014e, 2014u

7 **Table 21.17 Racial and Ethnic Minority Population in Huron and Mendota in 2000**

Areas	Total Population	Racial Minority	Hispanic or Latino Origin	Below Poverty Level
Huron City	6,306	79.6%	98.3%	39.4%
Mendota City	7,890	72.7%	94.7%	41.9%
Fresno County	799,407	45.7%	44.0%	22.9%
State of California	33,871,648	40.5%	32.4%	14.2%

8 Sources: U.S. Census Bureau, 2013c, 2013d, 2013e, 2013f

9 *Other Indicators of Economic Conditions*

10 Other indicators of economic struggles within these communities are the number
 11 of individuals who are on poverty alleviation programs, including CalFresh, the
 12 Federal Supplemental Nutrition Assistance Program administered by the State of
 13 California, California Work Opportunity and Responsibility to Kids
 14 (CalWORKs), and National School Lunch Program (NSLP).

15 Both CalFresh and CalWORKs are administered by the California Department of
 16 Social Services. The CalFresh Program issues monthly electronic benefits that
 17 can be used to buy most foods. The program’s purpose is to help improve the
 18 health and well-being of qualified households and individuals. CalWORKs is a
 19 social welfare program that provides cash aid and services to eligible needy
 20 California families. Figure 21.1 shows the trend in the average annual population
 21 on public assistance (both the CalFresh Program and CalWORKs program)
 22 between 2006 and 2012, the years for which electronic data were available for the
 23 cities of Huron and Mendota. The populations in Huron and Mendota have higher
 24 levels of participations in the two public assistance programs compared to the
 25 levels in Fresno County and the state. Additionally, the rates of participation in

1 the two communities have been growing at a faster rate than growth in these
2 programs in Fresno County and the state. Eligibility in the CalFresh Program is
3 based upon several factors, including a poverty threshold requirement and
4 citizenship/immigration status. Eligibility for CalWORKs is determined on the
5 basis of citizenship, age, income, resources, assets and other factors
6 (CDSS 2013j).

7 The NSLP program includes students that are eligible for assistance under
8 CalFresh and other federal assistance programs, such as the Temporary
9 Assistance for Needy Families and the Food Distribution Program on Indian
10 Reservations; and students who are eligible under the Other Source Categorically
11 Eligible Programs. A student is eligible under the Other Source Categorically
12 Eligible Programs if that student is: (1) homeless, runaway or migrant; (2) a foster
13 child; or (3) enrolled in a Federally-funded Head Start Program or a comparable
14 State-funded Head Start Program or pre-kindergarten programs, or in an Even
15 Start Program (USDA 2014b). Students enrolled in the NSLP are eligible for
16 either free or reduced price meals (FRPM). Figure 21.2 shows the proportion of
17 students enrolled in the FRPM program in the two communities, Fresno County,
18 and the state. Participation on FRPM in Fresno County is higher than in the entire
19 state; and lower than within Huron and Mendota.

20 Relatively large participation in the social services programs is related to low
21 employment in Huron and Mendota. Annual unemployment rates in Huron and
22 Mendota between 2006 and 2012 have consistently remained higher than for
23 Fresno County and the state, as presented in Figure 21.3. The pattern of
24 unemployment has been similar to unemployment patterns in Fresno County, and
25 increased following the economic recession that started in 2007. The increase in
26 unemployment also occurred at a time when both agricultural cultivated acreage
27 and farm employment in the area declined; and included five consecutive years
28 with reduced water availability, as described in Chapter 12, Agricultural
29 Resources, and Chapter 19, Socioeconomics.

30 **21.3.4.3 Delta and Suisun Marsh**

31 The Delta and Suisun Marsh portion of the Central Valley Region includes
32 Sacramento, Yolo, Solano, San Joaquin, and Contra Costa counties.

33 **21.3.4.3.1 Minority Populations**

34 As recorded in the 2010 U.S. Census, the Delta and Suisun Marsh portion of the
35 Central Valley Region had a total population of 2,718,287 in 2010. About
36 54.8 percent of this population identified themselves as a racial minority and/or of
37 Hispanic or Latino origin, regardless of race, as presented in Table 21.18. The
38 table also shows the minority population distribution for the entire Central Valley
39 Region and the State of California.

40 **21.3.4.3.2 Poverty Levels**

41 Poverty levels presented in Table 21.19 are calculated on a subset of the total
42 population of a county, as described above in section 21.3.2, Characterization of
43 Conditions Considered in the Environmental Justice Analysis.

1 **Table 21.18 Minority Population Distribution in the Central Valley Region – Delta and Suisun Marsh in 2010**

Areas	Total Population	Races							Hispanic or Latino Origin	Total Minority ^a
		White	Black/ African American	American Indian and Native Alaskan	Asian	Native Hawaiian and Other Pacific Islander	Some Other Race	Two or More Races		
Sacramento County	1,418,788	57.5%	10.4%	1.0%	14.3%	1.0%	9.3%	6.6%	21.6%	51.6%
Yolo County	200,849	63.2%	2.6%	1.1%	13.0%	0.5%	13.9%	5.8%	30.3%	50.1%
Solano County	413,344	51.0%	14.7%	0.8%	14.6%	0.9%	10.5%	7.6%	24.0%	59.2%
San Joaquin County	685,306	51.0%	7.6%	1.1%	14.4%	0.5%	19.1%	6.4%	38.9%	64.1%
Contra Costa County	1,049,025	58.6%	9.3%	0.6%	14.4%	0.5%	10.7%	5.9%	24.4%	52.2%
Total Delta and Suisun Marsh Valley	3,767,312	56.2%	9.6%	0.9%	14.3%	0.7%	11.9%	6.4%	26.2%	54.8%
Central Valley Region	8,379,045	61.4%	6.3%	1.3%	9.5%	0.4%	15.7%	5.4%	42.6%	53.5%
STATE OF CALIFORNIA	37,253,956	57.6%	6.2%	1.0%	13.0%	0.4%	17.0%	4.9%	37.6%	59.9%

2 Sources: U.S. Census 2014a, 2014y, 2014z, 2014aa, 2014ab, 2014ac

3 Note:

4 a. Total Minority is an aggregation of all non-white racial groups and includes all individuals of Hispanic or Latino origin, regardless of race.

1 **Table 21.19 Population below Poverty Level in the Central Valley Region – Delta**
 2 **and Suisun Marsh, 2006–2010**

Areas	Total Population ^a	Population Below Poverty Level	Percent of Population Below Poverty Level
Sacramento County	1,368,693	190,768	13.9%
Yolo County	186,800	31,895	17.1%
Solano County	397,576	41,158	10.4%
San Joaquin County	657,594	105,502	16.0%
Contra Costa County	1,013,854	91,142	9.0%
Total Delta and Suisun Marsh Valley	3,624,517	460,465	12.7%
Central Valley Region	8,025,054	1,268,984	15.8%
STATE OF CALIFORNIA	35,877,036	4,919,945	13.7%

3 Source: U.S. Census 2014e

4 Note:

5 a. Population numbers are only those for whom poverty status was determined and exclude
 6 institutionalized individuals

7 Of the total population for whom poverty status is determined within the Delta
 8 and Suisun Marsh portion of the Central Valley Region, 3,624,517 individuals,
 9 12.7 percent were below the poverty level based on the 2006–2010 ACS 5-year
 10 dataset (U.S. Census 2014e). The U.S. Census Bureau defines geographical areas
 11 with more than 20 percent of the population below the poverty level as a “poverty
 12 areas.” None of the counties in this area are defined as poverty areas.

13 **21.3.4.3.3 Social Services**

14 Distribution of social services varies for each county. Federal grants to the state
 15 and local agencies for Medicaid, other health related activities, and nutrition and
 16 family welfare; and Federal direct payments made to individuals under the
 17 CalFresh and supplemental social security income within counties in the Delta
 18 and Suisun Marsh portion of the Central Valley Region are summarized in
 19 Table 21.20.

20 **21.3.4.3.4 Limited English Proficiency**

21 The percent of the population that speaks English and other languages at home
 22 and the percent of the population that speak English “less than very well” based
 23 on the language they speak at home are presented in Tables 21.21 and 21.22.

24 **21.3.5 San Francisco Bay Area Region**

25 The San Francisco Bay Area Region includes portions of Napa, Alameda, Santa
 26 Clara, and San Benito counties that are within the CVP and SWP service areas.
 27 Contra Costa County also is part of the San Francisco Bay Area Region.
 28 However, for this chapter, Contra Costa County is discussed under
 29 Section 14.3.4.3, Delta Suisun Marsh.

1 **21.3.5.1 Minority Populations**

2 As recorded in the 2010 U.S. Census, the San Francisco Bay Area Region had a
 3 total population of 3,483,666 in 2010. About 64.4 percent of this population
 4 identified themselves as a racial minority and/or of Hispanic or Latino origin,
 5 regardless of race, as presented in Table 21.23. The table also shows the minority
 6 population distribution for the State of California.

7 **21.3.5.2 Poverty Levels**

8 Poverty levels presented in Table 21.24 are calculated on a subset of the total
 9 population of a county, as described above in section 21.3.2, Characterization of
 10 Conditions Considered in the Environmental Justice Analysis. Of the total
 11 population for whom poverty status is determined within the San Francisco Bay
 12 Area Region, 3,344,994 individuals, 10.1 percent were below the poverty level
 13 based on the 2006–2010 ACS 5-year dataset (U.S. Census 2014e). The
 14 U.S. Census Bureau defines geographical areas with more than 20 percent of the
 15 population below the poverty level as a “poverty areas.” None of the counties in
 16 the San Francisco Bay Area Region are defined as poverty areas.

17 **Table 21.20 Federal Funds Distributed for Social Programs in the Central Valley**
 18 **Region – Delta and Suisun Marsh in 2010**

Areas	Grants (millions of dollars)		Distributed to Individuals (millions of dollars)
	Medicaid and Other Health-Related Items	Nutrition and Family Welfare	CalFresh Benefits and Supplemental Security Income
Sacramento County	\$2,115.5	\$2,695.9	\$659.1
Yolo County	\$504.8	\$39.7	\$55.2
Solano County	\$264.2	\$71.7	\$118.6
San Joaquin County	\$739.1	\$153.5	\$287.4
Contra Costa County	\$749.7	\$189.3	\$238.8
Total Delta and Suisun Marsh Valley	\$4,373.3	\$3,150.1	\$1,359.1
Central Valley Region	\$8,759.9	\$4,308.9	\$3,179.8
STATE OF CALIFORNIA	\$41,931.1	\$11,743.7	\$12,469.4

19 Source: Gaquin and Ryan 2013

1 **Table 21.21 Top Five Non-English Languages Spoken at Home as a Proportion of the Total Population Five Years and Older in the**
 2 **Central Valley Region – Delta and Suisun Marsh, 2006 – 2010**

Areas	Speaks Only English	Spanish and Spanish Creole	Chinese	Tagalog	Vietnamese	Russian	Total Excluding English
Sacramento County	69.8%	13.2%	2.2%	2.0%	1.5%	1.6%	20.5%
Yolo County	65.8%	20.2%	3.3%	0.8%	0.9%	1.6%	26.9%
Solano County	70.6%	15.9%	0.8%	6.8%	0.6%	0.1%	24.1%
San Joaquin County	0.0%	25.1%	1.0%	2.8%	1.0%	0.0%	29.9%
Contra Costa County	67.6%	17.3%	2.9%	2.8%	0.6%	0.6%	24.2%
Total Delta and Suisun Marsh Valley	56.5%	17.2%	2.1%	2.8%	1.0%	0.9%	24.0%
Central Valley Region	66.2%	23.1%	1.2%	1.7%	0.6%	0.5%	27.1%
STATE OF CALIFORNIA	57.0%	28.5%	2.9%	2.2%	1.4%	0.4%	35.4%

3 Source: U.S. Census 2014f

1 **Table 21.22 Percent of Population Speaking One of the Top Five Non-English Languages Spoken at Home in the Central Valley Region –**
 2 **Delta and Suisun Marsh that Speaks English “Less than Very Well” as a Proportion of the Total Population Five Years and Older,**
 3 **2006–2010**

Areas	Spanish and Spanish Creole	Chinese	Tagalog	Vietnamese	Russian
Sacramento County	6.0%	1.3%	0.7%	0.9%	0.9%
Yolo County	9.5%	1.5%	0.2%	0.3%	1.0%
Solano County	7.4%	0.4%	2.2%	0.3%	0.0%
San Joaquin County	12.3%	0.6%	1.0%	0.6%	0.0%
Contra Costa County	8.4%	1.3%	0.7%	0.3%	0.3%
Total Delta and Suisun Marsh Valley	8.1%	1.1%	0.9%	0.6%	0.5%
Central Valley Region	10.8%	0.6%	0.5%	0.3%	0.2%
STATE OF CALIFORNIA	13.6%	1.6%	0.7%	0.9%	0.2%

4 Source: U.S. Census 2014f

1 **Table 21.23 Minority Population Distribution in the San Francisco Bay Area Region in 2010**

Areas	Total Population	Races							Hispanic or Latino Origin	Total Minority ^a
		White	Black/ African American	American Indian and Native Alaskan	Asian	Native Hawaiian and Other Pacific Islander	Some Other Race	Two or More Races		
Alameda County	1,510,271	43.0%	12.6%	0.6%	26.1%	0.8%	10.8%	6.0%	22.5%	65.9%
Santa Clara County	1,781,642	47.0%	2.6%	0.7%	32.0%	0.4%	12.4%	4.9%	26.9%	64.8%
San Benito County	55,269	63.7%	0.9%	1.6%	2.6%	0.2%	26.2%	4.9%	56.4%	61.7%
Napa County	136,484	71.5%	2.0%	0.8%	6.8%	0.3%	14.7%	4.1%	32.2%	43.6%
San Francisco Bay Area Region	3,483,666	46.5%	6.9%	0.7%	28.0%	0.6%	12.0%	5.4%	25.7%	64.4%
STATE OF CALIFORNIA	37,253,956	57.6%	6.2%	1.0%	13.0%	0.4%	17.0%	4.9%	37.6%	59.9%

2 Sources: U.S. Census 2014a, 2014ad, 2014ae, 2014af, 2014ag

3 Note:

4 a. Total Minority is an aggregation of all non-white racial groups and includes all individuals of Hispanic or Latino origin, regardless of race.

1 **Table 21.24 Population below Poverty Level in the San Francisco Bay Area Region,**
 2 **2006–2010**

Areas	Total Population ^a	Population Below Poverty Level	Percent of Population Below Poverty Level
Alameda County	1,450,546	165,417	11.4
Santa Clara County	1,710,231	152,066	8.9
San Benito County	54,160	6,323	11.7
Napa County	130,057	12,948	10.0
San Francisco Bay Area Region	3,344,994	336,754	10.1
STATE OF CALIFORNIA	35,877,036	4,919,945	13.7%

3 Source: U.S. Census 2014e

4 Note:

5 a. Population numbers are only those for whom poverty status was determined and exclude
 6 institutionalized individuals

7 **21.3.5.3 Social Services**

8 Distribution of social services varies for each county. Federal grants to the state
 9 and local agencies for Medicaid, other health related activities, and nutrition and
 10 family welfare; and Federal direct payments made to individuals under the
 11 CalFresh and supplemental social security income within counties in the San
 12 Francisco Bay Area Region are summarized in Table 21.25.

13 **21.3.5.4 Limited English Proficiency**

14 The percent of the population that speaks English and other languages at home
 15 and the percent of the population that speak English “less than very well” based
 16 on the language they speak at home are presented in Tables 21.26 and 21.27.

17 **21.3.6 Central Coast Region**

18 The Central Coast Region includes portions of San Luis Obispo and Santa
 19 Barbara counties served by the SWP. SWP water supplies are used directly by
 20 municipal and industrial water users, and as part of groundwater replenishment
 21 plans to meet municipal, industrial, and agricultural water demands.

22 **21.3.6.1 Minority Populations**

23 As recorded in the 2010 U.S. Census, the Central Coast Region had a total
 24 population of 693,532 in 2010. About 43.1 percent of this population identified
 25 themselves as a racial minority and/or of Hispanic or Latino origin, regardless of
 26 race, as presented in Table 21.28. The table also shows the minority population
 27 distribution for the State of California.

28 **21.3.6.2 Poverty Levels**

29 Poverty levels presented in Table 21.29 are calculated on a subset of the total
 30 population of a county, as described above in section 21.3.2, Characterization of
 31 Conditions Considered in the Environmental Justice Analysis. Of the total
 32 population for whom poverty status is determined within the Central Coast

1 Region, 649,348 individuals, 13.8 percent were below the poverty level based on
 2 the 2006–2010 ACS 5-year dataset (U.S. Census 2014e). The U.S. Census
 3 Bureau defines geographical areas with more than 20 percent of the population
 4 below the poverty level as a “poverty areas.” None of the counties in the Central
 5 Coast Region are defined as poverty areas.

6 **21.3.6.3 Social Services**

7 Distribution of social services varies for each county. Federal grants to the state
 8 and local agencies for Medicaid, other health related activities, and nutrition and
 9 family welfare; and Federal direct payments made to individuals under the
 10 CalFresh and supplemental social security income within counties in the Central
 11 Coast Region are summarized in Table 21.30.

12 **Table 21.25 Federal Funds Distributed for Social Programs in the San Francisco**
 13 **Bay Area Region in 2010**

Areas	Grants (millions of dollars)		Distributed to Individuals (millions of dollars)
	Medicaid and Other Health-Related Items	Nutrition and Family Welfare	CalFresh Benefits and Supplemental Security Income
Alameda County	\$2,556.4	\$318.6	\$529.6
Santa Clara County	\$2,000.2	\$334.3	\$466.3
San Benito County	\$27.1	\$12.5	\$8.2
Napa County	\$102.5	\$32.0	\$21.3
San Francisco Bay Area Region	\$4,686.2	\$697.4	\$1,025.4
STATE OF CALIFORNIA	\$41,931.1	\$11,743.7	\$12,469.4

14 Source: Gaquin and Ryan 2013

1 **Table 21.26 Top Five Non-English Languages Spoken at Home as a Proportion of the Total Population Five Years and Older in the San**
 2 **Francisco Bay Area Region, 2006–2010**

Areas	Speaks Only English	Spanish and Spanish Creole	Chinese	Tagalog	Vietnamese	Hindi	Total Excluding English
Alameda County	57.4%	16.8%	8.2%	3.8%	1.8%	1.6%	32.2%
Santa Clara County	49.3%	19.1%	7.4%	3.3%	6.5%	1.5%	37.8%
San Benito County	60.1%	37.3%	0.1%	0.7%	0.2%	0.0%	38.3%
Napa County	66.5%	26.2%	0.4%	2.4%	0.2%	0.1%	29.3%
San Francisco Bay Area Region	53.7%	18.6%	7.3%	3.4%	4.1%	1.5%	35.0%
STATE OF CALIFORNIA	57.0%	28.5%	2.9%	2.2%	1.4%	0.4%	35.4%

3 Source: U.S. Census 2014f

1 **Table 21.27 Percent of Population Speaking One of the Top Five Non-English Languages Spoken at Home in the San Francisco Bay**
 2 **Area Region that Speaks English “Less than Very Well” as a Proportion of the Total Population Five Years and Older, 2006–2010**

Areas	Spanish and Spanish Creole	Chinese	Tagalog	Vietnamese	Hindi
Alameda County	8.2%	4.8%	1.1%	1.1%	0.3%
Santa Clara County	8.9%	3.6%	1.1%	4.0%	0.2%
San Benito County	20.4%	0.1%	0.3%	0.2%	0.0%
Napa County	14.6%	0.2%	0.9%	0.2%	0.04%
San Francisco Bay Area Region	9.0%	3.9%	1.1%	2.5%	0.2%
STATE OF CALIFORNIA	13.6%	1.6%	0.7%	0.9%	0.1%

3 Source: U.S. Census 2014f

4 **Table 21.28 Minority Population Distribution in the Central Coast Region in 2010**

Areas	Total Population	Races							Hispanic or Latino Origin	Total Minority ^a
		White	Black/ African American	American Indian and Native Alaskan	Asian	Native Hawaiian and Other Pacific Islander	Some Other Race	Two or More Races		
San Luis Obispo County	269,637	82.6%	2.1%	0.9%	3.2%	0.1%	7.3%	3.8%	20.8%	28.9%
Santa Barbara County	423,895	69.6%	2.0%	1.3%	4.9%	0.2%	17.4%	4.6%	42.8%	52.1%
Central Coast Region	693,532	74.7%	2.0%	1.2%	4.2%	0.2%	13.5%	4.3%	34.3%	43.1%
STATE OF CALIFORNIA	37,253,956	57.6%	6.2%	1.0%	13.0%	0.4%	17.0%	4.9%	37.6%	59.9%

5 Sources: U.S. Census 2014a, 2014ah, 2014ai

6 Note:

7 a. Total Minority is an aggregation of all non-white racial groups and includes all individuals of Hispanic or Latino origin, regardless of race.

1 **Table 21.29 Population below Poverty Level in the Central Coast Region,**
 2 **2006–2010**

Areas	Total Population ^a	Population Below Poverty Level	Percent of Population Below Poverty Level
San Luis Obispo County	248,764	32,183	12.9%
Santa Barbara County	400,584	57,463	14.3%
Central Coast Region	649,348	89,646	13.8%
STATE OF CALIFORNIA	35,877,036	4,919,945	13.7%

3 Source: U.S. Census 2014e

4 Note:

5 a. Population numbers are only those for whom poverty status was determined and exclude
 6 institutionalized individuals

7 **Table 21.30 Federal Funds Distributed for Social Programs in the Central Coast**
 8 **Region in 2010**

Areas	Grants (millions of dollars)		Distributed to Individuals (millions of dollars)
	Medicaid and Other Health-Related Items	Nutrition and Family Welfare	CalFresh Benefits and Supplemental Security Income
San Luis Obispo County	\$176.0	\$70.7	\$44.5
Santa Barbara County	\$332.1	\$93.3	\$91.6
Central Coast Region	\$508.1	\$164.0	\$136.1
STATE OF CALIFORNIA	\$41,931.1	\$11,743.7	\$12,469.4

9 Source: Gaquin and Ryan 2013

10 **21.3.6.4 Limited English Proficiency**

11 The percent of the population that speaks English and other languages at home
 12 and the percent of the population that speak English “less than very well” based
 13 on the language they speak at home are presented in Tables 21.31 and 21.32.

14 **21.3.7 Southern California Region**

15 The Southern California Region includes portions of Ventura, Los Angeles,
 16 Orange, San Diego, Riverside, and San Bernardino counties served by the SWP.

17 **21.3.7.1 Minority Populations**

18 As recorded in the 2010 U.S. Census, the Southern California Region had a total
 19 population of 20,972,319 in 2010. About 64.2 percent of this population
 20 identified themselves as a racial minority and/or of Hispanic or Latino origin,
 21 regardless of race, as presented in Table 21.33. The table also shows the minority
 22 population distribution for the State of California.

1 **21.3.7.2 Poverty Levels**

2 Poverty levels presented in Table 21.34 are calculated on a subset of the total
3 population of a county, as described above in section 21.3.2, Characterization of
4 Conditions Considered in the Environmental Justice Analysis. Of the total
5 population for whom poverty status is determined within the Southern California
6 Region, 20,296,879 individuals, 13.8 percent, were below the poverty level based
7 on the 2006–2010 ACS 5-year dataset (U.S. Census 2014e). The U.S. Census
8 Bureau defines geographical areas with more than 20 percent of the population
9 below the poverty level as a “poverty areas.” None of the counties in the
10 Southern California Region are defined as poverty areas.

11 **21.3.7.3 Social Services**

12 Distribution of social services varies for each county. Federal grants to the state
13 and local agencies for Medicaid, other health related activities, and nutrition and
14 family welfare; and Federal direct payments made to individuals under the
15 CalFresh and supplemental social security income within counties in the Southern
16 California Region are summarized in Table 21.35.

17 **21.3.7.4 Limited English Proficiency**

18 The percent of the population that speaks English and other languages at home
19 and the percent of the population that speak English “less than very well” based
20 on the language they speak at home are presented in Tables 21.36 and 21.37.

1 **Table 21.31 Top Five Non-English Languages Spoken at Home as a Proportion of the Total Population Five Years and Older in the**
 2 **Central Coast Region, 2006–2010**

Areas	Speaks Only English	Spanish and Spanish Creole	Chinese	Tagalog	French (including Patois and Cajun)	German	Total Excluding English
San Luis Obispo County	83.3%	13.1%	0.3%	0.5%	0.3%	0.4%	14.7%
Santa Barbara County	61.3%	31.9%	0.8%	0.9%	0.6%	0.6%	34.7%
Central Coast Region	70.0%	24.5%	0.6%	0.8%	0.5%	0.5%	26.8%
STATE OF CALIFORNIA	57.0%	28.5%	2.9%	2.2%	0.4%	0.3%	34.3%

3 Source: U.S. Census 2014f

4 **Table 21.32 Percent of Population Speaking One of the Top Five Non-English Languages Spoken at Home in the Central Coast Region**
 5 **that Speaks English “Less than Very Well” as a Proportion of the Total Population Five Years and Older, 2006–2010**

Areas	Spanish and Spanish Creole	Chinese	Tagalog	French (including Patois and Cajun)	German
San Luis Obispo County	5.5%	0.1%	0.2%	0.04%	0.04%
Santa Barbara County	16.5%	0.4%	0.4%	0.1%	0.1%
Central Coast Region	12.2%	0.3%	0.4%	0.1%	0.1%
STATE OF CALIFORNIA	13.6%	1.6%	0.7%	0.1%	0.04%

6 Source: U.S. Census 2014f

1 **Table 21.33 Minority Population Distribution in the Southern California Region in 2010**

Areas	Total Population	Races							Hispanic or Latino Origin	Total Minority ^a
		White	Black/ African American	American Indian and Native Alaskan	Asian	Native Hawaiian and Other Pacific Islander	Some Other Race	Two or More Races		
Ventura County	823,318	68.7%	1.8%	1.0%	6.7%	0.2%	17.0%	4.5%	40.3%	51.3%
Los Angeles County	9,818,605	50.3%	8.7%	0.7%	13.7%	0.3%	21.8%	4.5%	47.7%	72.2%
Orange County	3,010,232	60.8%	1.7%	0.6%	17.9%	0.3%	14.5%	4.2%	33.7%	55.9%
San Diego County	3,095,313	64.0%	5.1%	0.9%	10.9%	0.5%	13.6%	5.1%	32.0%	51.5%
Riverside County	2,189,641	61.0%	6.4%	1.1%	6.0%	0.3%	20.5%	4.8%	45.5%	60.3%
San Bernardino County	2,035,210	56.7%	8.9%	1.1%	6.3%	0.3%	21.6%	5.0%	49.2%	66.7%
Southern California Region	20,972,319	56.3%	6.7%	0.8%	12.1%	0.3%	19.2%	4.6%	43.1%	64.2%
STATE OF CALIFORNIA	37,253,956	57.6%	6.2%	1.0%	13.0%	0.4%	17.0%	4.9%	37.6%	59.9%

2 Sources: U.S. Census 2014a, 2014aj, 2014ak, 2014al, 2014am, 2014an, 2014ao

3 Note:

4 a. Total Minority is an aggregation of all non-white racial groups and includes all individuals of Hispanic or Latino origin, regardless of race.

1 **Table 21.34 Population below Poverty Level in the Southern California Region,**
 2 **2006–2010**

Areas	Total Population ^a	Population Below Poverty Level	Percent of Population Below Poverty Level
Ventura County	798,863	73,842	9.2%
Los Angeles County	9,604,871	1,508,618	15.7%
Orange County	2,925,244	296,846	10.1%
San Diego County	2,930,875	361,248	12.3%
Riverside County	2,075,782	278,358	13.4%
San Bernardino County	1,961,244	291,020	14.8%
Southern California Region	798,863	73,842	9.2%
STATE OF CALIFORNIA	35,877,036	4,919,945	13.7%

3 Source: U.S. Census 2014e

4 Note:

5 a. Population numbers are only those for whom poverty status was determined and exclude
 6 institutionalized individuals

7 **Table 21.35 Federal Funds Distributed for Social Programs in the Southern**
 8 **California Region in 2010**

Areas	Grants (millions of dollars)		Distributed to Individuals (millions of dollars)
	Medicaid and Other Health-Related Items	Nutrition and Family Welfare	CalFresh Benefits and Supplemental Security Income
Ventura County	\$445.3	\$153.9	\$147.1
Los Angeles County	\$13,950.6	\$2,840.6	\$4,259.6
Orange County	\$1,678.3	\$610.6	\$633.2
San Diego County	\$3,866.8	\$677.8	\$790.1
Riverside County	\$966.4	\$347.2	\$488.0
San Bernardino County	\$1,236.2	\$390.1	\$751.9
Southern California Region	\$22,143.6	\$5,020.2	\$7,069.9
STATE OF CALIFORNIA	\$41,931.1	\$11,743.7	\$12,469.4

9 Source: Gaquin and Ryan 2013

1 **Table 21.36 Top Five Non-English Languages Spoken at Home as a Proportion of the Total Population Five Years and Older in the**
 2 **Southern California Region, 2006–2010**

Areas	Speaks Only English	Spanish and Spanish Creole	Chinese	Tagalog	Vietnamese	Korean	Total Excluding English
Ventura County	62.6%	29.5%	1.0%	1.7%	0.4%	0.4%	33.1%
Los Angeles County	43.6%	39.4%	3.6%	2.5%	0.8%	2.0%	48.3%
Orange County	55.6%	26.2%	2.2%	1.5%	5.4%	2.5%	37.8%
San Diego County	63.7%	24.4%	1.4%	3.1%	1.3%	0.5%	30.6%
Riverside County	60.5%	33.2%	0.5%	1.4%	0.6%	0.4%	36.2%
San Bernardino County	59.5%	33.6%	1.0%	1.4%	0.6%	0.5%	37.1%
Southern California Region	52.3%	33.7%	2.4%	2.2%	1.5%	1.5%	41.3%
STATE OF CALIFORNIA	57.0%	28.5%	2.9%	2.2%	1.4%	1.1%	36.1%

3 Source: U.S. Census 2014f

1 **Table 21.37 Percent of Population Speaking One of the Top Five Non-English Languages Spoken at Home in the Southern California**
 2 **Region that Speaks English “Less than Very Well” as a Proportion of the Total Population Five Years and Older, 2006–2010**

Areas	Spanish and Spanish Creole	Chinese	Tagalog	Vietnamese	Korean
Ventura County	14.1%	0.5%	0.5%	0.2%	0.2%
Los Angeles County	19.0%	2.2%	0.8%	0.5%	1.3%
Orange County	13.4%	1.0%	0.4%	3.3%	1.5%
San Diego County	11.0%	0.7%	1.1%	0.8%	0.3%
Riverside County	14.5%	0.3%	0.4%	0.4%	0.2%
San Bernardino County	15.5%	0.5%	0.4%	0.4%	0.3%
Southern California Region	16.0%	1.4%	0.7%	0.9%	0.9%
STATE OF CALIFORNIA	13.6%	1.6%	0.7%	0.9%	0.7%

3 Source: U.S. Census 2014f

1 **21.4 Impact Analysis**

2 This section describes the potential mechanisms for change in conditions and
3 analytical methods; results of impact analyses; potential mitigation measures; and
4 cumulative effects.

5 **21.4.1 Potential Mechanisms for Change and Analytical Methods**

6 As described in Chapter 4, Approach to Environmental Analysis, the impact
7 analysis considers changes in factors that affect environmental justice or minority
8 and low-income populations specifically related to changes in CVP and SWP
9 operations under the alternatives as compared to the No Action Alternative and
10 Second Basis of Comparison.

11 The Council of Environmental Quality (CEQ) and U.S. Environmental Protection
12 Agency (USEPA) established guidelines to assist federal agencies in the analysis
13 of environmental justice defines minority and low-income areas summarized in
14 Section 21.3, Affected Environment (CEQ, 1997). The following guidelines are
15 used to determine if minority populations are present in a study area:

- 16 • The minority population of the affected area exceeds 50 percent, or
- 17 • The population percentage of the affected area is meaningfully greater than
18 the minority population percentage in the general population or other
19 appropriate unit of geographical analysis.

20 The CEQ guidelines do not specifically state the percentage considered
21 meaningful in the case of low-income populations. For this analysis, the
22 assumptions set forth in the CEQ guidelines for identifying and evaluating
23 impacts on minority populations also are used to identify and evaluate impacts on
24 low-income populations, including a determination that a low-income population
25 is present if the project area if 50 percent or more of the population is living
26 below the poverty level.

27 The alternatives considered in this EIS do not include project-specific
28 construction activities. In most portions of the study area, the availability of CVP
29 and SWP water supplies directly or indirectly affects most of the population
30 within a county. Therefore, the entire population of each counties within the
31 study area is considered to determine whether minority or low-income areas could
32 be affected by implementation of the alternatives. In the study area, populations
33 below the poverty level do not include 50 percent or more of the population. The
34 highest proportion of populations below the poverty level occurs in Fresno and
35 Tulare counties in which approximately 23 percent of the populations are below
36 the poverty level. However, minority populations contribute more than
37 50 percent of the total county populations in 24 of the 35 counties. The following
38 counties have 50 percent or more of the total population as minority populations.

- 39 • Central Valley Region: Colusa, Sacramento, Solano, Sutter, Yolo, Fresno,
40 Kern, Kings, Madera, Merced, San Joaquin, Stanislaus, and Tulare counties

- 1 • Central Coast Region; Santa Barbara.
- 2 • Southern California Region: Los Angeles, Orange, Riverside, San Bernardino,
- 3 San Diego, and Ventura.

4 Although, the majority of the populations in the Trinity River Region counties are
5 not minority populations, these counties do include the Hoopa Valley Indian
6 Reservation, Yurok Indian Reservation, and Resighini Rancheria. Therefore, the
7 Trinity River Region counties are also included in the environmental justice
8 analysis.

9 The CEQ guidance provides the following three factors to be considered for
10 determination if disproportionately high and adverse impacts may accrue to
11 minority or low-income populations.

12 The following criteria were used to evaluate the impacts to minority and
13 low-income populations resulting from the operational changes following the
14 implementation of each of the alternatives as compared to the No Action
15 Alternative and the Second Basis of Comparison:

- 16 • Whether there is or would be an impact that results in a disproportionately
17 high and adverse human health and environmental impact, including social
18 and economic effects on environmental justice populations.
- 19 • Whether the environmental effects are significant and are, or may be, having
20 an adverse impact on environmental justice populations that appreciably
21 exceeds or is likely to appreciably exceed those on the general population or
22 other appropriate comparison group.
- 23 • Whether the environmental effects occur or would occur in an environmental
24 justice population affected by cumulative or multiple adverse exposures from
25 environmental hazards.

26 To determine whether the operational changes resulting from implementation of
27 each of the alternatives as compared to the No Action Alternative and the Second
28 Basis of Comparison will have a “disproportionately high and adverse impact” on
29 minority and low-income populations, various factors were considered, including
30 potential adverse impacts, mitigation, and enhancement measures that will be
31 incorporated into the alternatives; and offsetting benefits.

32 The environmental justice guidance documents do not specifically define
33 conditions that would result in “high and adverse human health and
34 environmental impact.” For this analysis, the potential changes in air quality,
35 cultural resources, public health, and socioeconomics were considered within the
36 counties that had a minority population of 50 percent or greater of the total
37 population.

38 The changes were then determined if the impacts would be disproportionately high
39 on the minority populations. Potential adverse impacts were evaluated with
40 regard to air quality, public health, and socioeconomics.

1 Changes in CVP and SWP operations under the alternatives as compared to the
2 No Action Alternative and Second Basis of Comparison could result in
3 disproportionately high effects on minority or tribal populations related to changes
4 in air quality, public health, and socioeconomics.

5 **21.4.1.1 Changes in Emissions of Criteria Air Pollutants and Precursors,**
6 **and/or Exposure of Sensitive Receptors to Substantial**
7 **Concentrations of Air Contaminants Related to Changes in**
8 **Groundwater Pumping**

9 Changes in CVP and SWP operations under the alternatives could change the use
10 of individual engines to operate groundwater wells. To evaluate the potential for
11 changes in emissions of criteria air pollutants and precursors, and/or exposure of
12 sensitive receptors to substantial concentrations of air contaminants, results from
13 the CVHM model that indicate changes in groundwater withdrawals due to
14 changes in CVP and SWP operations were analyzed. However, it is not known
15 how many of the groundwater pumps use electricity and how many use diesel
16 engines. The diesel engines have the potential to emit criteria air pollutants and
17 precursors, and toxic air contaminants, as described in Chapter 16, Air Quality
18 and Greenhouse Gas Emissions.

19 Most of the groundwater wells in the Central Valley use electrical pumps. As
20 reported in a recent environmental assessment, approximately 14 to 15 percent of
21 the pumps used diesel fuel in 2003 (Reclamation 2013a). It is assumed for this
22 EIS, that the portion of groundwater pumps that use electricity would remain
23 approximately at 85 percent. Therefore, it is assumed that increases or decreases
24 in groundwater pumping would be indicative of an increase or decrease in the use
25 of diesel engines in the Central Valley as well as in the San Francisco Bay Area,
26 Central Coast, and Southern California regions. Changes in CVP and SWP
27 operations would not result in changes in groundwater pumping in the Trinity
28 River Region; therefore, this analysis does not address Trinity River Region.

29 **21.4.1.2 Changes in Public Health Related to Changes in Potential**
30 **Exposure to Mercury in Fish Used in Human Consumption**

31 Changes in CVP and SWP operations under the alternatives could change public
32 health factors related to mercury concentrations in fish used for human
33 consumption as compared to the No Action Alternative and Second Basis of
34 Comparison, as described in Chapter 18, Public Health.

35 **21.4.1.3 Changes in Socioeconomics**

36 Changes in CVP and SWP operations under the alternatives could change
37 socioeconomic factors related to employment related to irrigated agriculture and
38 municipal and industrial (M&I) water supplies and tribal salmon harvest in the
39 Trinity River Region as compared to the No Action Alternative and Second Basis
40 of Comparison, as described in Chapter 19, Socioeconomics. However, changes
41 in employment related to irrigated agriculture and M&I water supplies would be
42 similar. Therefore, these changes are not analyzed in this EIS.

1 **21.4.1.4 Effects due to Cross Delta Water Transfers**

2 Historically water transfer programs have been developed on an annual basis.
3 The demand for water transfers is dependent upon the availability of water
4 supplies to meet water demands. Water transfer transactions have increased over
5 time as CVP and SWP water supply availability has decreased, especially during
6 drier water years.

7 Parties seeking water transfers generally acquire water from sellers who have
8 available surface water who can make the water available through releasing
9 previously stored water, pump groundwater instead of using surface water
10 (groundwater substitution); idle crops; or substitute crops that uses less water in
11 order to reduce normal consumptive use of surface water.

12 Water transfers using CVP and SWP Delta pumping plants and south of Delta
13 canals generally occur when there is unused capacity in these facilities. These
14 conditions generally occur during drier water year types when the flows from
15 upstream reservoirs plus unregulated flows are adequate to meet the Sacramento
16 Valley water demands and the CVP and SWP export allocations. In non-wet
17 years, the CVP and SWP water allocations would be less than full contract
18 amounts; therefore, capacity may be available in the CVP and SWP conveyance
19 facilities to move water from other sources.

20 Projecting future environmental justice conditions related to water transfer
21 activities is difficult because specific water transfer actions required to make the
22 water available, convey the water, and/or use the water would change each year
23 due to changing hydrological conditions, CVP and SWP water availability,
24 specific local agency operations, and local cropping patterns. Reclamation
25 recently prepared a long-term regional water transfer environmental document
26 which evaluated potential changes in conditions related to water transfer actions
27 (Reclamation 2014c). Results from this analysis were used to inform the impact
28 assessment of potential effects of water transfers under the alternatives as
29 compared to the No Action Alternative and the Second Basis of Comparison.

30 **21.4.2 Conditions in Year 2030 without Implementation of**
31 **Alternatives 1 through 5**

32 This EIS includes two bases of comparison, as described in Chapter 3,
33 Description of Alternatives: the No Action Alternative and the Second Basis of
34 Comparison. Both of these bases are evaluated at 2030 conditions.

35 Changes that would occur over the next 15 years without implementation of the
36 alternatives are not analyzed in this EIS. However, the changes to environmental
37 justice factors that are assumed to occur by 2030 under the No Action Alternative
38 and the Second Basis of Comparison are summarized in this section. Many of the
39 changed conditions would occur in the same manner under both the No Action
40 Alternative and the Second Basis of Comparison.

1 **21.4.2.1 Common Changes in Conditions under the No Action Alternative**
2 **and Second Basis of Comparison**

3 Conditions in 2030 would be different than existing conditions due to:

- 4 • Climate change and sea level rise
- 5 • General plan development throughout California, including increased water
6 demands in portions of Sacramento Valley
- 7 • Implementation of reasonable and foreseeable water resources management
8 projects to provide water supplies

9 It is anticipated that climate change would result in more short-duration high-
10 rainfall events and less snowpack in the winter and early spring months. The
11 reservoirs would be full more frequently by the end of April or May by 2030 than
12 in recent historical conditions. However, as the water is released in the spring,
13 there would be less snowpack to refill the reservoirs. This condition would
14 reduce reservoir storage and available water supplies to downstream uses in the
15 summer. The reduced end of September storage also would reduce the ability to
16 release stored water to downstream regional reservoirs. These conditions would
17 occur for all reservoirs in the California foothills and mountains, including non-
18 CVP and SWP reservoirs.

19 These changes would result in a decline of the long-term average CVP and SWP
20 water supply deliveries by 2030 as compared to recent historical long-term
21 average deliveries under the No Action Alternative and the Second Basis of
22 Comparison. However, the CVP and SWP water deliveries would be less under
23 the No Action Alternative as compared to the Second Basis of Comparison, as
24 described in Chapter 5, Surface Water Resources and Water Supplies. Due to
25 climate change and related lower snowfall, end of September low reservoir
26 storage would be lower in critical dry years by 2030 as compared to recent
27 historical conditions in Shasta Lake, Lake Oroville, Folsom Lake, New Melones
28 Reservoir, and San Luis Reservoir. Therefore, the potential for reduced reservoir
29 water supplies for wildland firefighting would be greater under the No Action
30 Alternative and Second Basis of Comparison as compared to recent historical
31 conditions.

32 Under the No Action Alternative and the Second Basis of Comparison, land uses
33 in 2030 would occur in accordance with adopted general plans.

34 The No Action Alternative and the Second Basis of Comparison assumes
35 completion of water resources management and environmental restoration
36 projects that would have occurred without implementation of Alternatives 1
37 through 5, including regional and local recycling projects, surface water and
38 groundwater storage projects, conveyance improvement projects, and desalination
39 projects, as described in Chapter 3, Description of Alternatives. The No Action
40 Alternative and the Second Basis of Comparison also assumes implementation of
41 actions included in the 2008 U.S. Fish and Wildlife Service (USFWS) Biological
42 Opinion (BO) and 2009 National Marine Fisheries Service (NMFS) BO that

1 would have been implemented without the BOs by 2030, as described in
 2 Chapter 3, Description of Alternatives.

3 Under the No Action Alternative and Second Basis of Comparison, it is
 4 anticipated that mercury concentrations in fish tissue within the Delta will be
 5 either similar or greater than recent historical conditions. Phase 1 of the Delta
 6 Mercury Program mandated by the Central Valley Regional Water Quality
 7 Control Board (RWQCB) is currently being completed to protect people eating
 8 one meal per week of larger fish from the Delta, including Largemouth Bass.
 9 Phase 1 is focused on studies and pilot projects to develop and evaluate
 10 management practices to control methylmercury from mercury sources in the
 11 Delta and Yolo Bypass; and to reduce total mercury loading to the San Francisco
 12 Bay. Following completion of Phase 1 in 2019, Phase 2 will be implemented
 13 through 2030. Phase 2 will focus on methylmercury control programs and
 14 reduction programs for total inorganic mercury. Due to the extent of these
 15 studies, it is not anticipated that changes in methylmercury or total mercury
 16 concentrations in fish tissue will be reduced by 2030. Future mercury reduction
 17 and control programs will reduce mercury sources and related fish tissue
 18 concentrations; however, that will occur after 2030.

19 **21.4.3 Evaluation of Alternatives**

20 Alternatives 1 through 5 have been compared to the No Action Alternative; and
 21 the No Action Alternative and Alternatives 1 through 5 have been compared to
 22 the Second Basis of Comparison.

23 During review of the numerical modeling analyses used in this EIS, an error was
 24 determined in the CalSim II model assumptions related to the Stanislaus River
 25 operations for the Second Basis of Comparison, Alternative 1, and Alternative 4
 26 model runs. Appendix 5C includes a comparison of the CalSim II model run
 27 results presented in this chapter and CalSim II model run results with the error
 28 corrected. Appendix 5C also includes a discussion of changes in the comparison
 29 of groundwater conditions for the following alternative analyses.

- 30 • No Action Alternative compared to the Second Basis of Comparison
- 31 • Alternative 1 compared to the No Action Alternative
- 32 • Alternative 3 compared to the Second Basis of Comparison
- 33 • Alternative 5 compared to the Second Basis of Comparison.

34 **21.4.3.1 No Action Alternative**

35 The No Action Alternative is compared to the Second Basis of Comparison.

36 **21.4.3.1.1 Central Valley Region**

37 *Changes in Emissions of Criteria Air Pollutants and Precursors, and/or Exposure*
 38 *of Sensitive Receptors to Substantial Concentrations of Air Contaminants Related*
 39 *to Changes in Groundwater Pumping*

40 Groundwater pumping in the San Joaquin Valley portion of the Central Valley
 41 Region would increase by 8 percent under the No Action Alternative as compared
 42 to the Second Basis of Comparison. It is not known if the additional groundwater

1 pumping would rely upon electricity or diesel to drive the pump engines. Under
2 the worst case analysis, it is assumed that the increased use of diesel engines
3 would be proportional to the increased use of groundwater. Therefore, under the
4 No Action Alternative, there would be a potential increase in emissions of criteria
5 air pollutants and precursors, and/or exposure of sensitive receptors to substantial
6 concentrations of air contaminants as compared to the Second Basis of
7 Comparison.

8 *Changes in Public Health Factors Related to Mercury in Fish used for Human*
9 *Consumption*

10 Mercury concentrations in Largemouth Bass would be similar (within 5 percent
11 change) in most locations in the Delta, except for Rock Slough, San Joaquin River
12 near Antioch, and Montezuma Slough in Suisun Marsh. In these areas, the
13 mercury concentrations would increase by 7 percent over long-term conditions
14 under the No Action Alternative as compared to the Second Basis of Comparison.
15 Under dry and critical dry years, mercury concentrations would increase by 7 to
16 8 percent at Rock Slough, intakes of the Banks and Jones pumping plants, and
17 Victoria Canal. All values exceed the threshold of 0.24 mg/kg ww for mercury.

18 *Effects Related to Cross Delta Water Transfers*

19 Potential effects to environmental justice factors could be similar to those
20 identified in a recent environmental analysis conducted by Reclamation for long-
21 term water transfers from the Sacramento to San Joaquin valleys (Reclamation
22 2014c). Potential effects to environmental justice were identified as loss of
23 employment in the seller's service area if crop idling was used to provide transfer
24 water. The analysis indicated that the proportion of crop idled acreage would be
25 small as compared to the overall regional irrigated acreage, and that this change
26 would not result in in disproportionately high or adverse effects. In addition,
27 beneficial effects could occur in the purchaser's service area if more acreage was
28 cultivated with the water transfer program than without the water transfer
29 program.

30 Under the No Action Alternative, the timing of cross Delta water transfers would
31 be limited to July through September and include annual volumetric limits, in
32 accordance with the 2008 USFWS BO and 2009 NMFS BO. Under the Second
33 Basis of Comparison, water could be transferred throughout the year without an
34 annual volumetric limit. Overall, the potential for cross Delta water transfers
35 would be less under the No Action Alternative than under the Second Basis of
36 Comparison.

37 **21.4.3.1.2 San Francisco Bay Area, Central Coast, and Southern**
38 **California Regions**

39 *Changes in Emissions of Criteria Air Pollutants and Precursors, and/or Exposure*
40 *of Sensitive Receptors to Substantial Concentrations of Air Contaminants Related*
41 *to Changes in Groundwater Pumping*

42 It is anticipated that CVP and SWP water supplies would be decreased by
43 10 percent and 18 percent, respectively, in the San Francisco Bay Area, Central

1 Coast, and Southern California regions under No Action Alternative as compared
 2 to the Second Basis of Comparison. The decrease in surface water supplies could
 3 result in additional use of groundwater pumps and emissions of air pollutants and
 4 contaminants if the use of diesel engines is also increased.

5 **21.4.3.2 Alternative 1**

6 As described in Chapter 3, Description of Alternatives, Alternative 1 is identical
 7 to the Second Basis of Comparison. As described in Chapter 4, Approach to
 8 Environmental Analysis, Alternative 1 is compared to the No Action Alternative
 9 and the Second Basis of Comparison. However, because CVP and SWP
 10 operations under Alternative 1 are identical to conditions under the Second Basis
 11 of Comparison; Alternative 1 is only compared to the No Action Alternative.

12 **21.4.3.2.1 Alternative 1 Compared to the No Action Alternative**

13 *Central Valley Region*

14 *Changes in Emissions of Criteria Air Pollutants and Precursors, and/or*
 15 *Exposure of Sensitive Receptors to Substantial Concentrations of Air*
 16 *Contaminants Related to Changes in Groundwater Pumping*

17 Groundwater pumping in the San Joaquin Valley portion of the Central Valley
 18 Region would decrease by 8 percent under Alternative 1 as compared to the No
 19 Action Alternative. It is not known if the reduction in groundwater pumping
 20 would result in a reduction of the use of electricity or diesel to drive the pump
 21 engines. For this analysis, it is assumed that the decreased use of diesel engines
 22 would be proportional to the decreased use of groundwater. Therefore, under
 23 Alternative 1, there would be a potential decrease in emissions of criteria air
 24 pollutants and precursors, and/or exposure of sensitive receptors to substantial
 25 concentrations of air contaminants as compared to the No Action Alternative.

26 *Changes in Public Health Factors Related to Mercury in Fish used for Human*
 27 *Consumption*

28 Mercury concentrations in Largemouth Bass would be similar in most locations in
 29 the Delta, except for Rock Slough, San Joaquin River near Antioch, and
 30 Montezuma Slough in Suisun Marsh. In these areas, the mercury concentrations
 31 would decrease by 6 percent over the long-term conditions under Alternative 1 as
 32 compared to the No Action Alternative. Under dry and critical dry years, mercury
 33 concentrations would decrease by 6 to 8 percent at Rock Slough, intakes of the
 34 Banks and Jones pumping plants, and Victoria Canal. All values exceed the
 35 threshold of 0.24 mg/kg ww for mercury.

36 *Effects Related to Cross Delta Water Transfers*

37 Potential effects to environmental justice conditions could be similar to those
 38 identified in a recent environmental analysis conducted by Reclamation for long-
 39 term water transfers from the Sacramento to San Joaquin valleys (Reclamation
 40 2014c) as described above under the No Action Alternative compared to the
 41 Second Basis of Comparison. For the purposes of this EIS, it is anticipated that
 42 similar conditions would occur during implementation of cross Delta water
 43 transfers under Alternative 1 and the No Action Alternative, and that impacts on

1 environmental justice factors would not be substantial due to implementation
2 requirements of the transfer programs.

3 Under Alternative 1, water could be transferred throughout the year without an
4 annual volumetric limit. Under the No Action Alternative, the timing of cross
5 Delta water transfers would be limited to July through September and include
6 annual volumetric limits, in accordance with the 2008 USFWS BO and 2009
7 NMFS BO. Overall, the potential for cross Delta water transfers would be
8 increased under Alternative 1 as compared to the No Action Alternative.

9 *San Francisco Bay Area, Central Coast, and Southern California Regions*
10 *Changes in Emissions of Criteria Air Pollutants and Precursors, and/or*
11 *Exposure of Sensitive Receptors to Substantial Concentrations of Air*
12 *Contaminants Related to Changes in Groundwater Pumping*

13 It is anticipated that CVP and SWP water supplies would be increased by
14 11 percent and 21 percent, respectively, in the San Francisco Bay Area, Central
15 Coast, and Southern California regions under Alternative 1 as compared to the No
16 Action Alternative. The increase in surface water supplies could result in the
17 reduction in use of groundwater pumps and emissions of air pollutants and
18 contaminants if the use of diesel engines is also decreased.

19 **21.4.3.2 Alternative 1 Compared to the Second Basis of Comparison**

20 Alternative 1 is identical to the Second Basis of Comparison.

21 **21.4.3.3 Alternative 2**

22 The CVP and SWP operations under Alternative 2 are identical to the CVP and
23 SWP operations under the No Action Alternative, as described in Chapter 3,
24 Description of Alternatives; therefore Alternative 2 is only compared to the
25 Second Basis of Comparison.

26 **21.4.3.3.1 Alternative 2 Compared to the Second Basis of Comparison**

27 The CVP and SWP operations under Alternative 2 are identical to the CVP and
28 SWP operations under the No Action Alternative. Therefore, changes to
29 environmental justice factors under Alternatives 2 as compared to the Second
30 Basis of Comparison would be the same as the impacts described in
31 Section 18.4.3.1, No Action Alternative.

32 **21.4.3.4 Alternative 3**

33 As described in Chapter 3, Description of Alternatives, CVP and SWP operations
34 under Alternative 3 are similar to the Second Basis of Comparison with modified
35 Old and Middle River flow criteria and New Melones Reservoir operations. As
36 described in Chapter 4, Approach to Environmental Analysis, Alternative 3 is
37 compared to the No Action Alternative and the Second Basis of Comparison.

1 **21.4.3.4.1 Alternative 3 Compared to the No Action Alternative**

2 *Central Valley Region*

3 *Changes in Emissions of Criteria Air Pollutants and Precursors, and/or*
 4 *Exposure of Sensitive Receptors to Substantial Concentrations of Air*
 5 *Contaminants Related to Changes in Groundwater Pumping*

6 Groundwater pumping in the San Joaquin Valley portion of the Central Valley
 7 Region would decrease by 6 percent under Alternative 3 as compared to the No
 8 Action Alternative. It is not known if the reduction in groundwater pumping
 9 would result in a reduction of the use of electricity or diesel to drive the pump
 10 engines. For this analysis, it is assumed that the decreased use of diesel engines
 11 would be proportional to the decreased use of groundwater. Therefore, under
 12 Alternative 3, there would be a potential decrease in emissions of criteria air
 13 pollutants and precursors, and/or exposure of sensitive receptors to substantial
 14 concentrations of air contaminants as compared to the No Action Alternative.

15 *Changes in Public Health Factors Related to Mercury in Fish used for Human*
 16 *Consumption*

17 Mercury concentrations in Largemouth Bass would be similar (within 5 percent
 18 change) in most locations in the Delta, except for San Joaquin River near Antioch
 19 and Montezuma Slough in Suisun Marsh. In these areas, the mercury
 20 concentrations would decrease by 6 percent over the long-term conditions under
 21 Alternative 3 as compared to the No Action Alternative. Mercury concentrations
 22 under the dry and critical dry years would be similar throughout the Delta. All
 23 values exceed the threshold of 0.24 mg/kg ww for mercury.

24 *Effects Related to Cross Delta Water Transfers*

25 Potential effects to environmental justice factors could be similar to those
 26 identified in a recent environmental analysis conducted by Reclamation for long-
 27 term water transfers from the Sacramento to San Joaquin valleys (Reclamation
 28 2014c) as described above under the No Action Alternative compared to the
 29 Second Basis of Comparison. For the purposes of this EIS, it is anticipated that
 30 similar conditions would occur during implementation of cross Delta water
 31 transfers under Alternative 3 and the No Action Alternative, and that impacts on
 32 environmental justice factors would not be substantial due to implementation
 33 requirements of the transfer programs.

34 Under Alternative 3, water could be transferred throughout the year without an
 35 annual volumetric limit. Under the No Action Alternative, the timing of cross
 36 Delta water transfers would be limited to July through September and include
 37 annual volumetric limits, in accordance with the 2008 USFWS BO and 2009
 38 NMFS BO. Overall, the potential for cross Delta water transfers would be
 39 increased under Alternative 3 as compared to the No Action Alternative.

1 *San Francisco Bay Area, Central Coast, and Southern California Regions*
2 *Changes in Emissions of Criteria Air Pollutants and Precursors, and/or*
3 *Exposure of Sensitive Receptors to Substantial Concentrations of Air*
4 *Contaminants Related to Changes in Groundwater Pumping*

5 It is anticipated that CVP and SWP water supplies would be increased by
6 9 percent and 17 percent, respectively, in the San Francisco Bay Area, Central
7 Coast, and Southern California regions under Alternative 3 as compared to the No
8 Action Alternative. The increase in surface water supplies could result in the
9 reduction in use of groundwater pumps and emissions of air pollutants and
10 contaminants if the use of diesel engines is also decreased.

11 **21.4.3.4.2 Alternative 3 Compared to the Second Basis of Comparison**

12 *Central Valley Region*

13 *Changes in Emissions of Criteria Air Pollutants and Precursors, and/or*
14 *Exposure of Sensitive Receptors to Substantial Concentrations of Air*
15 *Contaminants Related to Changes in Groundwater Pumping*

16 Groundwater pumping in the San Joaquin Valley portion of the Central Valley
17 Region would be similar (within a 5 percent change) under Alternative 3 as
18 compared to the Second Basis of Comparison. Therefore, the emissions of
19 criteria air pollutants and precursors, and/or exposure of sensitive receptors to
20 substantial concentrations of air contaminants would be similar under
21 Alternative 3 as compared to the Second Basis of Comparison.

22 *Changes in Public Health Factors Related to Mercury in Fish Used for*
23 *Human Consumption*

24 Mercury concentrations in Largemouth Bass would be similar throughout the
25 Delta under Alternative 3 as compared to the Second Basis of Comparison, as
26 summarized in Chapter 6, Surface Water Quality. All values exceed the threshold
27 of 0.24 mg/kg ww for mercury.

28 *Effects Related to Cross Delta Water Transfers*

29 Potential effects to environmental justice factors could be similar to those
30 identified in a recent environmental analysis conducted by Reclamation for
31 long-term water transfers from the Sacramento to San Joaquin valleys
32 (Reclamation 2014c) as described above under the No Action Alternative
33 compared to the Second Basis of Comparison. For the purposes of this EIS, it is
34 anticipated that similar conditions would occur during implementation of cross
35 Delta water transfers under Alternative 3 and the Second Basis of Comparison,
36 and that impacts on environmental justice factors would not be substantial in the
37 seller's service area due to implementation requirements of the transfer programs.

38 Under Alternative 3 and the Second Basis of Comparison, water could be
39 transferred throughout the year without an annual volumetric limit. Overall, the
40 potential for cross Delta water transfers would be similar under Alternative 3 and
41 the Second Basis of Comparison.

1 *San Francisco Bay Area, Central Coast, and Southern California Regions*
 2 *Changes in Emissions of Criteria Air Pollutants and Precursors, and/or*
 3 *Exposure of Sensitive Receptors to Substantial Concentrations of Air*
 4 *Contaminants Related to Changes in Groundwater Pumping*

5 It is anticipated that CVP and SWP water supplies and emissions from diesel
 6 engines used for groundwater pumping would be similar in the San Francisco Bay
 7 Area, Central Coast, and Southern California regions under Alternative 3 as
 8 compared to the Second Basis of Comparison.

9 **21.4.3.5 Alternative 4**

10 The environmental justice conditions under Alternative 4 would be identical to
 11 the conditions under the Second Basis of Comparison; therefore, Alternative 4 is
 12 only compared to the No Action Alternative.

13 **21.4.3.5.1 Alternative 4 Compared to the No Action Alternative**

14 The CVP and SWP operations under Alternative 4 are identical to the CVP and
 15 SWP operations under the Second Basis of Comparison and Alternative 1.
 16 Therefore, changes in environmental justice conditions under Alternative 4 as
 17 compared to the No Action Alternative would be the same as the impacts
 18 described in Section 12.4.3.2.1, Alternative 1 Compared to the No Action
 19 Alternative.

20 **21.4.3.6 Alternative 5**

21 As described in Chapter 3, Description of Alternatives, CVP and SWP operations
 22 under Alternative 5 are similar to the No Action Alternative with modified Old
 23 and Middle River flow criteria and New Melones Reservoir operations. As
 24 described in Chapter 4, Approach to Environmental Analysis, Alternative 5 is
 25 compared to the No Action Alternative and the Second Basis of Comparison.

26 **21.4.3.6.1 Alternative 5 Compared to the No Action Alternative**

27 *Central Valley Region*

28 *Changes in Emissions of Criteria Air Pollutants and Precursors, and/or*
 29 *Exposure of Sensitive Receptors to Substantial Concentrations of Air*
 30 *Contaminants Related to Changes in Groundwater Pumping*

31 Groundwater pumping in the San Joaquin Valley portion of the Central Valley
 32 Region would be similar under Alternative 5 as compared to the No Action
 33 Alternative. Therefore, the emissions of criteria air pollutants and precursors,
 34 and/or exposure of sensitive receptors to substantial concentrations of air
 35 contaminants would be similar under Alternative 5 as compared to the No Action
 36 Alternative.

1 *Changes in Public Health Factors Related to Mercury in Fish used for Human*
2 *Consumption*

3 Mercury concentrations in Largemouth Bass would be similar throughout the
4 Delta under Alternative 5 as compared to the No Action Alternative, as
5 summarized in Chapter 6, Surface Water Quality. All values exceed the threshold
6 of 0.24 mg/kg ww for mercury.

7 *Effects Related to Cross Delta Water Transfers*

8 Potential effects to environmental justice factors could be similar to those
9 identified in a recent environmental analysis conducted by Reclamation for long-
10 term water transfers from the Sacramento to San Joaquin valleys (Reclamation
11 2014c) as described above under the No Action Alternative compared to the
12 Second Basis of Comparison. For the purposes of this EIS, it is anticipated that
13 similar conditions would occur during implementation of cross Delta water
14 transfers under Alternative 5 and the No Action Alternative, and that impacts on
15 environmental justice factors would not be substantial in the seller's service area
16 due to implementation requirements of the transfer programs.

17 Under Alternative 5 and the No Action Alternative, the timing of cross Delta
18 water transfers would be limited to July through September and include annual
19 volumetric limits, in accordance with the 2008 USFWS BO and 2009 NMFS BO.
20 Overall, the potential for cross Delta water transfers would be similar under
21 Alternative 5 and the No Action Alternative.

22 *San Francisco Bay Area, Central Coast, and Southern California Regions*
23 *Changes in Emissions of Criteria Air Pollutants and Precursors, and/or*
24 *Exposure of Sensitive Receptors to Substantial Concentrations of Air*
25 *Contaminants Related to Changes in Groundwater Pumping*

26 It is anticipated that CVP and SWP water supplies and emissions from diesel
27 engines used for groundwater pumping would be similar in the San Francisco Bay
28 Area, Central Coast, and Southern California regions under Alternative 5 as
29 compared to the No Action Alternative.

30 **21.4.3.6.2 Alternative 5 Compared to the Second Basis of Comparison**

31 *Central Valley Region*

32 *Changes in Emissions of Criteria Air Pollutants and Precursors, and/or*
33 *Exposure of Sensitive Receptors to Substantial Concentrations of Air*
34 *Contaminants Related to Changes in Groundwater Pumping*

35 Groundwater pumping in the San Joaquin Valley portion of the Central Valley
36 Region would increase by 8 percent under Alternative 5 as compared to the
37 Second Basis of Comparison. It is not known if the additional groundwater
38 pumping would rely upon electricity or diesel to drive the pump engines. Under
39 the worst case analysis, it is assumed that the increased use of diesel engines
40 would be proportional to the increased use of groundwater. Therefore, under
41 Alternative 5, there would be a potential increase in emissions of criteria air
42 pollutants and precursors, and/or exposure of sensitive receptors to substantial

1 concentrations of air contaminants as compared to the Second Basis of
2 Comparison.

3 *Changes in Public Health Factors Related to Mercury in Fish used for Human*
4 *Consumption*

5 Mercury concentrations in Largemouth Bass would be similar in most locations in
6 the Delta, except for Rock Slough, San Joaquin River near Antioch, and
7 Montezuma Slough in Suisun Marsh. In these areas, the mercury concentrations
8 would increase by 7 to 8 percent over long-term conditions under Alternative 5 as
9 compared to the Second Basis of Comparison. During dry and critical dry years,
10 mercury concentrations also would increase by 7 percent at intakes to Banks
11 Pumping Plant and Jones Pumping Plant; and 13 percent at Rock Slough. All
12 values exceed the threshold of 0.24 mg/kg ww for mercury.

13 *Effects Related to Cross Delta Water Transfers*

14 Potential effects to environmental justice factors could be similar to those
15 identified in a recent environmental analysis conducted by Reclamation for long-
16 term water transfers from the Sacramento to San Joaquin valleys (Reclamation
17 2014c) as described above under the No Action Alternative compared to the
18 Second Basis of Comparison. For the purposes of this EIS, it is anticipated that
19 similar conditions would occur during implementation of cross Delta water
20 transfers under Alternative 5 and the Second Basis of Comparison, and that
21 impacts on environmental justice factors would not be substantial in the seller's
22 service area due to implementation requirements of the transfer programs.

23 Under Alternative 5, the timing of cross Delta water transfers would be limited to
24 July through September and include annual volumetric limits, in accordance with
25 the 2008 USFWS BO and 2009 NMFS BO. Under the Second Basis of
26 Comparison, water could be transferred throughout the year without an annual
27 volumetric limit. Overall, the potential for cross Delta water transfers would be
28 reduced under Alternative 5 as compared to the Second Basis of Comparison.

29 *San Francisco Bay Area, Central Coast, and Southern California Regions*

30 *Changes in Emissions of Criteria Air Pollutants and Precursors, and/or*
31 *Exposure of Sensitive Receptors to Substantial Concentrations of Air*
32 *Contaminants Related to Changes in Groundwater Pumping*

33 It is anticipated that CVP and SWP water supplies would be decreased by
34 10 percent and 18 percent, respectively, in the San Francisco Bay Area, Central
35 Coast, and Southern California regions under Alternative 5 as compared to the
36 Second Basis of Comparison. The decrease in surface water supplies could result
37 in increased use of groundwater pumps and emissions of air pollutants and
38 contaminants if the use of diesel engines is also increased.

39 **21.4.3.7 Summary of Environmental Consequences**

40 The results of the environmental consequences of implementation of
41 Alternatives 1 through 5 as compared to the No Action Alternative and the
42 Second Basis of Comparison are presented in Tables 21.38 and 21.39.

1 **Table 21.38 Comparison of Alternatives 1 through 5 to No Action Alternative**

Alternative	Potential Change	Consideration for Mitigation Measures
Alternative 1	Decrease potential for emissions of criteria air pollutants and precursors, and/or exposure of sensitive receptors to substantial concentrations of air contaminants by 8 percent in the Central Valley, 11 to 21 percent in the San Francisco Bay Area Region, and by 21 percent in the Central Coast and Southern California regions. Similar mercury concentrations in Largemouth Bass in the most of the Delta; and a 6 percent decrease near Rock Slough, San Joaquin River at Antioch, and Montezuma Slough over the long-term conditions.	None needed
Alternative 2	No effects on environmental justice factors.	None needed
Alternative 3	Decrease potential for emissions of criteria air pollutants and precursors, and/or exposure of sensitive receptors to substantial concentrations of air contaminants by 6 percent in the Central Valley, 9 to 17 percent in the San Francisco Bay Area Region, and by 17 percent in the Central Coast and Southern California regions. Similar mercury concentrations in Largemouth Bass in the most of the Delta; and a 6 percent decrease near San Joaquin River at Antioch and Montezuma Slough over the long-term conditions.	None needed
Alternative 4	Same effects as described for Alternative 1 compared to the No Action Alternative.	None needed
Alternative 5	Similar potential for emissions of criteria air pollutants and precursors, and/or exposure of sensitive receptors to substantial concentrations of air contaminants in the Central Valley, San Francisco Bay Area, Central Coast, and Southern California regions. Similar mercury concentrations in Largemouth Bass throughout the Delta.	None needed

2 Note: Due to the limitations and uncertainty in the CalSim II monthly model and other analytical
 3 tools, incremental differences of 5 percent or less between alternatives and the Second Basis of
 4 Comparison are considered to be “similar.”

5 **Table 21.39 Comparison of Alternatives 1 through 5 to Second Basis of**
 6 **Comparison**

Alternative	Potential Change	Consideration for Mitigation Measures
No Action Alternative	Increase potential for emissions of criteria air pollutants and precursors, and/or exposure of sensitive receptors to substantial concentrations of air contaminants by 8 percent in the Central Valley, 10 to 18 percent in the San Francisco Bay Area Region, and by 18 percent in the Central Coast and Southern California regions. Similar mercury concentrations in Largemouth Bass in the most of the Delta; and a 7 percent increase near Rock Slough, San Joaquin River at Antioch, and Montezuma Slough over the long-term conditions.	Not considered for this comparison.
Alternative 1	No effects on environmental justice factors.	Not considered for this comparison.

Alternative	Potential Change	Consideration for Mitigation Measures
Alternative 2	Same effects as described for No Action Alternative as compared to the Second Basis of Comparison.	Not considered for this comparison.
Alternative 3	<p>Similar potential for emissions of criteria air pollutants and precursors, and/or exposure of sensitive receptors to substantial concentrations of air contaminants in the Central Valley, San Francisco Bay Area, Central Coast, and Southern California regions.</p> <p>Similar mercury concentrations in Largemouth Bass throughout the Delta.</p>	Not considered for this comparison.
Alternative 4	No effects on environmental justice factors.	Not considered for this comparison.
Alternative 5	<p>Increase potential for emissions of criteria air pollutants and precursors, and/or exposure of sensitive receptors to substantial concentrations of air contaminants by 8 percent in the Central Valley, 10 to 18 percent in the San Francisco Bay Area Region, and by 18 percent in the Central Coast and Southern California regions.</p> <p>Similar mercury concentrations in Largemouth Bass in the most of the Delta; and a 7 percent increase near Rock Slough, San Joaquin River at Antioch, and Montezuma Slough over the long-term conditions.</p>	Not considered for this comparison.

1 Note: Due to the limitations and uncertainty in the CalSim II monthly model and other analytical
 2 tools, incremental differences of 5 percent or less between alternatives and the Second Basis of
 3 Comparison are considered to be “similar.”

4 **21.4.3.8 Potential Mitigation Measures**

5 Mitigation measures are presented in this section to avoid, minimize, rectify,
 6 reduce, eliminate, or compensate for adverse environmental effects of
 7 Alternatives 1 through 5 as compared to the No Action Alternative. Mitigation
 8 measures were not included to address adverse impacts under the alternatives as
 9 compared to the Second Basis of Comparison because this analysis was included
 10 in this EIS for information purposes only.

11 Changes in CVP and SWP operations under Alternatives 1 through 5 as compared
 12 to the No Action Alternative would not result in changes in air quality or public
 13 health that are related to environmental justice factors. Therefore, there would be
 14 no disproportionately high or adverse environmental justice effects; and no
 15 mitigation measures are required.

16 **21.4.3.9 Cumulative Effects Analysis**

17 As described in Chapter 3, the cumulative effects analysis considers projects,
 18 programs, and policies that are not speculative; and are based upon known or
 19 reasonably foreseeable long-range plans, regulations, operating agreements, or
 20 other information that establishes them as reasonably foreseeable.

21 The cumulative effects analysis Alternatives 1 through 5 for Environmental
 22 Justice are summarized in Table 21.40.

1 **Table 21.4 Summary of Cumulative Effects on Environmental Justice of**
 2 **Alternatives 1 through 5 as Compared to the No Action Alternative**

Scenarios	Actions	Cumulative Effects of Actions
<p>Past & Present, and Future Actions included in the No Action Alternative and in all Alternatives in Year 2030</p>	<p>Consistent with Affected Environment conditions plus:</p> <p>Actions in the 2008 USFWS BO and 2009 NMFS BO that Would Have Occurred without Implementation of the Biological Opinions, as described in Section 3.3.1.2 (of Chapter 3, Descriptions of Alternatives), including climate change and sea level rise</p> <p>Actions not included in the 2008 USFWS BO and 2009 NMFS BO that Would Have Occurred without Implementation of the Biological Opinions, as described in Section 3.3.1.3 (of Chapter 3, Descriptions of Alternatives):</p> <ul style="list-style-type: none"> • Implementation of Federal and state policies and programs, including Clean Water Act (e.g., Total Maximum Daily Loads); Safe Drinking Water Act; Clean Air Act; and flood management programs • General plans for 2030. • Trinity River Restoration Program. • Central Valley Project Improvement Act programs • Folsom Dam Water Control Manual Update • FERC Relicensing for the Middle Fork of the American River Project • Lower Mokelumne River Spawning Habitat Improvement Project • Dutch Slough Tidal Marsh Restoration • Suisun Marsh Habitat Management, Preservation, and Restoration Plan Implementation • Tidal Wetland Restoration: Yolo Ranch, Northern Liberty Island Fish Restoration Project, Prospect Island Restoration Project, and Calhoun Cut/Lindsey Slough Tidal Habitat Restoration Project • San Joaquin River Restoration Program • Future water supply projects, including water recycling, desalination, groundwater banks and wellfields, and conveyance facilities (projects with completed environmental documents) 	<p><u>These effects would be the same in all alternatives.</u></p> <p>Climate change and sea level rise, development under the general plans, FERC relicensing projects, and some future projects to improve water quality and/or habitat are anticipated to reduce the availability of surface water, including CVP and SWP water supplies. This could result in increased groundwater withdrawals; and a portion of those groundwater pumps would rely upon diesel engines. Therefore, there would be an increased potential for emissions of criteria air pollutants and precursors, and/or exposure of sensitive receptors that could cause a disproportionately high and adverse impact on minority and low-income populations.</p> <p>Mercury concentrations in fish tissue within the Delta will be either similar or greater than recent historical conditions because Phases 1 and 2 of the Delta Mercury Program would be completed by 2030, as mandated by the Central Valley RWQCB, including methylmercury control programs and reduction programs for total inorganic mercury. Due to the extent of these programs, it is anticipated that the programs would be initiated; however, future reductions in mercury sources and related reductions of mercury and methylmercury concentrations in fish tissue would actually occur after 2030.</p>

Scenarios	Actions	Cumulative Effects of Actions
<p>Future Actions considered as Cumulative Effects Actions in with all Alternatives in Year 2030</p>	<p>Actions as described in Section 3.5 (of Chapter 3, Descriptions of Alternatives):</p> <ul style="list-style-type: none"> • Bay-Delta Water Quality Control Plan Update • FERC Relicensing Projects • Bay Delta Conservation Plan (including the California WaterFix alternative) • Shasta Lake Water Resources, North-of-the-Delta Offstream Storage, Los Vaqueros Reservoir Expansion Phase 2, and Upper San Joaquin River Basin Storage Investigations • El Dorado Water and Power Authority Supplemental Water Rights Project • Sacramento River Water Reliability Project • Semitropic Water Storage District Delta Wetlands • North Bay Aqueduct Alternative Intake • San Luis Reservoir Low Point Improvement Project • Future water supply projects, including water recycling, desalination, groundwater banks and wellfields, and conveyance facilities (projects that did not have completed environmental documents during preparation of the EIS) 	<p><u>These effects would be the same in all alternatives.</u></p> <p>Future reasonably foreseeable storage and water supply projects would improve surface water reliability. These actions would reduce the potential for increased groundwater withdrawals; and reduce the potential for emissions of criteria air pollutants and precursors, and/or exposure of sensitive receptors that could cause a disproportionately high and adverse impact on minority and low-income populations.</p>
<p>No Action Alternative with Associated Cumulative Effects Actions in Year 2030</p>	<p>Full implementation of the 2008 USFWS BO and 2009 NMFS BO</p>	<p>Climate change and sea level rise, FERC relicensing projects, and some future projects to improve water quality and/or habitat are anticipated to reduce the availability of surface water, including CVP and SWP water supplies. This could result in increased groundwater withdrawals; and a portion of those groundwater pumps would rely upon diesel engines. Therefore, there would be an increased potential for emissions of criteria air pollutants and precursors, and/or exposure of sensitive receptors that could cause a disproportionately high and adverse impact on minority and low-income populations.</p> <p>Mercury concentrations in fish tissue within the Delta will be</p>

Scenarios	Actions	Cumulative Effects of Actions
		<p>either similar or greater than recent historical conditions because Phases 1 and 2 of the Delta Mercury Program would be completed by 2030, as mandated by the Central Valley RWQCB, including methylmercury control programs and reduction programs for total inorganic mercury. Due to the extent of these programs, it is anticipated that the programs would be initiated; however, future reductions in mercury sources and related reductions of mercury and methylmercury concentrations in fish tissue would actually occur after 2030.</p>
<p>Alternative 1 with Associated Cumulative Effects Actions in Year 2030</p>	<p>No implementation of the 2008 USFWS BO and 2009 NMFS BO actions unless the actions would have been implemented without the BO (e.g., Red Bluff Pumping Plant)</p>	<p>Implementation of Alternative 1 with reasonably foreseeable actions would result in similar changes as under the No Action Alternative with these added actions.</p>
<p>Alternative 2 with Associated Cumulative Effects Actions in Year 2030</p>	<p>Full implementation of the 2008 USFWS BO and 2009 NMFS BO CVP and SWP operational actions No implementation of structural improvements or other actions that require further study to develop a more detailed action description.</p>	<p>Implementation of Alternative 2 with reasonably foreseeable actions would result in similar changes as under the No Action Alternative with these added actions.</p>
<p>Alternative 3 with Associated Cumulative Effects Actions in Year 2030</p>	<p>No implementation of the 2008 USFWS BO and 2009 NMFS BO actions unless the actions would have been implemented without the BO (e.g., Red Bluff Pumping Plant) Slight increase in positive Old and Middle River flows in the winter and spring months</p>	<p>Implementation of Alternative 3 with reasonably foreseeable actions would result in similar changes as under the No Action Alternative with these added actions.</p>
<p>Alternative 4 with Associated Cumulative Effects Actions in Year 2030</p>	<p>No implementation of the 2008 USFWS BO and 2009 NMFS BO actions unless the actions would have been implemented without the BO (e.g., Red Bluff Pumping Plant)</p>	<p>Implementation of Alternative 4 with reasonably foreseeable actions would result in similar changes as under the No Action Alternative with these added actions.</p>
<p>Alternative 5 with Associated Cumulative Effects Actions in Year 2030</p>	<p>Full implementation of the 2008 USFWS BO and 2009 NMFS BO Positive Old and Middle River flows and increased Delta outflow in spring months</p>	<p>Implementation of Alternative 5 with reasonably foreseeable actions would result in similar changes as under the No Action Alternative with these added actions.</p>

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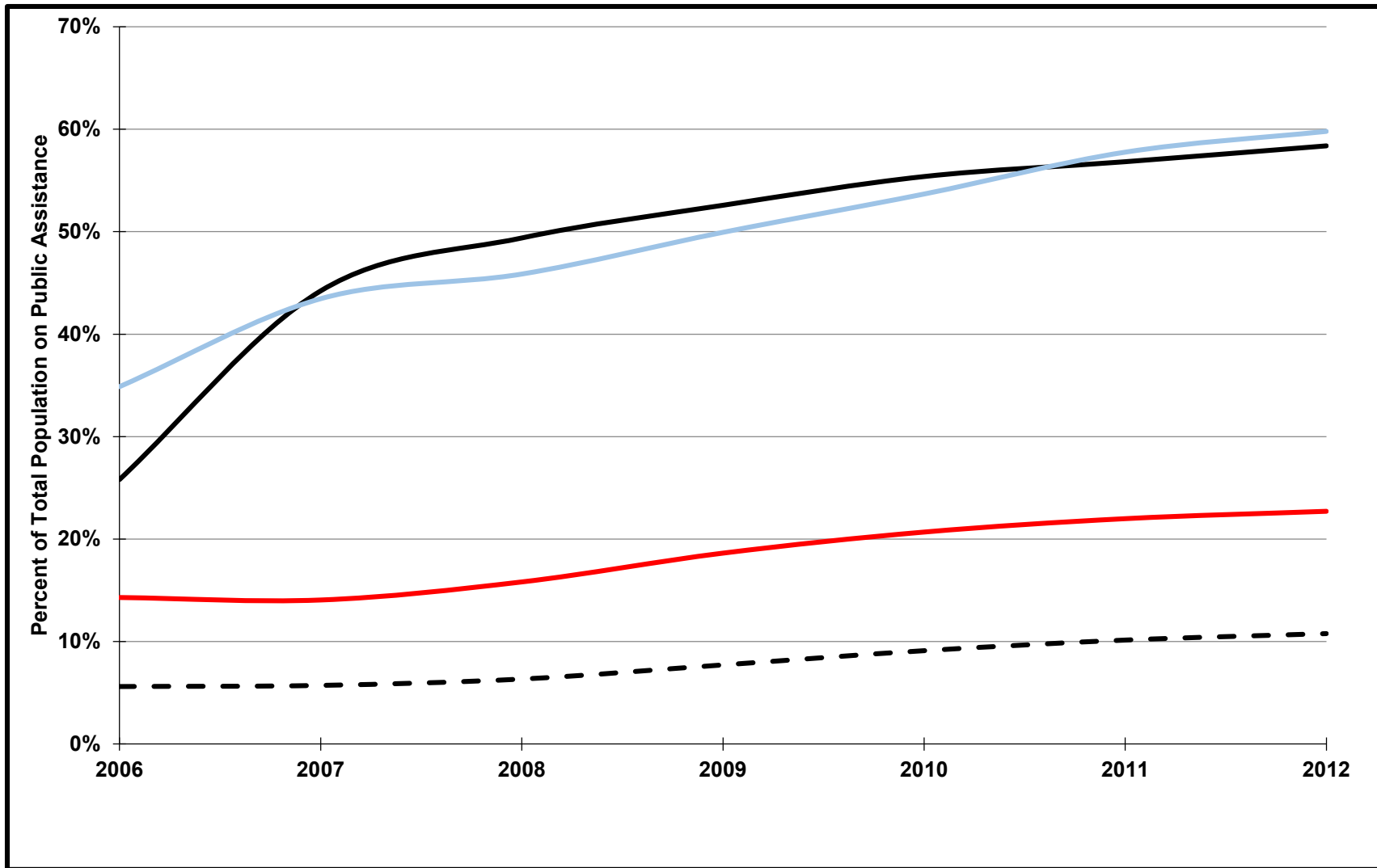


Figure 21.1 Population on CalFresh Program and CalWORKs Program in Huron and Mendota in 2006 through 2012

Source: CDSS 2008a –2008y, 2009a – 2009n, 2012a -2012a, 2013a – 2013i; Fresno County 2013

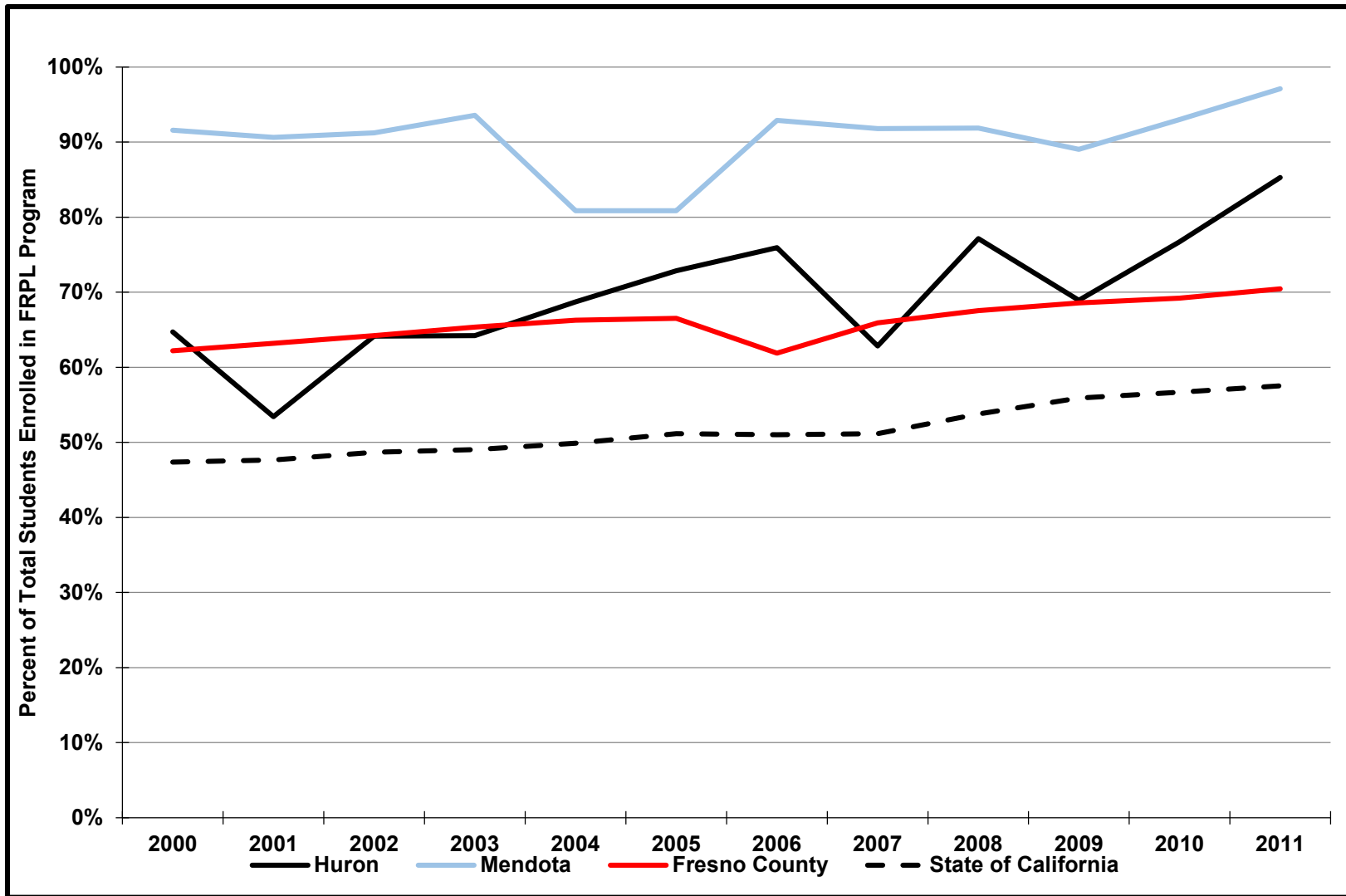


Figure 21.2 Enrollment in Free or Reduced Price Meals Program in Huron and Mendota in 2000 through 2011

Source: CDE 2013

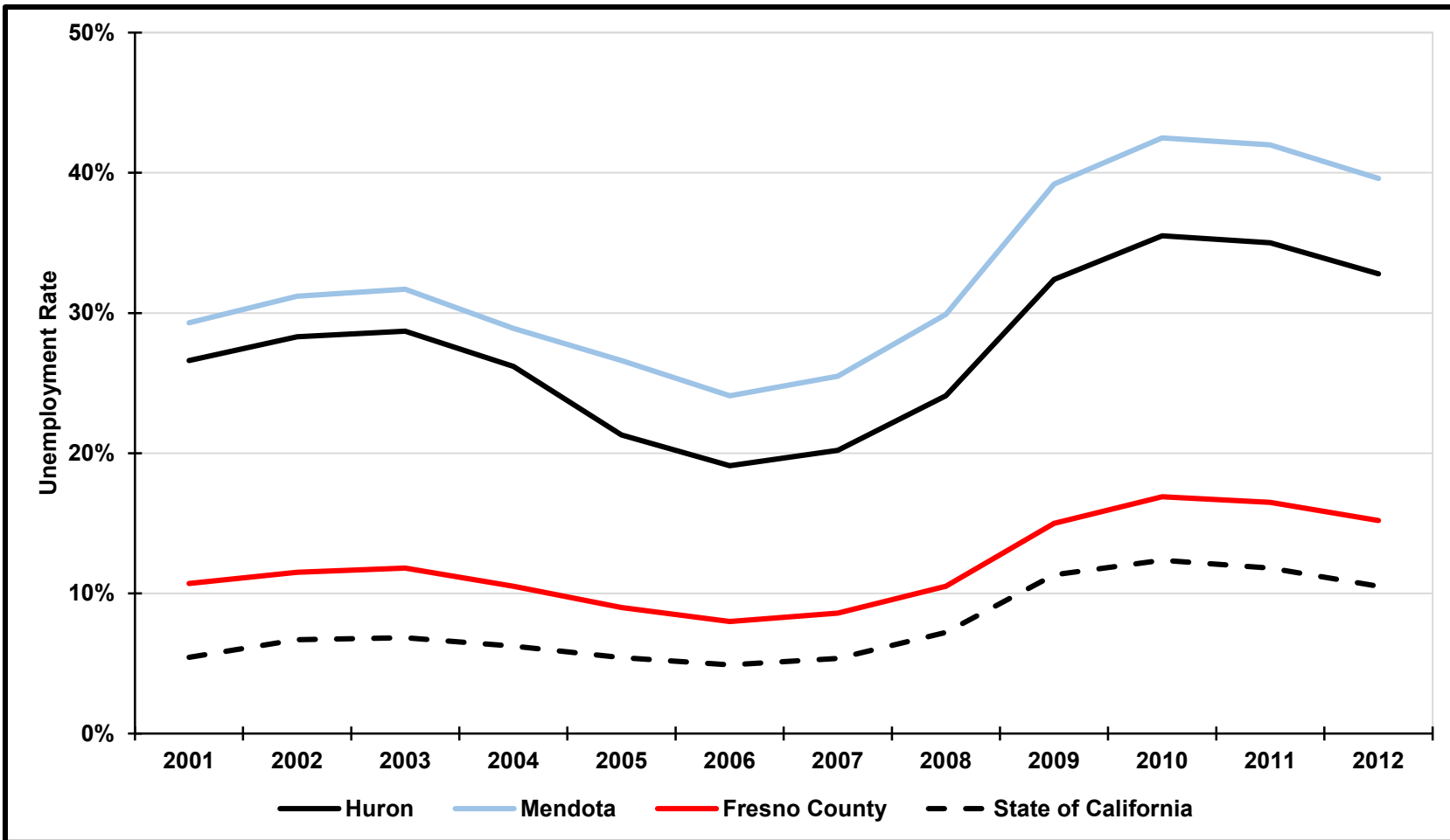


Figure 21.3 Unemployment in Huron and Mendota in 2001 through 2012

Source: BLS 2014; CEDD 2014

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Chapter 22**1 Other NEPA Requirements****2 22.1 Introduction**

3 In addition to the factors described in Chapters 5 through 21, the National
4 Environmental Policy Act (NEPA) requires consideration of the relationship of
5 short-term uses and long-term productivity, consideration of irreversible and
6 irretrievable commitments of resources, and growth-inducing impacts as
7 compared to the No Action Alternative (40 Code of Federal Regulations
8 [CFR] 1508.8). These considerations are described in the following sections of
9 this chapter.

10 22.2 Relationship between Short-term Uses and
11 Long-term Productivity

12 NEPA requires that an Environmental Impact Statement (EIS) prepared by
13 Federal agencies disclose "...the relationship between short-term uses of man's
14 environment and the maintenance and enhancement of long-term productivity..."
15 (40 CFR 1502.16). As discussed in Chapter 1, Introduction, this EIS evaluates
16 long-term potential direct, indirect, and cumulative impacts on the environment
17 that could result from implementation of alternatives for the continued long-term
18 operation of the Central Valley Project (CVP) and State Water Project (SWP) and
19 implementation of ecosystem restoration. This EIS does not evaluate short-term
20 impacts related to implementing project-specific actions, such as impacts during
21 construction and/or start-up periods for actions that are not fully defined at this
22 time and that may be implemented by Reclamation or other agencies as part of the
23 alternatives. It is recognized that numerous projects would be planned, designed,
24 and constructed under the No Action Alternative and the Second Basis of
25 Comparison, including tidal wetlands and floodplain restoration, as described in
26 Chapter 3, Description of Alternatives. It also recognized that facilities to
27 implement fish passage at CVP reservoirs would be implemented under the No
28 Action Alternative and Alternative 5; and facilities to implement a trap and haul
29 program for steelhead from the San Joaquin River under Alternative 4.
30 Project-specific construction impacts would be addressed in project-specific
31 environmental documents prepared at the time the projects are proposed for
32 approval. At this time, however, the need for, and the nature, magnitude, and
33 extent of specific impacts are not known.

34 Potential long-term effects (beneficial and adverse) of implementation of
35 Alternatives 1 through 5 as compared to the No Action Alternative with respect to
36 each environmental resource are summarized in Table 22.1.

1 There would be no long-term effects related to geology and soils resources,
 2 agricultural resources, land use, cultural resources, and Indian Trust Assets
 3 because the conditions under Alternatives 1 through 5 would be similar to
 4 conditions under the No Action Alternative and to the Second Basis of
 5 Comparison.
 6 A complete listing of the effects of implementation of Alternatives 1 through 5 as
 7 compared to the No Action Alternative and to the Second Basis of Comparison
 8 are included Chapter 3, Description of Alternatives.

9 **Table 22.1 Long-term Effects of Implementation of the No Action Alternative and**
 10 **Alternatives 1 through 5**

Environmental Resources	Comparison of Alternatives 1 through 5 and the No Action Alternative
Surface Water	
Trinity Lake	Water surface elevations similar in Alternatives 1 through 5 and the No Action Alternative. Storage under Alternatives 1, 3, and 4 is higher than under Alternatives 2 and 5 and the No Action Alternative.
Trinity River at Lewiston Dam	Flows similar or higher in November-December under Alternatives 1, 3, and 4 than under Alternatives 2 and 5 and the No Action Alternative. Similar flows in other months.
Shasta Lake	Water surface elevations similar in Alternatives 1 through 5 and the No Action Alternative. Storage under Alternatives 1, 3, and 4 is higher than under Alternatives 2 and 5 and the No Action Alternative.
Sacramento River at Keswick Dam	Flows similar or higher in December-August under Alternatives 1, 3, and 4 than under Alternatives 2 and 5 and the No Action Alternative. Flows higher in September-November under Alternatives 2 and 5 and the No Action Alternative than under Alternatives 1, 3, and 4.
Sacramento River at Freeport	Flows similar or higher under Alternatives 1 and 4 than under Alternative 3; and flows higher under Alternative 3 than under Alternatives 2 and 5 and the No Action Alternative in May-June. Flows higher in July-December under Alternatives 2 and 5 and the No Action Alternative than under Alternative 3; and flows higher under Alternative 3 than under Alternatives 1 and 4.
Clear Creek near Igo	Flows are similar under Alternatives 1 through 5 and the No Action Alternative in June-April. Flows under Alternatives 2 and 5 and the No Action Alternative are higher in May than under Alternatives 1, 3, and 4.
Lake Oroville	Water surface elevations similar in Alternatives 1 through 5 and the No Action Alternative. Storage under Alternatives 1, 3, and 4 is higher than under Alternatives 2 and 5 and the No Action Alternative.
Feather River downstream of Thermalito Complex	Flows under Alternatives 1, 3, and 4 similar or higher than under Alternatives 2 and 5 and the No Action Alternative.

Environmental Resources	Comparison of Alternatives 1 through 5 and the No Action Alternative
Folsom Lake	<p>Water surface elevations similar in Alternatives 1 through 5 and the No Action Alternative.</p> <p>Storage under Alternatives 1, 3, and 4 is higher in October-January than under Alternatives 2 and 5 and the No Action Alternative.</p> <p>Storage under Alternatives 2 and 5 and the No Action Alternative are higher in August-September than under Alternatives 1, 3, and 4.</p> <p>Storage similar under February-July in Alternatives 1 through 5 and the No Action Alternative.</p>
American River at Nimbus Dam	<p>Flows under Alternatives 1, 3, and 4 similar or higher than under Alternatives 2 and 5 and the No Action Alternative.</p>
New Melones Reservoir	<p>Water surface elevations similar in Alternatives 1 through 5 and the No Action Alternative.</p> <p>Storage under Alternative 3 is higher than under Alternatives 1 and 4; and storage under Alternatives 1 and 4 are higher than under Alternatives 2 and 5 and the No Action Alternative.</p>
Stanislaus River at Goodwin Dam	<p>Flows higher under Alternatives 1 and 4 than under Alternative 3; and flows under Alternative 3 are higher than under Alternative 5 and the No Action Alternative.</p> <p>Flows under Alternative 5 higher than under the No Action Alternative in April-May.</p>
San Joaquin River at Vernalis	<p>Flows higher in October under the Alternatives 2 and 5 and the No Action Alternative than under Alternatives 1, 3, and 4.</p> <p>Flows higher in April under Alternative 5 than under all other alternatives.</p> <p>Flows higher in May under Alternatives 1 and 4 than under Alternatives 3 and 5 and the No Action Alternative.</p> <p>Flows similar during other months.</p>
San Luis Reservoir	<p>Water surface elevations similar in Alternatives 1 through 5 and the No Action Alternative.</p> <p>Storage under Alternatives 1 and 4 higher than under Alternative 3; and storage under Alternatives 2 and 5 and the No Action Alternative.</p> <p>Storage under Alternatives 2 and the No Action Alternative higher than under Alternative 5 in dry and critical dry years.</p>
Flows into Yolo Bypass	<p>Flows entering the Yolo Bypass at Fremont Weir higher under Alternatives 1, 3, and 4 than under Alternatives 2 and 5 and the No Action Alternative.</p>
Delta Outflow	<p>Delta outflow higher under Alternatives 2 and 5 and the No Action Alternative than under Alternatives 1, 3, and 4.</p>
Reverse Flows in Old and Middle Rivers	<p>Old and Middle River flows in April-May more positive under Alternative 5 than under Alternative 2 and the No Action Alternative.</p> <p>Old and Middle River flows in July more positive under Alternatives 1 and 4 than under Alternative 3; and under Alternative 3 than under Alternatives 2 and 5 and the No Action Alternative.</p> <p>Old and Middle River flows in other months higher under Alternatives 2 and 5 and the No Action Alternative than Alternative 3; and higher under Alternative 3 than under Alternatives 1 and 4.</p>
Water Supplies	
Non-CVP and Non-SWP Deliveries	<p>Water deliveries under Alternatives 1 through 5 and the No Action Alternative.</p>
CVP Water Deliveries	<p>Water deliveries higher under Alternatives 1 and 4 than under Alternative 3; and higher under Alternative 3 than under Alternatives 2 and 5 and the No Action Alternative.</p>

Chapter 22: Other NEPA Requirements

Environmental Resources	Comparison of Alternatives 1 through 5 and the No Action Alternative
SWP Water Deliveries	Water deliveries higher under Alternatives 1 and 4 than under Alternative 3; and higher under Alternative 3 than under Alternatives 2 and 5 and the No Action Alternative.
Surface Water Quality	
Salinity in Northern Delta (near Emmaton)	Salinity in September-January under Alternatives 1, 3, and 4 than under Alternatives 2 and 5 and the No Action Alternative. Salinity in February-August under Alternatives 2 and 5 and the No Action Alternative higher than under Alternatives 1, 3, and 4.
Salinity in Western Delta (near Port Chicago)	Salinity in September-January under Alternatives 1, 3, and 4 than under Alternatives 2 and 5 and the No Action Alternative. Salinity in February-August under Alternatives 2 and 5 and the No Action Alternative higher than under Alternatives 1, 3, and 4.
Salinity in Western Central Delta (near Antioch)	Salinity in September-January under Alternatives 1, 3, and 4 than under Alternatives 2 and 5 and the No Action Alternative. Salinity in February-August under Alternatives 2 and 5 and the No Action Alternative higher than under Alternatives 1, 3, and 4.
Salinity in Western Central Delta (near Contra Costa Water District Intakes)	Salinity in September-January under Alternatives 1, 3, and 4 than under Alternatives 2 and 5 and the No Action Alternative. Salinity in February-August under Alternatives 2 and 5 and the No Action Alternative higher than under Alternatives 1, 3, and 4.
Salinity in Southern Delta (near CVP and SWP intakes)	Salinity under Alternatives 1 and 4 higher than under Alternative 3; and salinity under Alternative 3 higher than under Alternatives 2 and 5 and the No Action Alternative.
Mercury in Delta Fish	<p>Mercury concentrations in fish tissue of large fish in the Delta used for human consumption would exceed guidelines established by the State of California under Alternatives 1 through 5 and the No Action Alternative.</p> <p>In the interior Delta along the San Joaquin River and at the CVP Contra Costa Canal Pumping Plant, mercury concentrations in the tissue of large fish used for human consumption would be the higher under Alternative 5 than under Alternative 3. Mercury under Alternative 3 would be higher than under Alternative 2 and the No Action Alternative. Mercury under Alternative 2 and the No Action Alternative would be higher than under Alternatives 1 and 4.</p> <p>Near Suisun Marsh and Cache Slough, mercury concentrations would be higher under Alternative 2 and the No Action Alternative than under Alternatives 1 and 4. Mercury under Alternatives 1 and 4 would be higher than under Alternative 5; and concentrations under Alternative 5 would be higher than under Alternative 3.</p> <p>Along Old River near Clifton Court, mercury concentrations in the tissue of large fish used for human consumption would be higher under Alternative 2 and the No Action Alternative than under Alternative 5. Mercury under Alternative 5 would be higher than under Alternative 3. Mercury under Alternative 3 would be higher than under Alternatives 1 and 4.</p> <p>Near the CVP Jones Pumping Plant intake, mercury concentrations in the tissue of large fish used for human consumption would be higher under Alternative 2 and the No Action Alternative than under Alternative 3. Mercury under Alternative 3 would be higher than under Alternatives 1 and 4. Mercury under Alternatives 1 and 4 would be higher than under Alternative 5.</p>
Selenium in Delta and Delta Fish	Selenium concentrations similar under Alternatives 1 through 5 and the No Action Alternative.

Environmental Resources	Comparison of Alternatives 1 through 5 and the No Action Alternative
Groundwater Resources	
Trinity River Region	Similar groundwater conditions under Alternatives 1 through 5 and the No Action Alternative.
Central Valley Region: Sacramento Valley	Similar groundwater conditions under Alternatives 1 through 5 and the No Action Alternative.
Central Valley Region: San Joaquin Valley	Groundwater pumping would be higher under Alternative 5 than under Alternative 2 and the No Action Alternative. Pumping would be higher under Alternative 2 and the No Action Alternative than under Alternative 3. Pumping would be higher under Alternative 3 than under Alternatives 1 and 4. Increased groundwater pumping would result in lower groundwater elevations and increased subsidence potential.
San Francisco Bay Area, Central Coast, and Southern California Region	Groundwater pumping would be higher under Alternative 5 than under Alternative 2 and the No Action Alternative. Pumping would be higher under Alternative 2 and the No Action Alternative than under Alternative 3. Pumping would be higher under Alternative 3 than under Alternatives 1 and 4. Increased groundwater pumping would result in lower groundwater elevations and increased subsidence potential.
CVP and SWP Energy Resources	
Energy Generated and Used by CVP and SWP Water Users	<p>CVP net energy generation would be higher under Alternative 2 and the No Action Alternative than under Alternatives 1 and 4. Net energy generation would be higher under Alternatives 1 and 4 than under Alternative 3. Net energy generation would be higher under Alternative 3 than under Alternative 5.</p> <p>SWP net energy generation would be higher under Alternative 2 and the No Action Alternative than under Alternative 5. Net energy generation would be higher under Alternative 5 than under Alternative 3. Net energy generation would be higher under Alternative 3 than under Alternatives 1 and 4.</p> <p>Energy use by CVP and SWP water users for alternative water supplies would be higher under Alternative 5 than under Alternative 2 and the No Action Alternative. Energy use would be higher under Alternative 2 and the No Action Alternative than under Alternative 3. Energy use would be higher under Alternative 3 than under Alternatives 1 and 4.</p>
Aquatic Resources	
Trinity River: Coho Salmon	Habitat conditions would be similar under Alternatives 1 through 5 and the No Action Alternative.
Trinity River: Spring-run Chinook Salmon	Habitat conditions would be similar under Alternatives 1 through 5 and the No Action Alternative.
Trinity River: Fall-run Chinook Salmon	Habitat conditions would be similar under Alternatives 1 through 5 and the No Action Alternative.
Trinity River: Steelhead	Habitat conditions would be similar under Alternatives 1 through 5 and the No Action Alternative.
Trinity River: Green Sturgeon	Habitat conditions would be similar under Alternatives 1 through 5 and the No Action Alternative.
Trinity Lake and Lewiston Reservoir: Reservoir Fish	Habitat conditions would be similar under Alternatives 1 through 5 and the No Action Alternative.
Trinity River: Pacific Lamprey	Habitat conditions would be similar under Alternatives 1 through 5 and the No Action Alternative.
Trinity River: Eulachon	Habitat conditions would be similar under Alternatives 1 through 5 and the No Action Alternative.

Chapter 22: Other NEPA Requirements

Environmental Resources	Comparison of Alternatives 1 through 5 and the No Action Alternative
Sacramento River System: Winter-run Chinook Salmon	Habitat conditions would be better under Alternative 5 and the No Action Alternative than under Alternative 2. Conditions under Alternative 2 would be better than under Alternatives 3 and 4. Conditions under Alternative 3 and 4 would be better than under Alternative 1.
Sacramento River System: Spring-run Chinook Salmon	Habitat conditions would be better under Alternative 5 and the No Action Alternative than under Alternative 2. Conditions under Alternative 2 would be better than under Alternatives 3 and 4. Conditions under Alternative 3 and 4 would be better than under Alternative 1.
Sacramento River System: Fall-run Chinook Salmon	Habitat conditions under Alternatives 1, 3, 4, and 5 and the No Action Alternative would be better than under Alternative 2.
Sacramento River System: Late Fall-run Chinook Salmon	Habitat conditions under Alternatives 1, 3, 4, and 5 and the No Action Alternative would be better than under Alternative 2.
Sacramento River System: Steelhead	Habitat conditions would be better under Alternative 5 and the No Action Alternative than under Alternative 2. Conditions under Alternative 2 would be better than under Alternatives 3 and 4. Conditions under Alternative 3 and 4 would be better than under Alternative 1.
Sacramento River System: Green Sturgeon and White Sturgeon	Habitat conditions would be better under Alternative 3 than under Alternatives 1 and 4. Conditions under Alternative 4 would be better than under Alternatives 2 and 5 and the No Action Alternative.
Delta: Delta Smelt	Habitat conditions would be better under Alternatives 2 and 5 and the No Action Alternative than under Alternatives 1, 3, and 4.
Delta: Longfin Smelt	Habitat conditions would be better under Alternatives 2 and 5 and the No Action Alternative than under Alternatives 1, 3, and 4.
Delta: Sacramento Splittail	Habitat conditions would be better under Alternatives 2 and 5 and the No Action Alternative than under Alternatives 1, 3, and 4.
Sacramento River System: Reservoir Fish	Habitat conditions would be similar under Alternatives 1 through 5 and the No Action Alternative.
Sacramento River System: Pacific Lamprey	Habitat conditions would be similar under Alternatives 1 through 5 and the No Action Alternative.
Sacramento River System: Striped Bass, American Shad, and Hardhead	Habitat conditions for Hardhead and American Shad would be similar under Alternatives 1 through 5 and the No Action Alternative. Habitat conditions for Striped Bass would be better under Alternatives 1, 2, and 5 and the No Action Alternative than under Alternatives 3 and 4 due to increased harvest limits.
Stanislaus River: Fall-run Chinook Salmon	Habitat conditions better under Alternatives 3 and 4 than under Alternatives 1, 2, and 5 and the No Action Alternative.
Stanislaus River: Steelhead	Habitat conditions better under Alternative 5 and the No Action Alternative than under Alternatives 3 and 4. Conditions under Alternatives 3 and 4 are better than under Alternatives 1 and 2.
Stanislaus River: White Sturgeon	Habitat conditions better under Alternatives 2 and 5 and the No Action Alternative than under Alternatives 1, 3, and 4.
New Melones Reservoir; Reservoir Fish	Habitat conditions would be similar under Alternatives 1 through 5 and the No Action Alternative.
Stanislaus River: Other Fish	Habitat conditions for Hardhead and American Shad would be similar under Alternatives 1 through 5 and the No Action Alternative. Habitat conditions for Striped Bass would be better under Alternatives 1, 2, and 5 and the No Action Alternative than under Alternatives 3 and 4 due to increased harvest limits.

Environmental Resources	Comparison of Alternatives 1 through 5 and the No Action Alternative
Pacific Ocean: Killer Whale	Habitat conditions would be similar under Alternatives 1 through 5 and the No Action Alternative.
Terrestrial Resources	
Terrestrial Resources along Shoreline of CVP and SWP Reservoirs	Habitat conditions would be similar under Alternatives 1 through 5 and the No Action Alternative.
Terrestrial Resources along Rivers Downstream of CVP and SWP Reservoirs	Habitat conditions along Trinity, Sacramento, American, and Feather rivers would be similar under Alternatives 1 through 5 and the No Action Alternative. Habitat conditions along the Stanislaus River would be better under Alternatives 2 and 5 and the No Action Alternative than under Alternatives 1, 3, and 4.
Terrestrial Resources in Yolo Bypass	Habitat conditions would be similar under Alternatives 1 through 5 and the No Action Alternative.
Terrestrial Resources in Western Delta	Freshwater habitat in the western Delta would be better under Alternatives 2 and 5 and the No Action Alternative than under Alternatives 1, 3, and 4.
Geology and Soils Resources	
Geology and Soils Resources	Geology and soils conditions would be similar under Alternatives 1 through 5 and the No Action Alternative.
Agricultural Resources	
Agricultural Production and Employment	Agricultural production and employment conditions would be similar under Alternatives 1 through 5 and the No Action Alternative.
Land Use	
Municipal and Industrial Land Use	Municipal and industrial land use conditions would be similar under Alternatives 1 through 5 and the No Action Alternative.
Visual Resources	
Visual Resources of Land Irrigated with CVP and SWP Water	Visual resource conditions would be similar under Alternatives 1 through 5 and the No Action Alternative.
Visual Resources at Reservoirs that Store CVP and SWP Water	Visual resource conditions would be similar under Alternatives 1 through 5 and the No Action Alternative.
Recreation Resources	
Recreation Resources at Reservoirs that Store CVP and SWP Water	Recreational resource conditions at the reservoirs would be similar under Alternatives 1 through 5 and the No Action Alternative.
Recreation Resources in Rivers downstream of CVP and SWP Reservoirs	Recreational resource conditions at the along the rivers would be similar under Alternatives 1 through 5 and the No Action Alternative. Recreational resource conditions related to Striped Bass fishing and sport ocean salmon fishing would be better under Alternatives 1, 2, and 5 and the No Action Alternative than under Alternatives 3 and 4 due to increased harvest limitations.

Chapter 22: Other NEPA Requirements

Environmental Resources	Comparison of Alternatives 1 through 5 and the No Action Alternative
Air Quality and Greenhouse Gas Emissions	
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	In the San Joaquin Valley and the San Francisco Bay Area, Central Coast, and Southern California regions, potential emissions from diesel engines used for groundwater pumping would be higher under Alternative 5 than under Alternative 2 and the No Action Alternative. Emissions would be higher under Alternative 2 and the No Action Alternative than under Alternative 3. Emissions would be higher under Alternative 3 than under Alternatives 1 and 4.
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 due to energy use related to alternative water supplies. Energy use by CVP and SWP water users for alternative water supplies would be higher under Alternative 5 than under Alternative 2 and the No Action Alternative. Energy use would be higher under Alternative 2 and the No Action Alternative than under Alternative 3. Energy use would be higher under Alternative 3 than under Alternatives 1 and 4.
Cultural Resources	
Potential for Disturbance of Cultural Resources	Cultural resource conditions would be similar under Alternatives 1 through 5 and the No Action Alternative.
Public Health	
Water Supply Availability for Wildland Firefighting	Water supply conditions for fighting wildland firefighting would be similar under Alternatives 1 through 5 and the No Action Alternative.
Potential Exposure to Mercury in Fish in Delta	<p>Mercury concentrations in fish tissue of large fish in the Delta used for human consumption would exceed guidelines established by the State of California under Alternatives 1 through 5 and the No Action Alternative.</p> <p>In the interior Delta along the San Joaquin River and at the CVP Contra Costa Canal Pumping Plant, mercury concentrations in the tissue of large fish used for human consumption would be the higher under Alternative 5 than under Alternative 3. Mercury under Alternative 3 would be higher than under Alternative 2 and the No Action Alternative. Mercury under Alternative 2 and the No Action Alternative would be higher than under Alternatives 1 and 4.</p> <p>Near Suisun Marsh and Cache Slough, mercury concentrations would be higher under Alternative 2 and the No Action Alternative than under Alternatives 1 and 4. Mercury under Alternatives 1 and 4 would be higher than under Alternative 5; and concentrations under Alternative 5 would be higher than under Alternative 3.</p> <p>Along Old River near Clifton Court, mercury concentrations in the tissue of large fish used for human consumption would be higher under Alternative 2 and the No Action Alternative than under Alternative 5. Mercury under Alternative 5 would be higher than under Alternative 3. Mercury under Alternative 3 would be higher than under Alternatives 1 and 4.</p> <p>Near the CVP Jones Pumping Plant intake, mercury concentrations in the tissue of large fish used for human consumption would be higher under Alternative 2 and the No Action Alternative than under Alternative 3. Mercury under Alternative 3 would be higher than under Alternatives 1 and 4. Mercury under Alternatives 1 and 4 would be higher than under Alternative 5.</p>
Socioeconomics	
Agricultural and Municipal and Industrial Employment	Agricultural, municipal, and industrial employment would be similar under Alternatives 1 through 5 and the No Action Alternative.

Environmental Resources	Comparison of Alternatives 1 through 5 and the No Action Alternative
Municipal and Industrial Water Supply Operating Expenses	Municipal and industrial water supply operating expenses would be similar under Alternatives 1 through 5 and the No Action Alternative.
Recreational Economics CVP and SWP Reservoirs	Recreational economic conditions would be similar under Alternatives 1 through 5 and the No Action Alternative.
Recreational Economics Related to Striped Bass Fishing in Delta	Recreational economic conditions related to Striped Bass fishing would be better under Alternatives 1, 2, and 5 and the No Action Alternative than under Alternatives 3 and 4 due to changes in harvest limitations.
Commercial and Sport Ocean Salmon Fishing	Recreational economic conditions related to commercial and sport ocean salmon fishing would be better under Alternatives 1, 2, and 5 and the No Action Alternative than under Alternatives 3 and 4 due to changes in harvest limitations.
Indian Trust Assets	
Potential for Disturbance of Indian Trust Assets	Indian Trust Asset conditions would be similar under Alternatives 1 through 5 and the No Action Alternative.
Environmental Justice	
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	In the San Joaquin Valley, potential emissions from diesel engines used for groundwater pumping would be higher under Alternative 5 than under Alternative 2 and the No Action Alternative. Emissions would be higher under Alternative 2 and the No Action Alternative than under Alternative 3. Emissions would be higher under Alternative 3 than under Alternatives 1 and 4.
Potential Exposure to Mercury in Fish in Delta	<p>Mercury concentrations in fish tissue of large fish in the Delta used for human consumption would exceed guidelines established by the State of California under Alternatives 1 through 5 and the No Action Alternative.</p> <p>In the interior Delta along the San Joaquin River and at the CVP Contra Costa Canal Pumping Plant, mercury concentrations in the tissue of large fish used for human consumption would be the higher under Alternative 5 than under Alternative 3. Mercury under Alternative 3 would be higher than under Alternative 2 and the No Action Alternative. Mercury under Alternative 2 and the No Action Alternative would be higher than under Alternatives 1 and 4.</p> <p>Near Suisun Marsh and Cache Slough, mercury concentrations would be higher under Alternative 2 and the No Action Alternative than under Alternatives 1 and 4. Mercury under Alternatives 1 and 4 would be higher than under Alternative 5; and concentrations under Alternative 5 would be higher than under Alternative 3.</p> <p>Along Old River near Clifton Court, mercury concentrations in the tissue of large fish used for human consumption would be higher under Alternative 2 and the No Action Alternative than under Alternative 5. Mercury under Alternative 5 would be higher than under Alternative 3. Mercury under Alternative 3 would be higher than under Alternatives 1 and 4.</p> <p>Near the CVP Jones Pumping Plant intake, mercury concentrations in the tissue of large fish used for human consumption would be higher under Alternative 2 and the No Action Alternative than under Alternative 3. Mercury under Alternative 3 would be higher than under Alternatives 1 and 4. Mercury under Alternatives 1 and 4 would be higher than under Alternative 5.</p>

1 **22.3 Irreversible and Irretrievable Commitments**
2 **of Resources**

3 NEPA requires that an EIS prepared by Federal agencies disclose "...any
4 irreversible and irretrievable commitments of resources which would be involved
5 in the proposed action should it be implemented..." (40 CFR 1502.16). An
6 irreversible and irretrievable commitment of resources includes use of natural or
7 depletable resources, including consumption of construction materials and
8 nonrenewable energy sources, and permanent conversion of land uses or habitat.

9 As described in Chapter 3, Description of Alternatives, there are several ongoing
10 projects that are assumed to be implemented by 2030, such as Grasslands Bypass
11 Project which is currently under construction. It is assumed that these projects
12 would be included in the No Action Alternative, all other alternatives, and Second
13 Basis of Comparison. The 2030 conditions assume the projected long-term
14 conditions for each ongoing project as described in their respective environmental
15 documents. This analysis does not address the construction activities of each
16 ongoing project because those impacts were addressed in separate environmental
17 documents for each project.

18 The alternatives include several future actions that would require construction,
19 such as implementation of tidal wetlands and floodplains, fish passage facilities,
20 or temperature control devices at CVP dams. Specific details for location and
21 construction of these future projects are not identified at this time and are not
22 addressed in this EIS. Future environmental documents would be prepared to
23 analyze potential environmental consequences related to specific construction and
24 operations. This EIS analyzes implementation of the alternatives with the
25 assumption that these projects would be implemented by 2030; however, this EIS
26 does not address irreversible and irretrievable commitment of resources
27 associated with consumption of construction materials and permanent conversion
28 of land uses or habitat.

29 Changes in nonrenewable energy resources would occur through implementation
30 of the No Action Alternative and Alternatives 1 through 5. Under the
31 alternatives, energy would be generated by CVP and SWP operations and used to
32 convey water in CVP and SWP facilities. As discussed in Chapter 8, Energy,
33 changes in CVP and SWP energy generation and use would result in the ability to
34 provide additional energy for use by others or the need to purchase additional
35 energy from others to operate the CVP and SWP facilities. Under both long-term
36 average conditions and dry/critical dry water years, Alternative 5 would result in
37 the least demand for electrical generation by others which would generally be
38 produced using fossil fuels. The No Action Alternative and Alternative 2 would
39 require more electrical generation by non-CVP and SWP facilities than
40 Alternative 5; and less electrical generation than under Alternatives 1, 3, and 4.
41 Alternative 1 would require the most electrical generation as compared to other
42 alternatives.

22.4 Growth-Inducing Impacts

NEPA requires that an EIS prepared by Federal agencies evaluate indirect growth-inducing effects (40 CFR 1508.8). A project could result in growth-inducing impacts through several measures, including the removal of obstacles to population growth, or actions that encourage and facilitate other activities beyond those proposed by the project. The availability of adequate water supplies, employment opportunities, and improved cultural amenities are examples of actions that could be growth-inducing impacts. Growth inducement may or may not be detrimental, beneficial, or significant. However, if the induced growth impacted the environment, or the ability of agencies to provide public services to an extent not envisioned due to the project actions, the impacts would be considered to be adverse.

As described in Chapter 13, Land Use, and Chapter 19, Socioeconomics, land use and growth projections are not anticipated to change under Alternatives 1 through 5 as compared to the No Action Alternative and the Second Basis of Comparison. Municipal and industrial water users that use CVP and SWP water have prepared Urban Water Management Plans (UWMPs) that project water demand and future water supplies to meet the demands by 2030, including water conservation measures. Projects that had undergone environmental review, were under design, or under construction were considered to exist in 2030 water supply assumptions in the No Action Alternative, Alternatives 1 through 5, and the Second Basis of Comparison. Future projects described in the UWMPs that are under evaluation are considered as options to increase fixed-yield supplies, including additional groundwater pumping, water transfers, recycling water treatment, and desalination water treatment. Existing and future water supplies considered for municipalities by 2030 are presented in Appendix 5B, Future Municipal Water Supplies for CVP and SWP Water Users. For smaller water users that are not addressed in a UWMP, information was obtained from water master plans and integrated regional water management plans. The analysis presented in Chapter 19, indicated that use of the existing and planned future projects would be adequate to meet the water demands in 2030 with or without the CVP and SWP water supply availability under the alternatives considered in this EIS.

Alternatives 1, 3, and 4 would result in higher CVP and SWP water deliveries than the No Action Alternative and Alternatives 2 and 5. However, the additional water supplies under Alternatives 1, 3, and 4 would result in less groundwater pumping and less water transfers which could result in less potential for groundwater overdraft and soil subsidence, and less potential impacts in the service area of the seller for the transfer water. None of the alternatives considered in this EIS would increase the total water supplies to meet 2030 water demands; and therefore, none of the alternatives considered in this EIS are considered to be growth inducing.

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Chapter 23

1 Consultation and Coordination

2 23.1 Introduction

3 This chapter summarizes completed, ongoing, and anticipated public outreach and
4 agency involvement efforts related to preparation of the Environmental Impact
5 Statement (EIS) for the coordinated long-term operation of the Central Valley
6 Project (CVP) and State Water Project (SWP).

7 23.2 Consultation with the Public and Interested 8 Parties

9 Consultation activities were initiated in 2012 with the scoping process and
10 continued through the preparation of the Final EIS. In this section, the term
11 “interested parties” includes representatives from agencies, utilities, agencies,
12 organizations, and other entities.

13 23.2.1 Scoping Process

14 As described in Chapters 1 and 3, the scoping process was initiated on
15 March 28, 2012, with the publication of the Notice of Intent (NOI) in the Federal
16 Register and continued through June 28, 2012. Initially the public scoping
17 process was to be completed on May 29, 2012. During the public scoping
18 process, other agencies and interested persons requested an extension of the
19 public scoping process to allow additional opportunities to provide scoping
20 comments. In response to these requests, U.S. Department of the Interior, Bureau
21 of Reclamation (Reclamation) published a notice on May 25, 2012, to extend the
22 public scoping period through June 28, 2012.

23 Scoping meetings were held to inform the public and interested stakeholders
24 about the project, and to solicit comments and input on the EIS. The scoping
25 meetings were held in the following locations and resulted in the following level
26 of public participation:

- 27 • Madera, California on April 25, 2012 (6 participants)
- 28 • Diamond Bar, California on April 26, 2012 (3 participants)
- 29 • Sacramento, California on May 2, 2012 (15 participants)
- 30 • Marysville, California on May 3, 2012 (2 participants)
- 31 • Los Banos, California on May 22, 2012 (230 participants)

32 Reclamation posted the scoping notices in the Federal Register, on its website,
33 and in newspapers that served areas where the scoping meetings were held.
34 Reclamation also published press releases to news organizations and others that
35 have requested notifications for all press releases.

1 Each participant in the scoping meetings was invited to sign an attendance sheet
2 and provided with an agenda, fact sheet, comment card, and speaker card. The
3 agenda, fact sheet, and comment card were available in both English and Spanish.

4 Each scoping meeting began with a presentation by Reclamation. The
5 presentation described the purpose of the meeting and the public scoping process,
6 an overview of the reasons that Reclamation was preparing the EIS, description of
7 the process and schedule that Reclamation will use to complete the EIS, and
8 methods to provide comments at the scoping meeting and subsequently until the
9 end of the public scoping period. The participants were encouraged to submit
10 written comments by mail, email, or fax until the close of the public scoping
11 comment period. During the presentation, Reclamation responded to questions as
12 they arose from the meeting participants. Following the presentation,
13 Reclamation heard testimony from those who presented oral comments. Oral
14 comments were recorded by a transcriber. Reclamation offered to provide
15 Spanish translation of the presentation and oral comments at each scoping
16 meeting; however, the translation service was only requested and provided at the
17 scoping meeting in Los Banos, California.

18 The scoping comments included suggestions related to:

- 19 • Purpose and need for the action.
- 20 • Geographical extent of the Project Area.
- 21 • Definition and assumptions of the No Action Alternative.
- 22 • Definition and assumptions of the action alternatives.
- 23 • Important considerations either for description of the affected environment or
24 for the methods of analyses for the following resources:
 - 25 – Water resources.
 - 26 – Biological resources.
 - 27 – Land use and socioeconomics.
 - 28 – Air quality.
 - 29 – Recreation and visual resources.

30 Scoping comments were used in the development of a reasonable range of
31 alternatives and identification of key issues that would require analysis in the
32 Environmental Consequences sections of this EIS, as described in Chapters 3.

33 Scoping comments also were used in development of the level of detail and
34 methods of analyses for water resources, biological resources, land use,
35 socioeconomics, recreation, air quality, and visual resources. These resources are
36 discussed in Chapters 5 through 10, 12 through 17, and 19 through 21.

37 Reclamation also posted on its website an initial range of alternatives discussed at
38 the meeting on October 19, 2012 of invited stakeholders. As described in
39 Chapter 3, Description of Alternatives, comments received during that process
40 were used to refine the description of the alternatives.

1 Project status meetings were held with cooperating agencies and other
 2 stakeholders during preparation of the Draft EIS, including meetings in
 3 Sacramento, California on January 16, May 29, and November 5, 2014;
 4 February 20, 2015; and June 24, 2015.

5 The scoping report is included in Appendix 23A, Scoping Report.

6 **23.2.2 Other Activities**

7 Reclamation established a website which includes the background material related
 8 to the purpose and need for the action, materials used in the scoping process,
 9 scoping comments, and information related to meetings with invited stakeholders
 10 and interest groups to discuss assumptions to be considered in the development of
 11 the No Action Alternative and action alternatives. As described in Chapter 3,
 12 comments received on the information posted on Reclamation's website during
 13 that process were used to refine the description of the alternatives.

14 **23.2.3 Stakeholder and Public Involvement during Preparation of** 15 **the Final EIS**

16 The Draft EIS was published for public review in July 2015. The Notice of
 17 Availability was published by Reclamation in the Federal Register on
 18 July 31, 2015 (Federal Register, Vol 80, No. 147, 45681). A copy of the Notice
 19 of Availability is included in Appendix 23B, Public Review of Draft
 20 Environmental Impact Statement.

21 Newspaper advertisements providing the dates and locations of the public
 22 meetings for the Draft EIS were published in the following newspapers on the
 23 specified dates.

- 24 • Sacramento Bee, Sacramento, California – August 26, 2015
- 25 • Oakland Tribune, Oakland, California – August 26, 2015
- 26 • San Jose Mercury, San Jose, California – August 26, 2015
- 27 • Contra Costa Times, Walnut Creek, California – August 26, 2015
- 28 • Record Searchlight, Redding, California – August 27, 2015
- 29 • Los Banos Enterprise, Los Banos, California – August 28, 2015
- 30 • Fresno Bee, Fresno, California – September 1, 2015
- 31 • Los Angeles Times, California – September 3, 2015

32 The distribution list for the Draft EIS is included in Chapter 24, Environmental
 33 Impact Statement Distribution List. Reclamation posted notification of the
 34 availability of the Draft EIS and the location and timing of public meetings on its
 35 website and through press releases.

1 Four public meetings were held during the public review period for the Draft EIS
2 in the following locations, with the following level of public participation:

- 3 • Sacramento, California on September 9, 2015 (9 participants)
- 4 • Red Bluff, California on September 10, 2015 (9 participants)
- 5 • Los Banos, California on Tuesday, September 15, 2015 (9 participants)
- 6 • Irvine, California on September 17, 2015 (2 participants)

7 The public meetings included an open house preceding a presentation by
8 Reclamation. The open house portion of the meetings included several project
9 information stations staffed by project team members available to respond to
10 attendee's questions. The open house stations included:

- 11 • Welcome Station with display boards that described the public meeting format
- 12 • Purpose and Need of the Project
- 13 • Surface Water and Groundwater Resources
- 14 • Aquatic, Wildlife, and Botanical Resources
- 15 • Socioeconomics
- 16 • Comments with a court reporter to record verbal comments

17 Fact sheets were provided at each of the open house stations.

18 Following the open house portion of the public meeting, Reclamation staff led a
19 brief presentation. The open house portion of the public meeting was resumed
20 after the presentation.

21 Copies of the display boards, fact sheets, and the presentation are included in
22 Appendix 23B, Public Review of Draft Environmental Impact Statement.

23 Only attendees at the meeting in Red Bluff chose to provide verbal comments to
24 the court reporter. The transcript of those comments also is included in
25 Appendix 23B. Responses to those comments are included in Appendix 1E.

26 Approximately 860 written and verbal comments were received on the Draft EIS.
27 All of the comments received on the Draft EIS were considered in preparation of
28 the Final EIS. Written responses to all substantial comments received are
29 included in Appendices 1A through 1E of the Final EIS.

30 **23.3 Consultation with U.S. Fish and Wildlife Service** 31 **and National Marine Fisheries Service**

32 As described in Chapter 1, federal agencies also have an obligation pursuant to
33 the Endangered Species Act (ESA) to "...ensure that any discretionary action
34 authorized, funded, or carried out by such an agency is not likely to jeopardize the
35 continued existence of any endangered or threatened species or result in the
36 destruction or adverse modification..." of such species' designated "critical
37 habitat," "...unless such agency has been granted an exemption for such
38 action..." by the Endangered Species Committee which the ESA creates
39 (16 United States Code (U.S.C.) section 1536 (a)(2). A discretionary agency

1 action jeopardizes the continued existence of a listed species if it “reasonably
2 would be expected, directly or indirectly, to reduce appreciably the likelihood of
3 both the survival and recovery of a listed species in the wild by reducing the
4 reproduction, numbers, or distribution of that species” (50 Code of Federal
5 Regulations [CFR] section 402.02). Such action results in the destruction or
6 adverse modification of designated critical habitat if there is “... a direct or
7 indirect alteration that appreciably diminishes the value of critical habitat for both
8 the survival and recovery of a listed species” (50 CFR section 402.02).

9 In carrying out its obligations, Reclamation must consult with the appropriate
10 regulatory agency or agencies (e.g., U.S. Fish and Wildlife Service [USFWS] and
11 National Marine Fisheries Service [NMFS]). At the conclusion of this
12 consultation process, those agencies render written statements (known as
13 biological opinions) setting forth their opinion as to how an action being proposed
14 by Reclamation would affect a listed species and its designated critical habitat. If
15 these agencies conclude that an action will jeopardize the continued existence of a
16 listed species or result in the destruction or adverse modification of their
17 designated critical habitat, then they must suggest a reasonable and prudent
18 alternative to the action being proposed by Reclamation.

19 Pursuant to ESA Section 7(a)(1), Reclamation also considers which it could take
20 under its existing authorities to benefit listed species. However, Section 7(a)(1)
21 does not give Reclamation additional authority to undertake any particular action,
22 regardless of its potential benefit for threatened and endangered species.

23 The Fish and Wildlife Coordination Act requires that Reclamation consult with
24 fish and wildlife agencies (federal and state) on all water development projects
25 that could affect biological resources. As part of this project, Reclamation has
26 been in continuous consultation with USFWS and NMFS. This continuous
27 consultation also satisfies any applicable requirements of the Fish and Wildlife
28 Coordination Act.

29 **23.4 Consultation with Cooperating Agencies and** 30 **Other Entities**

31 In accordance with requirements of the National Environmental Policy Act
32 (NEPA), Reclamation invited eligible governmental agencies to participate as a
33 cooperating agency. The federal cooperating agencies include the USFWS,
34 NMFS, U.S. Environmental Protection Agency (USEPA), U.S. Army Corps of
35 Engineers (USACE), and Bureau of Indian Affairs (BIA).

36 Reclamation also provided non-federal agencies with the opportunity to
37 participate in the NEPA process if they qualified under NEPA (as described
38 above) as a cooperating agency. In August of 2012, Reclamation mailed
39 invitations to 747 non-federal entities to be cooperating agencies for this EIS,
40 including:

- 41 • California Department of Water Resources

- 1 • State Water Resources Control Board
- 2 • California Department of Fish and Wildlife
- 3 • Agencies that have contracts with the CVP or SWP for water delivery, water
- 4 service repayment, exchange or settlement, or use of CVP or SWP facilities
- 5 for conveyance
- 6 • State and Federal Contractors Water Agency
- 7 • Cities and counties within the CVP and SWP service areas
- 8 • Federally-recognized tribes within the CVP and SWP service area or areas
- 9 affected by CVP or SWP operations
- 10 Non-federal entities that meet the specified criteria for cooperating agencies are
- 11 required to enter into a Memorandum of Understanding (MOU) with Reclamation
- 12 to memorialize their participation as a cooperating agency.
- 13 Reclamation has signed cooperating agency MOUs with the following entities:
- 14 • Anderson-Cottonwood Irrigation District
- 15 • California Department of Water Resources
- 16 • California Valley Miwok Tribe
- 17 • City of Hesperia
- 18 • Contra Costa Water District
- 19 • Friant Water Authority
- 20 • Glenn-Colusa Irrigation District
- 21 • Metropolitan Water District of Southern California
- 22 • Oakdale Irrigation District
- 23 • Reclamation District 108
- 24 • San Diego County Water Authority
- 25 • San Juan Water District
- 26 • San Luis & Delta-Mendota Water Authority
- 27 • Stockton East Water District
- 28 • Sutter Mutual Water District
- 29 • Tehama Colusa Canal Authority
- 30 • Zone 7 Water Agency
- 31 These agencies have participated in preliminary review of written materials that
- 32 were used to prepare this Draft EIS.
- 33 Reclamation also received a request from an interested party to include the
- 34 Federal Emergency Management Agency (FEMA) as a cooperating agency.
- 35 However, Reclamation concluded that FEMA does not have special expertise
- 36 related to environmental issue that would not be addressed by other cooperating
- 37 federal agencies.
- 38 Reclamation also received a request from the State Water Contractors, a non-
- 39 profit association of 27 public agencies from northern, central, and southern
- 40 California that purchase water under contract from the SWP (SWC 2015).

1 However, Reclamation concluded that the State Water Contractors was not a
2 public agency; and therefore, could not be cooperating agency. However, this
3 group and several other non-profit groups (including the Natural Resources
4 Defense Council and The Bay Institute) have participated in preliminary review
5 of written materials that were used to prepare this Draft EIS.

6 **23.5 Consultation with Other Federal, State, and** 7 **Local Agencies**

8 This EIS was prepared in accordance with policies and regulations adopted by
9 federal and state agencies. Brief discussions of relevant policies and regulations
10 for each resource are included in Appendix 4A, Federal and State Policies and
11 Regulations. Reclamation considered the requirements of these policies and
12 regulations during preparation of the EIS and consultation with the related
13 agencies, including the major regulations summarized below.

14 **23.5.1 Federal Water Pollution Control Act Amendments of 1972** 15 **(Clean Water Act)**

16 The Federal Water Pollution Control Act Amendments of 1972, also known as the
17 Clean Water Act (CWA), established the institutional structure for the
18 U.S. Environmental Protection Agency (USEPA) to regulate discharges of
19 pollutants into the waters of the United States, establish water quality standards,
20 conduct planning studies, and provide funding for specific grant projects. The
21 Clean Water Act was further amended through the Clean Water Act of 1977 and
22 the Water Quality Act of 1987. The California State Water Resources Control
23 Board (SWRCB) has been designated by the USEPA along with the nine
24 Regional Water Quality Control Boards (RWQCBs) to develop and enforce water
25 quality objectives and implementation plans in California. The provisions of the
26 Clean Water Act which affect water resources in the project area are described
27 below.

- 28 • Section 401 of the Clean Water Act requires water discharges into navigable
29 waters of the United States to apply for a Federal license or permit and to
30 certify that the discharge will be in compliance with specified provisions of
31 the Clean Water Act. Federal permits that are issued related to disturbance of
32 waters of the United States (such as streams and wetlands) also require a
33 Water Quality Certification in accordance with Clean Water Act section 401.
- 34 • Section 402 established the National Pollutant Discharge Elimination System
35 (NPDES) permit program to regulate point source and non-point source
36 discharges of pollutants into waters of the United States. An NPDES permit
37 sets specific discharge limits for point and non-point sources discharging
38 pollutants into waters of the United States and establishes monitoring and
39 reporting requirements. The NPDES permits are issued for long-term
40 discharges, including discharges from treatment plants, and temporary

1 discharges, such as discharges during construction activities (e.g., General
2 Permit for Storm Water Discharges Associated with Construction Activities).

- 3 • Section 404 requires the U.S. Army Corps of Engineers (USACE) to issue
4 permits for discharge of dredge or fill material into navigable waters, their
5 tributaries, and associated wetlands. Activities regulated by 404 permits
6 include, but are not limited to, dredging, bridge construction, flood control
7 actions, and some fishing operations.
- 8 • Section 303 requires preparation of basins plans. The SWRCB has approved
9 water quality control plans (basin plans) for each watershed basin in the State.
10 The basin plans designate the beneficial uses of waters within each watershed
11 basin, and water quality objectives designed to protect those uses pursuant to
12 Section 303 of the Clean Water Act. The beneficial uses together with the
13 water quality objectives that are contained in the basin plans constitute State
14 water quality standards.
- 15 • Under the CWA section 303(d), the SWRCB and USEPA identifies and ranks
16 water bodies for which existing pollution controls are insufficient to attain or
17 maintain water quality standards based upon information prepared by all
18 states, territories, and authorized Indian tribes. Each state must establish
19 priority rankings and develop Total Maximum Daily Loads (TMDLs) for all
20 impaired waters. TMDLs calculate the greatest pollutant load that a
21 waterbody can receive and still meet water quality standards and designated
22 beneficial uses.

23 **23.5.2 Rivers and Harbors Act**

24 The navigable waters of the United States in the Study Area, including the major
25 rivers in Sacramento and San Joaquin rivers watersheds and waterways in these
26 watersheds affected by tidal action, are subject to the requirements of the Rivers
27 and Harbors Act. “Navigable waters of the United States” are defined as those
28 waters subject to the ebb and flow of the tide shoreward to the mean high-water
29 mark or those that are used, have been used in the past, or may be susceptible to
30 use in interstate or foreign commerce. Sections 9 and 10 of the River and Harbors
31 Act are applicable to the coordinated long-term operation of the CVP and SWP.

32 Under the reauthorization of the Rivers and Harbor Act of 1937, Reclamation
33 took responsibility for the operation of the CVP.

34 **23.5.2.1 Section 9 of the Rivers and Harbors Act**

35 Section 9 of the Rivers and Harbors Act prohibits construction of any dike or dam
36 across any navigable waters without approvals from the Chief of Engineers and
37 the Secretary of the Army.

38 **23.5.2.2 Section 10 of the Rivers and Harbors Act**

39 Section 10 of the Rivers and Harbors Act of 1899 prohibits alterations of any
40 navigable waters, including construction of structures in, over, or under;
41 excavation of material from; and deposition of material into navigable waters of
42 the United States without permission from the USACE. The approval process

1 generally is completed simultaneously with the approval process under the Clean
2 Water Act Section 404.

3 **23.5.3 Federal Safe Drinking Water Act**

4 The Safe Drinking Water Act (SDWA) protects public health by regulating the
5 nation's public drinking water supply. The SDWA authorizes USEPA to set
6 national health-based standards for drinking water to protect against both
7 naturally occurring and human-made contaminants that may be found in drinking
8 water and its sources, including rivers, lakes, reservoirs, springs, and
9 groundwater wells.

10 **23.5.4 Wild and Scenic Rivers Act**

11 Congress created the National Wild and Scenic Rivers Act in 1968 (Public
12 Law 90-542; USC 1271 et seq.) to preserve rivers and outstanding natural,
13 cultural, or recreational features in a free-flowing condition. High priority is
14 place on visual resource management of these rivers to preserve or restore their
15 scenic characteristics. Under this act, a Federal agency may not assist the
16 construction of a water resources project that would have a direct and adverse
17 effect on the free-flowing, scenic, and natural values of a wild or scenic river. If
18 the project would affect the free-flowing characteristics of a designated river or
19 unreasonably diminish the scenic, recreational, and fish and wildlife values
20 present in the area, such activities should be undertaken in a manner that would
21 minimize adverse impacts and should be developed in consultation with the
22 National Park Service.

23 Within the study area, the following portions of the rivers have been designated as
24 Wild and Scenic Rivers.

- 25 • The Klamath River from the confluence with the Trinity River to the Pacific
26 Ocean was designated to be part of the National Wild and Scenic Rivers
27 System on January 19, 1981.
- 28 • The Middle Fork Feather River (from Beckwourth downstream of Lake Davis
29 to Lake Oroville) was designated to be part of the National Wild and Scenic
30 Rivers System on October 2, 1968.
- 31 • The American River between Nimbus Dam and the confluence with the
32 Sacramento River was designated to be part of the National Wild and Scenic
33 Rivers System on January 19, 1981.

34 **23.5.5 Fish and Wildlife Coordination Act (16 USC Section 651** 35 **et seq.)**

36 The Fish and Wildlife Coordination Act, as amended in 1964, was enacted to
37 protect fish and wildlife when federal actions result in the control or modification
38 of a natural stream or body of water. The statute requires federal agencies to take
39 into consideration the effect that water-related projects would have on fish and
40 wildlife resources. Consultation and coordination with USFWS and State fish and
41 game agencies are required to address ways to prevent loss of and damage to fish
42 and wildlife resources and to further develop and improve these resources.

1 **23.5.6 Marine Mammal Protection Act (16 USC 1361-1421h)**

2 The Marine Mammal Protection Act (MMPA) was enacted in 1972. All marine
3 mammals are protected under the MMPA. The MMPA prohibits, with certain
4 exceptions, the “take” of marine mammals in U.S. waters and by U.S. citizens on
5 the high seas, and the importation of marine mammals and marine mammal
6 products into the United States. It defines “take” to mean “to hunt harass,
7 capture, or kill” any marine mammal or attempt to do so. Exceptions to the
8 moratorium can be made through permitting actions for take incidental to
9 commercial fishing and other nonfishing activities; for scientific research; and for
10 public display at licensed institutions such as aquaria and science centers.

11 **23.5.7 Migratory Bird Treaty Act**

12 The Migratory Bird Treaty Act (MBTA) implements a series of international
13 treaties that provide migratory bird protection. The MBTA authorizes the
14 Secretary of the Interior to regulate the taking of migratory birds, and the act
15 provides that it shall be unlawful, except as permitted by regulations, “to pursue,
16 take, or kill any migratory bird, or any part, nest or egg of any such bird” (16 USC
17 section 703). This prohibition includes both direct and indirect acts, although
18 harassment and habitat modification are not included unless they result in direct
19 loss of birds, nests, or eggs. The current list of species protected by the MBTA
20 was published in the March 10, 2010 *Federal Register* (*Federal Register*,
21 Volume 75, page 9282 [75 FR 9282]).

22 **23.5.8 Executive Order 13186: Responsibilities of Federal**
23 **Agencies to Protect Migratory Birds**

24 Executive Order 13186 (January 10, 2001) directs federal agencies that have, or
25 are likely to have, a measurable negative effect on migratory bird populations to
26 develop and implement a Memorandum of Understanding with USFWS to
27 promote the conservation of migratory bird populations. The Memorandum of
28 Understanding should include implementation actions and reporting procedures
29 that would be followed through each agency’s formal planning process, such as
30 resource management plans and fisheries management plans.

31 **23.5.9 Executive Order 11990: Protection of Wetlands**

32 Executive Order 11990 (May 24, 1977) established the protection of wetlands and
33 riparian systems as the official policy of the federal government. It requires all
34 federal agencies to consider wetland protection as an important part of their
35 policies and take action to minimize the destruction, loss, or degradation of
36 wetlands and to preserve and enhance the natural and beneficial values
37 of wetlands.

38 **23.5.10 Federal Clean Air Act**

39 National air quality policies are regulated through the Federal Clean Air Act
40 (FCAA) of 1970 and its 1977 and 1990 amendments. Basic elements of the
41 FCAA include national ambient air quality standards for criteria air pollutants,
42 hazardous air pollutants standards, state attainment plans, motor vehicle emissions

1 standards, stationary source emissions standards and permits, acid rain control
2 measures, stratospheric ozone protection, and enforcement provisions.

3 **23.5.11 National Historic Preservation Act of 1966**

4 Section 106 of the NHPA and its implementing regulations (36 Code of Federal
5 Regulations (CFR) Part 800) require Federal agencies to consider the effects of
6 their undertakings on cultural resources that are, or that may be, eligible for listing
7 in the National Register of Historic Places (NRHP) and to afford the Advisory
8 Council on Historic Preservation an opportunity to comment. NRHP-eligible
9 resources are considered to be “significant.” The criteria used to evaluate
10 eligibility for listing on the NRHP are further discussed in the next subsection.

11 The Section 106 process that is typically associated with NEPA compliance
12 requires consultation of the federal lead agency with other federal, state, and local
13 agencies, the Advisory Council on Historic Preservation, the State Historic
14 Preservation Officer (SHPO), Indian tribes, and interested members of the public,
15 such as historical societies. Throughout the Section 106 process, the federal lead
16 agency and consulting parties work together to identify adverse impacts on sites
17 of cultural significance or historic properties, and seek ways to avoid, minimize,
18 or mitigate the adverse effects. A Memorandum of Agreement or Programmatic
19 Agreement is issued by the participating parties that includes the measures agreed
20 upon to avoid or reduce (i.e., mitigate) adverse effects. For large or complex
21 undertakings, a Programmatic Agreement may also be negotiated to develop a
22 phased approach to historic properties management or alternative Section 106
23 processes through consultations. Thus, impacts to cultural resources that are
24 identified in a NEPA document are addressed through Section 106.

25 Section 110 of the NHPA sets out the broad responsibilities of Federal agencies
26 for identifying and protecting historic properties under their jurisdiction, and for
27 avoiding unnecessary damage to them. It is intended to ensure that an historic
28 preservation program is fully integrated into the ongoing program of each Federal
29 agency. Section 110 allows the costs of preservation activities as eligible project
30 costs in all undertakings conducted or assisted by a Federal agency. Federal
31 agencies are directed to withhold grants, licenses, approvals, or other assistance to
32 applicants who intentionally damage or adversely affect historic properties in an
33 effort to avoid the Section 106 process.

34 **23.5.12 American Indian Religious Freedom Act**

35 The American Indian Religious Freedom Act of 1978 protects the rights of Native
36 Americans to freedom of expression of traditional religions (24 U.S. Code
37 section 1996). This act established “the policy of the United States to protect and
38 preserve for American Indians their inherent right of freedom to believe, express,
39 and exercise the traditional religions...including but not limited to access to sites,
40 use and possession of sacred objects, and the freedom to worship through
41 ceremonials and traditional rites.”

1 **23.5.13 Indian Sacred Sites on Federal Land**

2 Executive Order 13007 provides that in managing Federal lands, each Federal
3 agency with statutory or administrative responsibility for management of Federal
4 lands shall, to the extent practicable and as permitted by law, accommodate access
5 to and ceremonial use of Indian sacred sites by Indian religious practitioners, and
6 avoid adversely affecting the physical integrity of such sacred sites.

7 **23.6 Consultation with Tribal Governments**

8 Consistent with President Clinton’s April 29, 1994 Memorandum and President
9 Obama’s November 5, 2009 Memorandum, Reclamation contacted federally-
10 recognized tribal governments to participate in preparation of this EIS.
11 Reclamation met with the California Valley Miwok Tribe in 2012 and the Miwok
12 Maidu United Auburn Indian Community of the Auburn Rancheria in 2013.

13 Reclamation will continue to consult with each tribe on a government-to-
14 government basis before taking any action that could affect a tribal government.
15 Under the Federal Trust responsibility, Reclamation will provide full disclosure of
16 the beneficial and adverse impacts of a project to the tribal government in a
17 manner that provides adequate time for review and response. Reclamation will
18 review comments received and consult with the tribal government prior to
19 decisions related to a project.

20 Tribes and Indian Trust Assets were considered during preparation of this EIS, in
21 accordance with environmental justice considerations identified in Executive
22 Order 12898 (February 11, 1994), as summarized in Chapter 20, Indian Trust
23 Assets, and Chapter 21, Environmental Justice.

24 **23.7 References**

25 SWC (State Water Contractors). 2015. “State Water Contractors – About Us.”
26 Site accessed June 23, 2015. <http://www.swc.org/about-us>

Chapter 24

1

2

Environmental Impact Statement Distribution List

3

4

This chapter provides locations where the Draft and Final Environmental Impact Statement (EIS) are available for review and a list of governmental entities, organizations, and interested parties that received copies of this EIS.

5

6

7

24.1 Document Availability

8

The public distribution of this Draft and Final EIS emphasizes the use of electronic media to ensure cost-effective, broad availability to the public and interested parties. The Draft and Final EIS are available on the Internet at Reclamation's website.

9

10

11

12

Printed copies of the Draft and Final EIS are available for review at the following locations.

13

14

U.S. Department of the Interior, Bureau of Reclamation Library

15

2800 Cottage Way

16

Sacramento, CA 95825

17

U.S. Department of the Interior, Bureau of Reclamation, Bay-Delta Office

18

801 I Street, Suite 140

19

Sacramento, CA 95814

20

Electronic copies of the Draft and Final EIS are available on compact disc for viewing at the following libraries.

21

22

Alameda County Library

23

1247 Marin Avenue

24

Albany CA 94706

25

Alameda County Library

26

200 Civic Plaza

27

Dublin CA 94568

28

Alameda County Library

29

6300 Civic Terrace Avenue

30

Newark CA 94560

31

Butte County Library

32

1108 Sherman Avenue

33

Chico CA 95926

34

Colusa County Free Library

35

738 Market Street

36

Colusa CA 95932

Chapter 24: Environmental Impact Statement Distribution List

- 1 Contra Costa County Library
- 2 501 W. 18th Street
- 3 Antioch CA 94509
- 4 Contra Costa County Library
- 5 104 Oak Street
- 6 Brentwood CA 94513
- 7 Contra Costa County Library
- 8 1050 Neroly Road
- 9 Oakley CA 94561
- 10 Contra Costa County Library
- 11 80 Power Avenue
- 12 Pittsburg CA 94565
- 13 Contra Costa County Library
- 14 1750 Oak Park Boulevard
- 15 Pleasant Hill CA 94523
- 16 El Dorado County Library
- 17 345 Fair Lane
- 18 Placerville CA 95667
- 19 Fresno County Library
- 20 2420 Mariposa Street
- 21 Fresno CA 93721
- 22 Glenn County Library
- 23 201 North Lassen Street
- 24 Willows CA 95988
- 25 Kern County Library
- 26 701 Truxton Avenue
- 27 Bakersfield CA 93301
- 28 Kings County - Hanford Branch Library
- 29 401 N Douty Street
- 30 Hanford CA 93230
- 31 Los Angeles County Central Library
- 32 630 West 5th Street
- 33 Los Angeles CA 90071
- 34 Madera County Library
- 35 121 North G Street
- 36 Madera CA 95637
- 37 Merced County Library
- 38 2100 O Street
- 39 Merced CA 95340

Chapter 24: Environmental Impact Statement Distribution List

- 1 Napa County Library
- 2 580 Coombs Street
- 3 Napa CA 94559
- 4 Orange County Library
- 5 11200 Stanford Avenue
- 6 Garden Grove CA 92840
- 7 Placer County Library
- 8 350 Nevada Street
- 9 Auburn CA 95603
- 10 Plumas County Library
- 11 445 Jackson Street
- 12 Quincy CA 95970
- 13 Riverside County Library
- 14 5840 Mission Boulevard
- 15 Riverside CA 92509
- 16 Sacramento County Library
- 17 170 Primasing Avenue
- 18 Courtland CA 95615
- 19 Sacramento County Library
- 20 8900 Elk Grove Boulevard
- 21 Elk Grove CA 95624
- 22 Sacramento County Library
- 23 412 Union Street
- 24 Isleton CA 95641
- 25 Sacramento Central Library
- 26 828 I Street
- 27 Sacramento CA 95814
- 28 Santa Barbara County Library
- 29 40 E Anapamu Street
- 30 Santa Barbara CA 93101
- 31 San Benito County Library
- 32 470 5th Street
- 33 Hollister CA 95023
- 34 San Bernardino County Library - Norman Feldheym Central Library
- 35 555 W 6th Street
- 36 San Bernardino CA 92410
- 37 San Diego County Public Library
- 38 330 Park Boulevard
- 39 San Diego CA 92101

Chapter 24: Environmental Impact Statement Distribution List

- 1 San Joaquin County - Escalon Branch Library
- 2 1540 2nd Street
- 3 Escalon CA 95320
- 4 San Joaquin County - Lathrop Branch Library
- 5 450 Spartan Way
- 6 Lathrop CA 95330
- 7 San Joaquin County - Manteca Public Library
- 8 320 W Center Street
- 9 Manteca CA 95336
- 10 San Joaquin County - Margaret K Troke Branch Library
- 11 502 W Benjamin Holt Drive
- 12 Stockton CA 95207
- 13 San Joaquin County - Cesar Chavez Central Library
- 14 605 N El Dorado Street
- 15 Stockton CA 95202
- 16 San Joaquin County - Tracy Branch Library
- 17 20 E Eaton Avenue
- 18 Tracy CA 95376
- 19 San Luis Obispo County Library
- 20 995 Palm Street
- 21 San Luis Obispo CA 93403
- 22 Santa Clara County - Cupertino Library
- 23 10800 Torre Avenue
- 24 Cupertino CA 95014
- 25 Santa Clara County - Milpitas Library
- 26 160 N Main Street
- 27 Milpitas CA 95035
- 28 Shasta County - Redding Public Library
- 29 1100 Parkview Avenue
- 30 Redding CA 96001
- 31 Solano County - Fairfield Civic Center Library
- 32 1150 Kentucky Street
- 33 Fairfield CA 94533
- 34 Solano County Fairfield Cordelia Library
- 35 5050 Business Center Drive
- 36 Fairfield CA 94534
- 37 Solano County - John F Kennedy Library
- 38 505 Santa Clara Street
- 39 Vallejo CA 94590

Chapter 24: Environmental Impact Statement Distribution List

- 1 Solano County - Springstowne Library
- 2 1003 Oakwood Avenue
- 3 Vallejo CA 94591
- 4 Solano County - Vacaville Public Library
- 5 1 Town Square Place
- 6 Vacaville CA 95688
- 7 Solano County - Vacaville Public Library
- 8 1020 Ulatis Drive
- 9 Vacaville CA 95687
- 10 Solano County - Rio Vista Library
- 11 44 S 2nd Street
- 12 Rio Vista CA 94571
- 13 Solano County - Suisun City Library
- 14 601 Pintail Drive
- 15 Suisun City CA 94585
- 16 Stanislaus County Library
- 17 1500 I Street
- 18 Modesto CA 95354
- 19 Sutter County Library
- 20 750 Forbes Avenue
- 21 Yuba City CA 95991
- 22 Tehama County Library
- 23 645 Madison Street
- 24 Red Bluff CA 96080
- 25 Trinity County Library
- 26 351 N Main Street
- 27 Weaverville CA 96093
- 28 Tulare County Library
- 29 200 W Oak Avenue
- 30 Visalia CA 93291
- 31 Ventura County - Ojai Library
- 32 111 E Ojai Avenue
- 33 Ojai CA 93023
- 34 Ventura County - E P Foster Library
- 35 651 E Main Street
- 36 Ventura CA 93001
- 37 Ventura County - Oak Park Library
- 38 899 Kanan Road
- 39 Oak Park CA 91377

- 1 Yolo County - Clarksburg Branch Library
2 52915 Netherlands Road
3 Clarksburg CA 95612
4 Yolo County - Mary L Stephens Davis Branch Library
5 315 E 14th Street
6 Davis CA 95616
7 Yolo County - Winters Branch Library
8 708 Railroad Avenue
9 Winters CA 95694
10 Yolo County Library
11 250 1st Street
12 Woodland CA 95695
13 Yolo County Branch Library
14 37750 Sacramento Street
15 Yolo CA 95697

16 **24.2 Agencies and Organizations Receiving Copies**
17 **of the Draft Environmental Impact Statement**

18 All persons, agencies, and organizations listed in this chapter have been informed
19 of the availability of and locations to obtain the Draft and Final EIS. Parties listed
20 below have received an electronic copy on a compact disc of the Draft and Final
21 EIS.

22 **24.2.1 Federal Agencies**

- 23 • Bureau of Indian Affairs
24 • National Marine Fisheries Service
25 • U.S. Army Corps of Engineers
26 • U.S. Environmental Protection Agency
27 • U.S. Fish and Wildlife Service
28 • Western Area Power Administration

29 **24.2.2 Tribal Interests**

- 30 • California Valley Miwok Tribe
31 • United Auburn Indian Community

32 **24.2.3 State Agencies**

- 33 • California Department of Fish & Wildlife
34 • California Department of Water Resources
35 • Delta Stewardship Council

36 **24.2.4 Regional and Local Entities**

- 37 • Alameda County Zone 7

- 1 • Anderson-Cottonwood Irrigation District
- 2 • Central Delta Water Agency
- 3 • Contra Costa Water District
- 4 • East Bay Municipal Utility District
- 5 • El Dorado County Water Agency
- 6 • El Dorado Irrigation District
- 7 • El Dorado Water and Power Authority
- 8 • Folsom, City of
- 9 • Friant Water Authority
- 10 • Glenn-Colusa Irrigation District
- 11 • Hesperia, City of
- 12 • Lower Tule River Irrigation District
- 13 • Oakdale Irrigation District
- 14 • Placer County Water Agency
- 15 • Reclamation District 108
- 16 • Roseville, City of
- 17 • Sacramento, City of
- 18 • San Diego County Water Authority
- 19 • San Juan Water District
- 20 • San Luis & Delta Mendota Water Authority
- 21 • Santa Clara Valley Water District
- 22 • South Delta Water Agency
- 23 • South San Joaquin Irrigation District
- 24 • Stanislaus, County of
- 25 • Stockton East Water District
- 26 • Sutter Mutual Water Company
- 27 • Tehama-Colusa Canal Authority
- 28 • Westlands Water District

- 29 **24.2.5 Other Interested Parties**
- 30 • AquAlliance
- 31 • The Bay Institute
- 32 • California Farm Bureau Federation
- 33 • Coalition for a Sustainable Delta
- 34 • California Water Impact Network
- 35 • California Sportfishing Protection Alliance
- 36 • The Center for Environmental Science Accuracy and Reliability
- 37 • Environmental Water Caucus
- 38 • Friends of the River
- 39 • Golden Gate Salmon Association
- 40 • Kern County Water Agency
- 41 • Northern California Water Agency
- 42 • Natural Resources Defense Council
- 43 • North Coast Rivers Alliance

Chapter 24: Environmental Impact Statement Distribution List

- 1 • Pacific Coast Federation of Fisherman's Associations
- 2 • Restore the Delta
- 3 • South Valley Water Association
- 4 • State and Federal Contractors Water Authority
- 5 • State Water Contractors
- 6 • Water 4 Fish
- 7

Chapter 25**1 List of Preparers**

2 The following individuals contributed to the preparation of this Environmental
3 Impact Statement.

4 Bureau of Reclamation

Name	Title	Years of Experience
Theresa Olson	Chief, Conservation and Conveyance Division	23
Amy Aufdemberge	Assistant Regional Solicitor	More than 20
Andrew Shultz	Fish Biologist	20
Ann Stine	Natural Resources Specialist	32
Ben Nelson	Natural Resources Specialist	5
Bonnie Van Pelt	Natural Resources Specialist	9
Carolyn Bragg	Natural Resources Specialist	8
David O'Connor	Water Resource Modeler	9
David van Rijn	Chief, Science Division	22
Donna Garcia	Project Manager	–
Erwin Van Nieuwenhuysse	Supervisory Fish Biologist	15
Greg Krzys	Natural Resources Specialist	20
Janice Piñero	Endangered Species Act Compliance Specialist	15
Jason Hassrick	Fish Biologist	17
Joel Sturm	Geologist	40
John Dealy	Project Manager	More than 30
John Hannon	Fisheries Biologist	25
Josh Israel	Fish Biologist	11
Kaylee Allen	Assistant Regional Solicitor	16
Kirk Nelson	Civil Engineer (Hydraulic)	11
Kristin White	Hydraulic Engineer	11
Laureen Perry	Regional Archaeologist	25
Michael Mosley	Physical Scientist	7
Michael Tansey	Climate Change Coordinator	40
Michele Palmer	Fisheries Biologist	20
Michelle Banonis	BDCP Program Manager	16

Chapter 25: List of Preparers

Name	Title	Years of Experience
Nancy Parker	Hydraulic Engineer (Water Resources Engineer)	25
Patti Idlof	Supervisory Natural Resources Specialist	30
Paul Zedonis	Supervisory Natural Resource Specialist	25
Rain Emerson	Supervisory Natural Resource Specialist	6
Rebecca Victorine	Natural Resource Specialist	18
Ronald Silva	Chief, Engineering and O&M Division	30
Russell Grimes	Chief, Environmental Compliance and Habitat Conservation Branch	24
Scott Springer	Outdoor Recreation Planner	21
Stanley Parrott	Geologist	29
Steve Pavich	Agricultural Economist	18
Traci Michel	Water Management Goal Supervisor	22

1 **CH2M HILL**

Name	Project Role	Education
Gwendolyn Buchholz, Professional Engineer (P.E.)	Project Manager	M.S., Civil Engineering, 1976 B.A., Physics, 1974
Derya Sumer, P.E.	Deputy Project Manager, Modeling Lead	Ph.D., Civil Engineering–Water Resources, 2007 M.S., Civil Engineering–Water Resources, 2002 B.S., Civil Engineering, 1999
Robert Antel	Graphics	B.A., Art, 1990
Nathan Brown, Professional Geologist (PG)	Groundwater	M.S., Hydrogeology, 1995 B.S., Geology, 1993
Earl Byron	Water Quality	Ph.D., Ecology and Limnology, 1979 B.A., Marine Biology, 1973
Chandra Chilmakuri, P.E.	Water Supply, Surface Water, Water Quality	Ph.D., Hydrodynamics and Environmental Modeling, 2005 M.S., Civil and Environmental Engineering, 2002 B.S., Civil Engineering, 2000

Name	Project Role	Education
Heidi Chou, P.E.	Water Supply, Surface Water	M.S., Civil Engineering, B.S., Civil Engineering, 2010
David Christophel	Biological Resources	M.S., Biological Sciences, 1989 B.S., Biological Sciences, 1979
Tapash Das	Water Supply, Surface Water, Groundwater	Ph.D., Hydrology, 2006 M.T., Water Resources Development and Management, 2002 B.S., Agricultural Engineering, 1999
Tyson Daus	Graphics	B.S., Graphic Design, 2008
Rosemarie Dimacali	Water Quality	M.S., Civil Engineering B.S. 2009
Fawn Elhadidi	GIS Mapping	Certificate in Business Management and Accounting, 1989
Al Farber	Cultural Resources	M.A., Anthropology, 1982 B.A., Anthropology, 1976
Tyler Hatch, P.E.	Groundwater	Ph.D., Civil and Environmental Engineering, 2013 M.S., Civil and Environmental Engineering, 2011 B.S., Civil Engineering, 2008
Steven Hatchett	Agriculture, Socioeconomics	Ph.D., Agricultural Economics, 1984 M.A., Administration, 1980 B.S., Forestry, 1977
David Julian	Water Supply, Surface Water, Water Quality	M.S. Civil Engineering, 2013 B.S., Civil Engineering, 2011
Kevin Kasberg	Agriculture, Socioeconomics	M.S., Agricultural and Resources Economics, 2012 B.A., Environmental Studies/Economics, 2009
Justin LaNier	Groundwater	M.S., Civil Engineering, 2006 B.S., Civil Engineering, 2002
Peter Lawson, P.G.	Groundwater	M.S., Hydrology, 1988 B.S., Geology, 1985
Robert Leaf, P.E.	Water Supply Surface Water, Water Quality	M.S., Civil Engineering, 1994 B.S., Civil Engineering, 1992 B.S., Forest and Resource Management, 1987
Chakri Malakpet, P.E.	Water Supply	M.S., Civil Engineering, 2007 B.S., Civil Engineering, 2005

Chapter 25: List of Preparers

Name	Project Role	Education
Armin Munévar, P.E.	Water Supply Surface Water, Water Quality	M.S., Civil Engineering, 1997 B.S., Civil Engineering, 1991
Neil Nikirk	Biological Resources	M.S., Fisheries Science, 1992 B.S., Fisheries Science, 1987
Harry Ohlendorf	Water Quality	Ph.D., Wildlife Science, 1971 M.S., Wildlife Science, 1969 B.S., Wildlife Management, 1962
Lisa Porta, P.E.	Groundwater, Water Quality	M.S., Environmental Science and Engineering, 2007 B.S., Biological Systems Engineering, 2004
Reed Thayer	Water Supply, Surface Water	M.S., Civil Engineering, 2015 B.S., Civil Engineering, 2013
Elisabeth Towers	GIS Mapping	B.A., Human Geography and Planning, 2013
Robert Tull, P.E.	Water Supply, Surface Water	M.S., Environmental Engineering, 10986 B.S., Environmental Planning, 1981
Jeff Tupen	Biological Resources	B.S., Environmental and Systematic Biology, 1989
Pamela Vanderbilt	Air Quality and Biological Resources	M.A., Biology, 1979 B.A., Biology, 1977
Brian Van Lienden, P.E.	Water Supply, Energy Resources	M.S., Civil Engineering, 2000 B.S., Civil Engineering, 1998
Kyle Winslow, P.E.	Water Quality	Ph.D., Environmental Fluid Mechanics, 2001 M.S., Environmental Water Resources, 1996 B.S., Civil Engineering, 1995
Fatuma Yusuf	Socioeconomics	Ph.D., Agricultural Economics, 2000 M.S., Statistics, 1999 M.A., Agricultural Economics, 1994 B.S., Range Management, 1990

1 **Ag-Recon**

Name	Project Role	Education
David Olson	Agricultural Resources	B.S., Agricultural Engineering, 1985

1 **Cramer Fish Sciences**

Name	Project Role	Education
Paul Bergman	Aquatic Resources	M.S., Fisheries, 2007 B.S., Fisheries and Biology, 1994
Brad Cavallo	Aquatic Resources	M.S., Aquatic Ecology, 1997 B.S. Wildlife and Fisheries Biology, 1994
Travis Hinkelman	Aquatic Resources	Ph.D., Biological Sciences, 2012 M.S., Aquaculture, Fisheries and Wildlife, 2004 B.S., Fisheries and Wildlife, 2001
Steven Zeug	Aquatic Resources	Ph.D., Wildlife and Fisheries Sciences, 2007 B.S., Fisheries Biology, 2001

2 **ERA Economics**

Name	Project Role	Education
Duncan MacEwan	Agricultural Resources	Ph.D., Economics, 2012 M.S., Economics, 2008 B.S., Economics, 2006

3 **InCommunications**

Name	Project Role	Education
Christine Kohn	Consultation and Coordination	M.S., Journalism and Public Affairs, 1993 B.A., Journalism, 1991

4 **Kearns and West**

Name	Project Role	Education
Michael Harty	Consultation and Coordination	J.D., Georgetown University Law Center, 1986 B.A., Political Philosophy, 1978

5 **QEDA**

Name	Project Role	Education
Noble Hendrix	Aquatic Resources	Ph.D., Aquatic and Fisheries Sciences, 2003 M.S., Aquatic and Fisheries Sciences, 2000

1 **Resource Management Associates**

Name	Project Role	Education
Stacie Grinbergs, P.E.	Surface Water Modeling	M.S., Civil Engineering, 1998
Donald Smith, P.E.	Water Temperature Modeling	B.S., Civil Engineering, 1968

2 **RMann Economics**

Name	Project Role	Education
Roger Mann	Socioeconomics	Ph.D., Agricultural Economics, 1978

3 **Stillwater Associates**

Name	Project Role	Education
Ethan Bell	Aquatic Resources	M.S., Biology, 2001
Joshua Strange	Aquatic Resources	Ph.D., Fisheries Biologist, 2001

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