Chapter 18

Public Health

18.1 Introduction

This chapter describes public health hazards in the Study Area related to changes in the environment that could occur as a result of implementing the alternatives evaluated in this Environmental Impact Statement (EIS). Implementation of the alternatives considered in this EIS could affect public health through changes in available water supplies from the Central Valley Project (CVP) and State Water Project (SWP); changes in irrigated crop acreage related to potential changes in operation of the CVP and SWP; changes in wetlands acreage related to potential changes in ecosystem restoration; and changes in water quality related to potential changes in operation of the CVP and SWP.

Changes in available water supplies, agricultural resources, wetlands, and water quality are described in more detail in Chapter 5, Surface Water Resources and Water Supplies; Chapter 12, Agricultural Resources; and Chapter 6, Water Quality, respectively.

18.2 Regulatory Environment and Compliance Requirements

Potential actions that could be implemented under the alternatives evaluated in this EIS could affect public health throughout the Study Area. Some of the actions considered in the alternatives evaluated in this EIS could include facilities located on public agency lands; or actions implemented, funded, or approved by Federal and state agencies. These actions would need to be compliant with appropriate Federal and state agency policies and regulations, as summarized in Chapter 4, Approach to Environmental Analyses.

18.3 Affected Environment

This section describes the following public health factors that could be potentially affected by the implementation of the alternatives considered in this EIS.

- Changes in available water supplies.
- Increases in the potential for mosquito-borne diseases due to an increase in wetlands.
- Changes in the potential for Valley Fever from disturbed soils when irrigation water supplies change.
- Changes in the potential for bioaccumulation of mercury in fish and shellfish.

Changes in the potential of direct or indirect exposure to high water quality concentrations of various constituents also may occur due to implementation of the alternatives. These direct changes to water quality and the related changes to drinking water safety and consumption of fish or shellfish exposed to high concentrations of constituents of concern are described in Chapter 6, Water Quality.

Public health effects that could occur due to construction activities are not discussed in this chapter, including increased exposure to naturally occurring asbestos, methane production from disturbance of peat soils, disturbance of oil and gas production fields, use and transport of hazardous wastes, and changes in wastewater or stormwater discharges. Although several of the alternatives include assumptions of constructed facilities, those actions will require subsequent planning and environmental documentation prior to implementation. The subsequent environmental documentation and related permits will evaluate public health effects associated with construction and implementation of those facilities.

18.3.1 Public Health Issues Related to Available Water Supplies

Water supply availability can affect public health in several ways. Potential direct effects to public health are related to reduction of municipal water supplies. Potential indirect effects to public health are related to reduction of industrial and irrigation water supplies which could affect the ability to earn an income to fund food, shelter, and other critical factors necessary for public health. Effects related to loss of jobs.

Availability of water supplies substantially decreased for CVP and SWP water users during recent droughts in 1976-1977, 1987-1992, and 2012-2014. In addition, as described in Chapter 5, Surface Water Resources and Water Supplies, the frequency of substantially reduced water supplies provided by the CVP and SWP have increased since the 1976-1977 drought due to changes in regulations and increased water demands by users with higher priorities for water use.

During the 2014 drought, CVP and SWP water supply allocations have been reduced substantially to protect future water supplies and the ability to meet existing regulations, as described in Chapter 5, Surface Water Resources and Water Supplies. The allocations were modified throughout the 2013-2014 winter with the allocations that are the most stringent in the history of the CVP and/or SWP operations, as summarized below (Reclamation 2014a, 2014b; DWR 2013, 2014).

- CVP North of Delta Water Users.
  - Sacramento River Settlement Contractors – allocated 40 percent of total contracted water supply.
  - Sacramento Valley Refuges that use CVP water supplies – allocated 40 percent of total contracted water supply.

  - Agricultural Water Service Contractors – allocated 0 percent of total contracted water supply.
  - Municipal and Industrial Water Service Contractors – allocated 50 percent of historic water use.
- CVP In-Delta Water Service Contractor: Contra Costa Water District – allocated 50 percent of historic water use.
- CVP South of Delta Water Users.
  - San Joaquin River Exchange and Settlement Contractors – allocated 65 percent of total contracted water supply.
  - San Joaquin Valley Refuges that use CVP water supplies – allocated 65 percent of total contracted water supply.
  - Agricultural Water Service Contractors – allocated 0 percent of total contracted water supply.
  - Municipal and Industrial Water Service Contractors – allocated 50 percent of historic water use.
- CVP Friant Division Contractors – allocated 0 percent of total contracted water supply.
- CVP Eastside Water Service Contractors: Water supplies delivered from New Melones Reservoir – allocated 55 percent of total contracted water supply.
- SWP Water Service Contractors – 5 percent of total contracted water supply.

Another potential indirect effect to public health is related to reduction of stored water in the CVP and SWP reservoirs which could affect the ability to provide enough water for firefighting,

18.3.1.1 Public Health and Safety Related to Available Municipal and Industrial Water Supplies

The Department of the Interior, Bureau of Reclamation (Reclamation) current *Draft Municipal and Industrial Shortage Policy* (Reclamation 2005) describes that the CVP water service contractors should develop public health and safety volumes based California's public health and safety criteria or criteria developed in coordination with Reclamation. Currently, California does not have a uniform set of public health and safety criteria for municipal and industrial water supplies. At this time, most of the urban communities have not adopted specific public health and safety criteria. However, in some of the recently completed Urban Water Management Plans, criteria have been identified to protect public health and safety that range from 25 to 50 percent of the total water demand, as described in Chapter 5, Surface Water Resources and Water Supplies (CCWD 2011; Folsom 2011; Metropolitan 2010). The Urban Water Management Plans indicate that during the critical periods with reductions in water supplies, municipal and industrial water uses will be focused on inside water uses with little or no outside irrigation water.

At this time, no specific volumes have been identified for public health and safety quantities for the CVP and/or SWP water users. During the 2014 drought, the Department of Water Resources (DWR) and Reclamation identified 1,500 cubic feet per second as a minimum amount of CVP and SWP Delta exports for public health and safety uses for municipal and industrial water supplies. This amount is also defined by the limitations of the CVP and SWP conveyance facilities, as described in Chapter 5, Surface Water Resources and Water Supplies.

As described above, in 2014, CVP and SWP water supply allocations are at historically low values. However, it is difficult to identify local public health and safety issues, non-agricultural related industrial job losses, and economic losses associated with reductions in CVP and/or SWP water supplies. The potential economic losses, socioeconomic effects, and environmental justice effects are described in Chapter 19, Socioeconomics, and Chapter 21, Environmental Justice.

18.3.1.2 Public Health and Safety Related to Available Agricultural Water Supplies

Agricultural water suppliers have developed responses to the reductions in agricultural water supplies from the CVP and SWP, as described in Chapter 12, Agricultural Resources. Historically, the number of employment opportunities that rely directly or indirectly on the availability of CVP and/or SWP water supplies for irrigation have declined in the areas where the water supplies have declined, communities within the Central Valley Region and Southern California Region, as described in Chapter 19, Socioeconomics.

18.3.1.3 Public Health and Safety Related to Water Supply Availability for Wildland Firefighting

Complex terrain, Mediterranean climate, productive natural plant communities, and ample natural and aboriginal ignition sources has caused California to be a complex wildfire-prone and fire-adapted landscape. While natural wildfires support ecosystem health and is critical to maintaining the structure and function of ecosystems, wildfires pose a significant threat to life, public health, infrastructure, properties, and natural resources.

In accordance with Public Resources Code sections 4201 to 4204 and Government Code sections 51175 to 51189, the California Department of Forestry and Fire Prevention (CAL FIRE) has mapped areas of significant fire hazards based on fuels, terrain, weather, and other relevant factors. The zones are referred to as Fire Hazard Severity Zones and represent the risks associated with wildland fires. Under CAL FIRE regulations, areas within very high fire-hazard risk zones must comply with specific building and vegetation requirements intended to reduce property damage and loss of life within these areas.

According to CAL FIRE, there is an increasing trend of acres burned statewide, with particular increase in conifer vegetation types (CAL FIRE FRAP 2010). Statewide, there are 21.3 million acres of land designated as high priority landscape. The high priority landscape areas include locations with high value water supplies and high threats of fire and large communities which should be protected to prevent wildfire threats to maintain ecosystem health, water supplies,

and large communities. These areas include the upper Trinity River watershed in the Trinity River Region; the upper Shasta Lake, Lake Oroville, Folsom Lake, New Melones Reservoir, and Millerton Lake watersheds in the Central Valley Region; and communities in throughout the Southern California Region. Areas designated as high priority landscape occur within 46 of 58 counties. Many rural counties have significant numbers of communities and acreage in medium priority landscape, including 508 communities with some high priority landscape areas.

CAL FIRE manages the State Responsibility Areas, and local fire districts manage Local Responsibility Areas. First responders are typically the local fire districts. The U.S. Forest Service provides wildland fire protection both independently and cooperatively with the California Department of Forestry and Fire Protection. In addition, the U.S. Department of the Interior National Park Service and Bureau of Land Management provide resource management and fire protection on portions of Federal lands.

Firefighting actions frequently involve use of water from reservoirs located close to wildland fires in the Trinity River, Central Valley, Central Coast, and Southern California regions, including reservoirs owned by Reclamation and DWR.

18.3.2 Public Health Issues Related to Mosquito-Borne Diseases

There are more than 50 species of mosquitos in California, including members of the four major genera: 24 species of *Aedes*, 5 species of *Anopheles*, 11 species of *Culex*, and 4 species of *Culiseta* (CDPH et al. 2012). Not all of these species are known to transmit mosquito-borne viruses, as described below. There are approximately 15 mosquito-borne viruses that occur in California; however, the most significant viruses that cause human disease are St. Louis encephalitis virus (SLEV), western equine encephalomyelitis (WEEV), and West Nile virus (WNV) (CDPH et al. 2014). No cases of SLEV or WEEV have been reported in humans over the past few years in California. Malaria also is a mosquito-borne disease that is caused by a parasite instead of a virus.

The *Culex tarsalis* has been identified as part of transmission of SLEV, WEEV, and WNV, especially in rural areas. The *Culex pipiens* and *Culex quinquefasciatus* have been identified as part of the transmission of WNV and SLEV. The *Culex stigmatosoma* has been identified as part of the transmission of WNV and SLEV, especially among birds. The *Aedes melanimon, Aedes vexans*, and *Culex erythrothorax* have been identified as species involved in transmitting the virus between birds and mammals or between mammals.

Mosquitoes, especially *Culex tarsalis,* live in every area of California, and can be a threat to the health of humans and domestic animals throughout the state. The mosquito life cycle requires water for the egg, larva, and pupa stages. Some of the species are more associated with irrigated agriculture, and others are more associated with urban communities (CDPH et al. 2014). Most of the diseases are not treatable and vaccines are not available for humans. Methods to prevent mosquitoes from becoming adults and methods to prevent mosquitos from biting humans are the only available and practical methods to protect public health.

California Health and Safety Code (Sections 2001 – 4(d); 2002; and 2060(b)) describes that landowners are legally responsible to eliminate public nuisances from their properties, including mosquito breeding habitat (CDPH 2008; CDPH et al. 2012). Federal, state, and local agencies supplement the preventive activities of individual landowners toward protecting humans and domestic animals from mosquito-borne diseases. The California Department of Public Health (CDPH) monitors mosquito populations throughout the state. In 1915, the state legislature enacted the Mosquito Abatement Act to allow local mosquito abatement special districts. The local mosquito and vector control districts monitor mosquito populations and take actions such as eliminating breeding sites, using biological control (predators such as mosquitofish), and using chemical control, to reduce mosquito population size (CDPH 2013a).

18.3.2.1 St. Louis Encephalitis Virus

The SLEV is a mosquito-borne virus that circulates among birds and is transmitted to humans via mosquito bites CALSURV 2013a; CDPH 2007). Human infection with SLE can cause mild to severe fever and headaches due to inflammation of the brain. In severe cases, the illness can cause disorientation and comas and possibly cause death. Elderly can become more severely ill than young children with SLEV as compared to WEEV.

Since the SLEV was first recognized in 1933 in St. Louis, Missouri, outbreaks have been reported throughout the United States, Canada, and northern Mexico, generally between August and October (CALSURV 2013a). In 1984 and 1989, 29 human cases were reported in the San Joaquin Valley of the Central Valley Region. During the same time periods, 26 human cases were reported in the Los Angeles area of the Southern California Region. The last human case reported in California occurred in 1997 in Los Angeles County.

18.3.2.2 Western Equine Encephalitis

The WEEV is another mosquito-borne virus that circulates among birds and is transmitted to horses and humans by mosquitoes (CDPH 2007). Symptoms are similar to SLEV. Infants and small children are most severely afflicted with WEEV as compared to SLEV. There is a vaccine for horses, but not for humans. Historically, substantial number of horses died due to this disease as well as humans. Recently, there has not been a recorded case of WEEV in humans in California (CDPH et al. 2014).

18.3.2.3 West Nile Virus

West Nile virus (WNV) can cause mild to severe illness in human, other mammals, and birds.

The virus circulates among birds and is transmitted to humans primarily by *Culex* mosquitoes (CDPH et al. 2014). The WNV was first detected in North America in New York in 1999, and has subsequently spread to 48 states, Canada, and Mexico.

The WNV first appeared in humans in California in 2002 with the identification of one human case (CALSURV 2013b). In 2003, three human cases and one equine case were reported with numerous verified findings of WNV activity among dead birds and mosquitoes. In 2004, the WNV was reported in 58 counties, with 779 human cases, including 29 WNV-associated deaths (CALSURV 2013b). From 2003 through 2013, there were 4,004 reported human cases of WNV with 145 deaths; 16,299 reported bird deaths; and 1,202 reported cases involving horses (CDPH 2014a). In 2007, 2008, and between 2010 and 2013, the majority of reported human cases occurred in the six counties in Southern California Region, with most of the cases reported in Los Angeles County. Between 2007 and 2013, numerous human cases were reported in Butte, Sutter, Sacramento, Stanislaus, Fresno, Tulare, and Kern counties in the Central Valley Region. During this same period, no human cases were reported in the Trinity River Region; Lassen, Plumas, and Nevada counties in the Central Valley Region; San Benito County in the San Francisco Bay Area Region; and San Luis Obispo County in the Central Coast Region.

In humans, WNV may not result in any symptoms or only mild viral symptoms, including mild fever, headache, body aches, skin rash, and swollen lymph glands. Symptoms in less than 1 percent of people that are infected can include headache, high fever, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, and paralysis that are associated with meningitis or encephalitis.

18.3.2.4 Malaria

Malaria also is a mosquito-borne disease caused by a parasite that destroys the red blood cells of its host. People with malaria often experience fever, chills, and flu-like illness which can lead to death (CDPH et al. 2012). Malaria is no longer endemic in California, as well as the rest of the United States, due to intense mosquito control efforts and anti-malarial drugs. However, the disease is diagnosed every year, especially in people who have traveled outside the United States. In 2012, 92 human cases were reported in California (CDPH 2013). Of the 92 cases, 90 patients had traveled to countries characterized as endemic with malaria during the previous three years. The *Anopheles* mosquitoes can transmit the parasite to humans and are prevalent in California (CDPH et al. 2012).

18.3.3 Public Health Issues Related to Valley Fever

Valley fever is an illness that is caused by inhaling the spores of a fungus *Coccidioides immitis* (CDPH 2013c). This fungus lives in the top layers of some soils within 2 to 12 inches from the ground surface. When the soil is disturbed by digging, vehicles, cultivation, or wind, the fungal spores can be inhaled by persons within the area. Irrigated soils are less likely to contain the fungus than dry, previously undisturbed soils.

In most cases, symptoms in humans include mild cough and flu-like symptoms (CDPH 2013c). However, in about 40 percent of the reported cases, the illness can last for more than a month, make the person susceptible to pneumonia, and include cough, fever, chest pain, headache, muscle ache, rash, joint pain, and/or

fatigue. In about 5 percent of the reported cases, the disease becomes "disseminated Valley Fever" and can cause meningitis and/or affect bones, joints, skin, or other organs. There are no vaccines to prevent Valley Fever.

The *Coccidioides immitis* is endemic in many areas of the southwestern United States, Mexico, Central America, and South America. In California, the fungus is found in many areas of the San Joaquin Valley and Southern California (CDPH 2011, 2014b). In California between 2001 and 2012, there were over 35,000 reported cases of Valley Fever. The number of incidences increased from 1,483 cases in 2001 to 4,094 cases in 2012. The highest number of cases reported during this period occurred in Kings, Kern, Fresno, Tulare, and Madera counties in the San Joaquin Valley within the Central Valley Region; San Luis Obispo County in the Central Coast Region; and Los Angeles County in the Southern California Region.

In general, the people who have the highest risk of exposure to the fungus include construction workers, archeologists, geologists, wildland fighters, military personnel, mining or gas/oil extraction workers, and agricultural workers in non-irrigated areas (CDPH 2013c). Other employees also may be at risk. For example, members of the cast and crew of a television film became ill with Valley Fever after working on an outdoor set in Ventura County (CDCP 2014).

In 2011, Fresno, Kern, Kings, San Joaquin, San Luis Obispo, and Tulare counties conducted an analysis of information related to Valley Fever incidences (Fresno County et al. 2011). The observations included:

- More incidences were reported in the western parts of Kern, Kings, Fresno, and San Joaquin counties than in other portions of the counties.
- More incidences were reported in northern San Luis Obispo County and southern Tulare County than other portions of the counties.
- In recent years, there was increased reporting of Valley Fever in the prison populations in Fresno and Kings counties. In Kern County, 8 percent of the reported cases between 2005 and 2008 were prison inmates. In Fresno County, incidences at Pleasant Valley State Prison were 43 percent of the total cases in the county between 2004 and 2010. In Kings County, incidences at state prisons were 58 percent of the total cases in the county between 2007 and 2010.

In 2012, the San Joaquin Valley Air Pollution Control District (SJVAPCD) evaluated causes for Valley Fever and options to reduce social and economic effects of Valley Fever in the San Joaquin Valley (SJVAPCD 2012). The analysis described that Valley Fever appears to be related to a fungus that forms in subsoil strata that are dry through a portion of the year. The analysis referred to other studies that correlated weather patterns with outbreaks of Valley Fever during dry periods following periods of heavy rainfall. The study also indicated that airborne *Coccidioides* spores do not generally come from irrigated agriculture. It appears that it is more likely that the spores are from non-irrigated lands, including undisturbed natural lands, undeveloped land, and grazing areas. The study

indicated that additional monitoring or reduction of particulate matter of 10 microns, or PM_{10}, did not appear to be useful in reduction of the potential for Valley Fever. The study recommended additional funding to develop a vaccine for Valley Fever.

18.3.4 Public Health Issues Related to High Concentrations of Mercury in Fish and Shellfish

As described in Chapter 6, Water Quality, high concentrations of certain substances accumulate in fish and shellfish based upon the water quality. The California Environmental Protection Agency, Office of Environmental Health Hazard Assessment (OEHHA) evaluates concentrations of potentially toxic substances in edible tissues of fish and shellfish harvested in water bodies in California (OEHHA 2014a). Based upon the evaluation, general and specific safe eating guidelines are developed for the fish and shellfish, as summarized in Table 18.1. For the water bodies in the Study Area, the primary constituents that have triggered the development of safe eating guidelines are mercury, dieldrin, and/or polychlorinated biphenyl (PCB). Other constituents are present, including selenium; however, the concentrations do not exceed thresholds that would trigger safe eating guidelines. The OEHHA develops two separate guidelines: (1) Guidelines for Children from 1 to 17 years and Women from 18 to 45 years; and (2) Guidelines for Women over 45 years old and Men over 17 years old. The guidelines recommend the number of servings per week by fish or shellfish harvested from specific waters. A "serving size" is defined as "about the size and thickness of your hand" (OEHHA 2014a).

Table 18.1 Summary of Safe Eating Guidelines for Fish and Shellfish from Water Bodies in the Study Area Based on Mercury and PCB (servings per week)

Region	Water Body	Fish and Shellfish[a]	Guidelines for Children and Women up to 45 Years Old[b]	Guidelines for Men and Women over 45 Years Old[b]
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
		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

Region	Water Body	Fish and Shellfish[a]	Guidelines for Children and Women up to 45 Years Old[b]	Guidelines for Men and Women over 45 Years Old[b]
		Largemouth Bass, Smallmouth Bass, Spotted Bass, catfish	Do not eat	1
Central Valley (continued)	Folsom Lake	Bluegill, Green Sunfish, or other sunfish; Rout: 16 inches or less	2	5
		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	7
		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
		Striped Bass	Do not eat	2
		Bass, white sturgeon	Do not eat	1

Region	Water Body	Fish and Shellfish[a]	Guidelines for Children and Women up to 45 Years Old[b]	Guidelines for Men and Women over 45 Years Old[b]
Central Valley (continued)	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
	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

Region	Water Body	Fish and Shellfish[a]	Guidelines for Children and Women up to 45 Years Old[b]	Guidelines for Men and Women over 45 Years Old[b]
		Largemouth Bass, Smallmouth Bass	Do not eat	1
Southern California Region (continued)	Pyramid Lake (continued)	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
		Striped Bass	Do not eat	2
		White Sturgeon	Do not eat	1

Sources: OEHHA 2014b, 2014c, 2014d, 2014e, 2014f, 2014g, 2014h, 2014i, 2014j, 2014k, 2014l, 2014m, 2014n, 2014o, 2014p, 2014q, 2014r, 2014s, 2014t, 2014u, 2014v, 2014w

Notes:
a. All fish and shellfish names are as appears in the OEHHA guidelines.
b. The OEHHA guidelines refer to the total number of servings of fish per week for one water body, not just the total for a specific species. For example, OEHHA guidelines for Men eating fish from Trinity Lake would include no more than 5 servings of Rainbow Trout, Brown Trout, or White Catfish; OR 1 serving of Largemouth Bass or Smallmouth Bass.

Resident Delta fish accumulate mercury primarily through dietary exposure; larger, piscivorous (fish-eating) fish show the greatest levels of tissue mercury. In contrast to anadromous fish (migratory species), the resident fish experience constant exposure to local mercury sources. Resident species include larger fish with human health exposure (such as Largemouth Bass) and smaller, forage fish (such as Inland Silversides). Fish tissues are the ultimate route of exposure to mercury for humans who consume locally caught fish.

Historically, substantial levels of mercury contamination have occurred in fish throughout the Delta. Mercury concentrations in tissue of the larger piscivorous fish are lower in for fish in the central Delta as compared to fish from the Mokelumne, Cosumnes, Sacramento, and San Joaquin rivers (CVRWQCB 2010a, 2010b). Larger, piscivorous resident fish, in general, provide a good record of fish tissue mercury as a baseline condition for the Delta. Largemouth Bass were chosen because they are popular sport fish, top predators, live for several years, and tend to stay in the same area (exhibit high site fidelity). Consequently, they are excellent indicators of long-term average mercury exposure, risk, and spatial pattern for ecological and human health. Mercury in sport fish from the Delta region was reported for Largemouth Bass as a median tissue mercury concentration of 0.53 mg mercury per kilogram (Hg/kg) wet weight (Davis et al. 2003). Current fish tissue concentrations thus exceed both adopted regulatory standards and guidance from the U.S. Environmental Protection Agency (USEPA). In the 2010 Delta TMDL for methylmercury, the Central Valley Regional Water Quality Control Board (Central Valley RWQCB) established a fish tissue threshold (fillet concentrations, wet weight mercury) of 0.24 mg Hg/kg wet weight in trophic level 4 fish (adult, top predatory sport fish, such as Largemouth Bass) (Central Valley Water Board 2010a). These values are slightly lower than USEPA's national recommended water quality criterion for fish tissue of 0.3 mg Hg/kg wet weight for protection of human health and wildlife (USEPA 2001). Therefore, the Delta average for Largemouth Bass fillet concentrations in the study by Davis et al. exceeds both recommended safe consumption guidelines.

18.4 Impact Analysis

This section describes the potential mechanisms for change in conditions and analytical methods; results of impact analyses; potential mitigation measures; and cumulative effects.

18.4.1 Potential Mechanisms for Change and Analytical Methods

As described in Chapter 4, Approach to Environmental Analysis, the impact analysis considers changes in public health factors related to changes in CVP and SWP operations under the alternatives as compared to the No Action Alternative and Second Basis of Comparison.

Changes in CVP and SWP operations under the alternatives as compared to the No Action Alternative and Second Basis of Comparison could change public health factors affected by CVP and SWP operations.

18.4.1.1 Changes in Public Health Factors Related to Available CVP and SWP Agricultural Water Supplies

Changes in water supply availability to agricultural water users could result in reductions of irrigated acreage and related jobs. The availability of jobs can affect public health, as described in Section 18.3.2, Public Health Issues Related to Available Water Supplies. As described in Chapter 12, Agricultural Resources, agricultural acreage would be similar under Alternatives 1 through 5, No Action Alternative, and Second Basis of Comparison. Therefore, the change in public health conditions would be the same under all of the alternatives and the Second Basis of Comparison; and is not analyzed in this EIS.

18.4.1.2 Changes in Public Health Factors Related to Available Municipal Water Supplies

As described in Section 18.3.2, Public Health Issues Related to Available Water Supplies, water supply availability can affect public health related to direct use within the household and indirect effects related to adequate water supplies for industrial and commercial water users that provide employment. As described in Chapter 5, Surface Water Resources and Water Supplies, and Chapter 18, Socioeconomics, t municipal and industrial water users would rely upon alternate water supplies to meet water demands in 2030. Therefore, public health conditions related to availability of municipal and industrial water supplies would be the same under all of the alternatives and the Second Basis of Comparison; and is not analyzed in this EIS.

18.4.1.3 Changes in Public Health Factors Related to Wildland Firefighting and CVP and SWP Reservoir Storage

Stored water in water supply reservoirs is used for wildland firefighting in the California foothills and mountains, including water stored in CVP and SWP reservoirs. During drier periods, reduced storage levels could affect the availability of water for wildlife firefighting, as indicated in changes in CVP and SWP reservoir at the end of September in critical dry water years, as described in Chapter 5, Surface Water Resources and Water Supplies.

Reservoirs that store water in the San Francisco Bay Area, Central Coast, and Southern California regions are managed to store water supplies as part of short-term conveyance management or storage for regional and local water supplies using water from numerous sources and water for wildland firefighting is not known; and therefore, are not analyzed in this EIS.

18.4.1.4 Changes in Public Health Factors Related to Wetlands Restoration and Mosquito-Borne Diseases

Wetlands provide habitat for mosquito breeding, especially in tidally-influenced wetlands with slow moving water and floodplains after the majority of the water recedes. Management practices (e.g., designing wetlands to provide flushing flows, use of biological controls) can reduce the nuisance and public health aspects of mosquito populations. The extent of seasonal floodplains and tidally-influenced wetlands in Yolo Bypass, Cache Slough, and Suisun Marsh areas would increase in a similar manner under all of the alternatives and the Second

Basis of Comparison, as described in Chapter 3, Description of Alternatives. Therefore, the potential for changes in public health conditions related to mosquito populations would be the same under all of the alternatives and the Second Basis of Comparison; and is not analyzed in this EIS.

18.4.1.5 Changes in Public Health Factors Related to Potential Valley Fever

As described above, recent studies have indicated that valley fever exposure appears to be related to cultivated lands, including lands that are idled due to agricultural practices or reduced water supply availability. Changes in CVP and SWP operations under the alternatives and the Second Basis of Comparison would not affect the extent of non-irrigated lands. Therefore, the potential for changes in public health conditions related to Valley Fever would be the same under all of the alternatives and the Second Basis of Comparison; and is not analyzed in this EIS.

18.4.1.6 Changes in Public Health Factors Related to Mercury in Fish used for Human Consumption

As described above, fish used for human consumption in the Delta have mercury levels that exceed OEHHA guidelines. Changes in CVP and SWP operations under the alternatives and the Second Basis of Comparison would change the accumulated mercury concentrations in fish in the Delta. As described in Chapter 6, Surface Water Quality, the bioavailability and toxicity of mercury is enhanced through the natural, bacterial conversion of mercury to methylmercury in marshlands or wetlands. These stagnant locations with reduced oxygen concentrations promote chemical reduction processes that make methylation possible. The methylmercury model is based upon the Total Maximum Daily Load translation equation for mercury developed by the Central Valley Regional Water Quality Control Board. The model estimates fish tissue concentrations from waterborne concentrations of mercury in the Delta and evaluates the potential to cause exceedances of water quality or tissue benchmarks. The tissue concentrations associated with the Alternatives 1 through 5 were compared to the No Action Alternative and the Second Basis of Comparison.

18.4.2 Conditions in Year 2030 without Implementation of Alternatives 1 through 5

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

18.4.2.1 Common Changes in Conditions under the No Action Alternative and Second Basis of Comparison

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

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

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

These changes would result in a decline of the long-term average CVP and SWP water supply deliveries by 2030 as compared to recent historical long-term average deliveries under the No Action Alternative and the Second Basis of Comparison. However, the CVP and SWP water deliveries would be less under the No Action Alternative as compared to the Second Basis of Comparison, as described in Chapter 5, Surface Water Resources and Water Supplies. Due to climate change and related lower snowfall, end of September low reservoir storage would be lower in critical dry years by 2030 as compared to recent historical conditions in Shasta Lake, Lake Oroville, Folsom Lake, New Melones Reservoir, and San Luis Reservoir. Therefore, the potential for reduced reservoir water supplies for wildland firefighting would be greater under the No Action Alternative and Second Basis of Comparison as compared to recent historical conditions.

Under the No Action Alternative and the Second Basis of Comparison, land uses in 2030 would occur in accordance with adopted general plans.

The No Action Alternative and the Second Basis of Comparison assumes completion of water resources management and environmental restoration projects that would have occurred without implementation of Alternatives 1 through 5, including regional and local recycling projects, surface water and groundwater storage projects, conveyance improvement projects, and desalination projects, as described in Chapter 3, Description of Alternatives. The No Action Alternative and the Second Basis of Comparison also assumes implementation of actions included in the 2008 U.S. Fish and Wildlife Service (USFWS) Biological Opinion (BO) and 2009 National Marine Fisheries Service (NMFS) BO that

would have been implemented without the BOs by 2030, as described in Chapter 3, Description of Alternatives.

Under the No Action Alternative and Second Basis of Comparison, it is anticipated that mercury concentrations in fish tissue within the Delta will be either similar or greater than recent historical conditions. Phase 1 of the Delta Mercury Program mandated by the Central Valley RWQCB is currently being completed to protect people eating one meal per week of larger fish from the Delta, including Largemouth Bass. Phase 1 is focused on studies and pilot projects to develop and evaluate management practices to control methylmercury from mercury sources in the Delta and Yolo Bypass; and to reduce total mercury loading to the San Francisco Bay. Following completion of Phase 1 in 2019, Phase 2 will be implemented through 2030. Phase 2 will focus on methylmercury control programs and reduction programs for total inorganic mercury. Due to the extent of these studies, it is not anticipated that changes in methylmercury or total mercury concentrations in fish tissue will be reduced by 2030. Future mercury reduction and control programs will reduce mercury sources and related fish tissue concentrations; however, that will occur after 2030.

18.4.3 Evaluation of Alternatives

As described in Chapter 4, Approach to Environmental Analysis, Alternatives 1 through 5 have been compared to the No Action Alternative; and the No Action Alternative and Alternatives 1 through 5 have been compared to the Second Basis of Comparison.

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

- No Action Alternative compared to the Second Basis of Comparison
- Alternative 1 compared to the No Action Alternative
- Alternative 3 compared to the Second Basis of Comparison
- Alternative 5 compared to the Second Basis of Comparison

18.4.3.1 No Action Alternative

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

18.4.3.1.1 Trinity River Region

Changes in Public Health Factors Related to Wildland Firefighting and CVP and SWP Reservoir Storage

Changes in CVP water supplies and operations under the No Action Alternative as compared to the Second Basis of Comparison would result in similar end of September reservoir elevations in critical dry years (changes within 5 percent) at Trinity Lake, as described in Chapter 5, Surface Water Resources and Water

Supplies. Therefore, the potential for water availability for wildland firefighting would be similar under the No Action Alternative as compared to the Second Basis of Comparison.

18.4.3.1.2 Central Valley Region

Changes in Public Health Factors Related to Wildland Firefighting and CVP and SWP Reservoir Storage

Changes in CVP water supplies and operations under the No Action Alternative as compared to the Second Basis of Comparison would result in similar end of September reservoir elevations in critical dry years (changes within 5 percent) at Shasta Lake, Lake Oroville, Folsom Lake, and New Melones Reservoir, as described in Chapter 5, Surface Water Resources and Water Supplies. Therefore, the potential for water availability for wildland firefighting would be similar under the No Action Alternative as compared to the Second Basis of Comparison.

End of September surface water elevations at San Luis Reservoir in critical dry years would be 6 percent lower under the No Action Alternative as compared to the Second Basis of Comparison. Therefore, the potential for water availability for wildland firefighting would be reduced at San Luis Reservoir under the No Action Alternative as compared to the Second Basis of Comparison.

Changes in Public Health Factors Related to Mercury in Fish used for Human Consumption

Mercury concentrations in Largemouth Bass would be similar (within 5 percent change) in most locations in the Delta, except for Rock Slough, San Joaquin River near Antioch, and Montezuma Slough in Suisun Marsh. In these areas, the mercury concentrations would increase by 7 percent over long-term conditions under the No Action Alternative as compared to the Second Basis of Comparison. Under dry and critical dry years, mercury concentrations would increase by 7 to 8 percent at Rock Slough, intakes of the Banks and Jones pumping plants, and Victoria Canal. All values exceed the threshold of 0.24 mg/kg ww for mercury.

18.4.3.2 Alternative 1

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

18.4.3.2.1 Alternative 1 Compared to the No Action Alternative

Trinity River Region

Changes in Public Health Factors Related to Wildland Firefighting and CVP and SWP Reservoir Storage

Changes in CVP water supplies and operations under Alternative 1 as compared to the No Action Alternative would result in similar end of September reservoir elevations in critical dry years at Trinity Lake, as described in Chapter 5, Surface Water Resources and Water Supplies. Therefore, the potential for water

availability for wildland firefighting would be similar under Alternative 1 as compared to the No Action Alternative.

Central Valley Region

Changes in Public Health Factors Related to Wildland Firefighting and CVP and SWP Reservoir Storage

Changes in CVP water supplies and operations under Alternative 1 as compared to the No Action Alternative would result in similar end of September reservoir elevations in critical dry years at Shasta Lake, Lake Oroville, Folsom Lake, and New Melones Reservoir, as described in Chapter 5, Surface Water Resources and Water Supplies. Therefore, the potential for water availability for wildland firefighting would be similar under Alternative 1 as compared to the No Action Alternative.

End of September surface water elevations at San Luis Reservoir in critical dry years would be 7 percent higher under Alternative 1 as compared to the No Action Alternative. Therefore, the potential for water availability for wildland firefighting would be increased at San Luis Reservoir under Alternative 1 as compared to the No Action Alternative.

Changes in Public Health Factors Related to Mercury in Fish used for Human Consumption

Mercury concentrations in Largemouth Bass would be similar in most locations in the Delta, except for Rock Slough, San Joaquin River near Antioch, and Montezuma Slough in Suisun Marsh. In these areas, the mercury concentrations would decrease by 6 percent over the long-term conditions under Alternative 1 as compared to the No Action Alternative. Under dry and critical dry years, mercury concentrations would decrease by 6 to 8 percent at Rock Slough, intakes of the Banks and Jones pumping plants, and Victoria Canal. All values exceed the threshold of 0.24 mg/kg ww for mercury.

18.4.3.2.2 Alternative 1 Compared to the Second Basis of Comparison

Alternative 1 is identical to the Second Basis of Comparison.

18.4.3.3 Alternative 2

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

18.4.3.3.1 Alternative 2 Compared to the Second Basis of Comparison

The CVP and SWP operations under Alternative 2 are identical to the CVP and SWP operations under the No Action Alternative. Therefore, changes to public health conditions under Alternatives 2 as compared to the Second Basis of Comparison would be the same as the impacts described in Section 18.4.3.1, No Action Alternative.

18.4.3.4 Alternative 3

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

18.4.3.4.1 Alternative 3 Compared to the No Action Alternative

Trinity River Region

Changes in Public Health Factors Related to Wildland Firefighting and CVP and SWP Reservoir Storage

Changes in CVP water supplies and operations under Alternative 3 as compared to the No Action Alternative would result in similar end of September reservoir elevations in critical dry years at Trinity Lake, as described in Chapter 5, Surface Water Resources and Water Supplies. Therefore, the potential for water availability for wildland firefighting would be similar under Alternative 3 as compared to the No Action Alternative.

Central Valley Region

Changes in Public Health Factors Related to Wildland Firefighting and CVP and SWP Reservoir Storage

Changes in CVP water supplies and operations under Alternative 3 as compared to the No Action Alternative would result in similar end of September reservoir elevations in critical dry years at Shasta Lake, Lake Oroville, Folsom Lake, New Melones Reservoir, and San Luis Reservoir, as described in Chapter 5, Surface Water Resources and Water Supplies. Therefore, the potential for water availability for wildland firefighting would be similar under Alternative 3 as compared to the No Action Alternative.

Changes in Public Health Factors Related to Mercury in Fish used for Human Consumption

Mercury concentrations in Largemouth Bass would be similar (within 5 percent change) in most locations in the Delta, except for San Joaquin River near Antioch and Montezuma Slough in Suisun Marsh. In these areas, the mercury concentrations would decrease by 6 percent over the long-term conditions under Alternative 3 as compared to the No Action Alternative. Mercury concentrations under the dry and critical dry years would be similar throughout the Delta. All values exceed the threshold of 0.24 mg/kg ww for mercury.

18.4.3.4.2 Alternative 3 Compared to the Second Basis of Comparison

Trinity River Region

Changes in Public Health Factors Related to Wildland Firefighting and CVP and SWP Reservoir Storage

Changes in CVP water supplies and operations under Alternative 3 as compared to the Second Basis of Comparison would result in similar end of September reservoir elevations in critical dry years at Trinity Lake, as described in Chapter 5,

Surface Water Resources and Water Supplies. Therefore, the potential for water availability for wildland firefighting would be similar under Alternative 3 as compared to the Second Basis of Comparison.

Central Valley Region

Changes in Public Health Factors Related to Wildland Firefighting and CVP and SWP Reservoir Storage

Changes in CVP water supplies and operations under Alternative 3 as compared to the Second Basis of Comparison would result in similar end of September reservoir elevations in critical dry years at Shasta Lake, Lake Oroville, Folsom Lake, New Melones Reservoir, and San Luis Reservoir, as described in Chapter 5, Surface Water Resources and Water Supplies. Therefore, the potential for water availability for wildland firefighting would be similar under Alternative 3 as compared to the Second Basis of Comparison.

Changes in Public Health Factors Related to Mercury in Fish used for Human Consumption

Mercury concentrations in Largemouth Bass would be similar throughout the Delta under Alternative 3 as compared to the Second Basis of Comparison, as summarized in Chapter 6, Surface Water Quality. All values exceed the threshold of 0.24 mg/kg ww for mercury.

18.4.3.5 Alternative 4

The public health conditions under Alternative 4 would be identical to the conditions under the Second Basis of Comparison; therefore, Alternative 4 is only compared to the No Action Alternative.

18.4.3.5.1 Alternative 4 Compared to the No Action Alternative

The CVP and SWP operations under Alternative 4 are identical to the CVP and SWP operations under the Second Basis of Comparison and Alternative 1. Therefore, changes in public health conditions under Alternative 4 as compared to the No Action Alternative would be the same as the impacts described in Section 12.4.4.2.1, Alternative 1 Compared to the No Action Alternative.

18.4.3.6 Alternative 5

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

18.4.3.6.1 Alternative 5 Compared to the No Action Alternative

Trinity River Region

Changes in Public Health Factors Related to Wildland Firefighting and CVP and SWP Reservoir Storage

Changes in CVP water supplies and operations under Alternative 5 as compared to the No Action Alternative would result in similar end of September reservoir

elevations in critical dry years at Trinity Lake, as described in Chapter 5, Surface Water Resources and Water Supplies. Therefore, the potential for water availability for wildland firefighting would be similar under Alternative 5 as compared to the No Action Alternative.

Central Valley Region

Changes in Public Health Factors Related to Wildland Firefighting and CVP and SWP Reservoir Storage

Changes in CVP water supplies and operations under Alternative 5 as compared to the No Action Alternative would result in similar end of September reservoir elevations in critical dry years at Shasta Lake, Lake Oroville, Folsom Lake, New Melones Reservoir, and San Luis Reservoir, as described in Chapter 5, Surface Water Resources and Water Supplies. Therefore, the potential for water availability for wildland firefighting would be similar under Alternative 5 as compared to the No Action Alternative.

Changes in Public Health Factors Related to Mercury in Fish used for Human Consumption

Mercury concentrations in Largemouth Bass would be similar throughout the Delta under Alternative 5 as compared to the No Action Alternative, as summarized in Chapter 6, Surface Water Quality. All values exceed the threshold of 0.24 mg/kg ww for mercury.

18.4.3.6.2 Alternative 5 Compared to the Second Basis of Comparison

Trinity River Region

Changes in Public Health Factors Related to Wildland Firefighting and CVP and SWP Reservoir Storage

Changes in CVP water supplies and operations under Alternative 5 as compared to the Second Basis of Comparison would result in similar end of September reservoir elevations in critical dry years at Trinity Lake, as described in Chapter 5, Surface Water Resources and Water Supplies. Therefore, the potential for water availability for wildland firefighting would be similar under Alternative 5 as compared to the Second Basis of Comparison.

Central Valley Region

Changes in Public Health Factors Related to Wildland Firefighting and CVP and SWP Reservoir Storage

Changes in CVP water supplies and operations under Alternative 5 as compared to the Second Basis of Comparison would result in similar end of September reservoir elevations in critical dry years at Shasta Lake, Lake Oroville, Folsom Lake, and New Melones Reservoir, as described in Chapter 5, Surface Water Resources and Water Supplies. Therefore, the potential for water availability for wildland firefighting would be similar under Alternative 5 as compared to the Second Basis of Comparison.

End of September surface water elevations at San Luis Reservoir in critical dry years would be 9 percent lower under Alternative 5 as compared to the Second

Basis of Comparison. Therefore, the potential for water availability for wildland firefighting would be reduced at San Luis Reservoir under Alternative 5 as compared to the Second Basis of Comparison.

Changes in Public Health Factors Related to Mercury in Fish used for Human Consumption

Mercury concentrations in Largemouth Bass would be similar in most locations in the Delta, except for Rock Slough, San Joaquin River near Antioch, and Montezuma Slough in Suisun Marsh. In these areas, the mercury concentrations would increase by 7 to 8 percent over long-term conditions under Alternative 5 as compared to the Second Basis of Comparison. During dry and critical dry years, mercury concentrations also would increase by 7 percent at intakes to Banks Pumping Plant and Jones Pumping Plant; and 13 percent at Rock Slough. All values exceed the threshold of 0.24 mg/kg ww for mercury.

18.4.3.7 Summary of Environmental Consequences

The results of the environmental consequences of implementation of Alternatives 1 through 5 as compared to the No Action Alternative and the Second Basis of Comparison are presented in Tables 18.2 and 18.3, respectively.

Table 18.2 Comparison of Alternatives 1 through 5 to No Action Alternative

Alternative	Potential Change	Consideration for Mitigation Measures
Alternative 1	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. 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 public health issues.	None needed
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 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 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.	None needed

Table 18.3 Comparison of No Action Alternative and Alternatives 1 through 5 to 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.

18.4.3.8 Potential Mitigation Measures

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

18.4.3.9 Cumulative Effects Analysis

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

The No Action Alternative, Alternatives 1 through 5, and Second Basis of Comparison include climate change and sea level rise, implementation of general plans, and completion of ongoing projects and programs (see Chapter 3, Description of Alternatives). The effects of these items were analyzed quantitatively and qualitatively, as described in the Impact Analysis of this chapter. The discussion below focuses on the qualitative effects of the alternatives and other past, present, and reasonably foreseeable future projects identified for consideration of cumulative effects (see Chapter 3, Description of Alternatives).

18.4.3.9.1 No Action Alternative and Alternatives 1 through 5

Continued coordinated long-term operation of the CVP and SWP under the No Action Alternative would result in reduced CVP and SWP water supply availability as compared to recent conditions due to climate change and sea level rise by 2030. These conditions are included in the analysis presented above.

Future water resource management projects considered in cumulative effects analysis could increase water supply availability, as described in Chapter 5, Surface Water Resources and Water Supplies. These projects would not necessarily result in changes in public health factors.

There also are several ongoing programs that could result in reductions in CVP and SWP water supply availability due to changes in flow patterns in the Sacramento and San Joaquin rivers watersheds and the Delta that could reduce availability of CVP and SWP water deliveries as well as local and regional water supplies, as described in Chapter 5, Surface Water Resources and Water Supplies. These projects would not necessarily result in changes in public health factors.

There would be no adverse public health factors impacts associated with implementation of the alternatives as compared to the No Action Alternative or the Second Basis of Comparison. Therefore, Alternatives 1 through 5 would not contribute adverse cumulative impacts to public health factors.

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