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Central Valley Project: Issues and Legislation

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Central Valley Project: Issues and Legislation

The Central Valley Project (CVP), a federal water project owned and operated by the U.S. Bureau of Reclamation (Reclamation), is one of the world's largest water supply projects. The CVP covers approximately 400 miles in California, from Redding to Bakersfield, and draws from two large river basins: the Sacramento and the San Joaquin. It is composed of 20 dams and reservoirs and numerous pieces of water storage and conveyance infrastructure. In an average year, the CVP delivers more than 7 million acre-feet of water to support irrigated agriculture, municipalities, and fish and wildlife needs, among other purposes. About 75% of CVP water is used for agricultural irrigation, including 7 of California's top 10 agricultural counties. The CVP is operated jointly with the State Water Project (SWP), which provides much of its water to municipal users in Southern California.

SUMMARY

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CVP water is delivered to users that have contracts with Reclamation. These contractors receive varying levels of priority for water deliveries based on several factors, including hydrology, water rights, prior agreements with Reclamation, and regulatory requirements. The Sacramento and San Joaquin Rivers' confluence with the San Francisco Bay (*Bay-Delta* or *Delta*) is a hub for CVP water deliveries; many CVP contractors south of the Delta receive water that is "exported" from north of the Delta.

Development of the CVP resulted in significant changes to the area's natural hydrology. However, construction of most CVP facilities predated major federal natural resources and environmental protection laws. Much of the current debate related to the CVP revolves around how to deal with changes to the hydrologic system that were not significantly mitigated for when the project was constructed. Thus, multiple ongoing efforts to protect species and restore habitat have been authorized and are incorporated into project operations.

Congress has engaged in CVP issues through oversight and at times legislation, including provisions in the 2016 Water Infrastructure Improvements for the Nation (WIIN Act; P.L. 114-322) that, among other things, authorized changes to operations in an attempt to provide for delivery of more water under certain circumstances. Although some stakeholders are interested in further operational changes to enhance CVP water deliveries, others are focused on the environmental impacts of operations.

Various state and federal proposals are currently under consideration and have generated controversy for their potential to affect CVP operations and allocations. In mid-2018, the State of California proposed revisions to its Bay-Delta Water Quality Control Plan. These changes would require that more flows from the San Joaquin and Sacramento Rivers reach the Bay-Delta for water quality and fish and wildlife enhancement (and thus would further restrict water supplies for other users). At the same time, the Trump Administration is exploring options to increase CVP water supplies for users. Efforts to add or supplement CVP storage and conveyance also are being considered. The state is proposing a major new water conveyance project (known as the California WaterFix) that would bypass the Bay-Delta and, under certain conditions, increase exports from north to south for users. Additionally, Reclamation and the state are studying other new, augmented storage projects that aim to increase CVP and SWP water supplies.

In the 115th Congress, legislators are considering bills that would aim to further increase CVP water exports compared to current baselines by altering environmental requirements and repealing parts of some existing restoration programs. Congress also is considering more targeted but potentially significant changes, such as appropriations provisions that would provide federal approval and funding for certain water storage projects in California, prohibit federal funding for the Bay-Delta Water Quality Control Plan, and prohibit judicial review of WaterFix and other water supply projects, among other things. Congress also may consider legislation that would extend or amend previously enacted CVP authorities (e.g., WIIN Act authorities that are expiring or have exceeded their appropriations ceiling).

This report provides background on the CVP, the process of allocating CVP water supplies, and associated controversies. It also covers major proposals associated with the project's current and future operation. Finally, it discusses recently enacted authorities and proposed legislation related to the CVP.

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Introduction

The Bureau of Reclamation (Reclamation), part of the Department of the Interior (DOI), operates the multipurpose federal Central Valley Project (CVP) in California, one of the world's largest water storage and conveyance systems. The CVP runs approximately 400 miles in California, from Redding to Bakersfield (**Figure 1**). It supplies water to hundreds of thousands of acres of irrigated agriculture throughout the state, including some of the most valuable cropland in the country. It also provides water to selected state and federal wildlife refuges, as well as to some municipal and industrial (M&I) water users.

This report provides information on hydrologic conditions in California and their impact on state and federal water management, with a focus on deliveries related to the federal CVP. It also summarizes selected issues for Congress related to the CVP.

Recent Developments

The drought of 2012-2016, widely considered to be among California's most severe droughts in recent history, resulted in major reductions to CVP contractor allocations and economic and environmental impacts throughout the state.[1] These impacts were of interest to Congress, which oversees federal operation of the CVP. Although the drought ended with the wet winter of 2017, many of the water supply controversies associated with the CVP predated those water shortages and remain unresolved. Absent major changes to existing hydrologic, legislative, and regulatory baselines, most agree that at least some water users are likely to face ongoing constraints to their water supplies. Due to the limited water supplies available, proposed changes to the current operations and allocation system are controversial.

As a result of the scarcity of water in the West and the importance of federal water infrastructure to the region, western water issues are regularly of interest to many lawmakers. Legislation enacted in the 114th Congress (Title II of the Water Infrastructure Improvements for the Nation [WIIN] Act; P.L. 114-322) included several CVP-related sections.[2] These provisions directed pumping to "maximize" water supplies for the CVP (including pumping or "exports" to CVP water users south of the Sacramento and San Joaquin Rivers' confluence with the San Francisco Bay, known as the *Bay-Delta* or *Delta*) in accordance with applicable biological opinions (BiOps) for project operations.[3] They also allowed for increased pumping during certain storm events generating high flows, authorized actions to facilitate water transfers, and established a new standard for measuring the effects of water operations on species. In addition to operational provisions, the WIIN Act authorized funding for construction of new federal and nonfederal water storage projects. CVP projects are among the most likely recipients of this funding.

[1] For more information on drought in general, see CRS Report R43407, *Drought in the United States: Causes and Current Understanding*, by (name redacted)

[2] For more information, see CRS Report R44986, *Water Infrastructure Improvements for the Nation (WIIN) Act: Bureau of Reclamation and California Water Provisions*, by (name redacted), (name redacted), and (name redacted) .

[3] The Endangered Species Act (ESA) requires that a federal agency proposing an action that may have an effect on a listed species consult with the U.S. Fish and Wildlife Service or the National Marine Fisheries Service (i.e., regulatory agencies). The action agency will commonly complete a biological assessment on potential effects to the fish or its habitat and submit it to the regulatory agency. The regulatory agency then renders a biological opinion, or BiOp, to the action agency making the proposal. The intent of a BiOp is to ensure that the proposed action will not reduce the likelihood of survival and recovery of an ESA-listed species. BiOps typically include conservation recommendations intended to further recovery of the ESA-listed species.

Due to increased precipitation and disagreements with the state, among other factors, the WIIN Act's CVP operational authorities did not yield significant new water exports south of the Delta in 2017 and 2018. However, the authorities may be more significant in years of limited precipitation and thus may yield increased supplies in the future. Although use of the new operational authorities was limited, Reclamation received funding for WIIN Act-authorized water storage project design and construction in FY2017-FY2019; a significant amount of this funding has gone to CVP-related projects.

In addition to oversight of WIIN Act changes, the 115th Congress is considering legislation that proposes additional changes to CVP operations. H.R. 23, the Gaining Responsibility on Water Act (GROW Act), would make additional operational directives and changes to the CVP and related restoration initiatives. Other bills under consideration in the 115th Congress would make more targeted changes affecting the CVP, including approval of funds for new and augmented project storage. There is also ongoing debate on bills under consideration that would address other aspects of California water issues and the prospect of federal involvement in a major state water conveyance project (the California WaterFix project).

Several state and federal proposals are also currently under consideration and have generated controversy for their potential to significantly alter CVP operations. In mid-2018, the State of California proposed revisions to its Bay-Delta Water Quality Control Plan. These changes would require that more flows from the San Joaquin and Sacramento Rivers reach the California Bay-Delta for water quality and fish and wildlife enhancement (and would thus further restrict water supplies for other users). At the same time, the Trump Administration is exploring options to increase CVP water supplies users.

Background

California's Central Valley encompasses almost 20,000 square miles in the center of the state (**Figure 1**). It is bound by the Cascade Range to the north, the Sierra Nevada to the east, the Tehachapi Mountains to the south, and the Coast Ranges and San Francisco Bay to the west. The northern third of the valley is drained by the Sacramento River, and the southern two-thirds of the valley are drained by the San Joaquin River. Historically, this area was home to significant fish and wildlife populations.

The CVP originally was conceived as a state project; the state studied the project as early as 1921, and the California state legislature formally authorized it for construction in 1933. After it became clear that the state was unable to finance the project, the federal government (through the U.S. Army Corps of Engineers, or USACE) assumed control of the CVP as a public works construction project authority provided under the Rivers and Harbors Act of 1935.[4] The Franklin D. Roosevelt Administration subsequently transferred the project to Reclamation.[5] Construction on the first unit of the CVP (Contra Costa Canal) began in October 1937, with water first delivered in 1940. Additional CVP units were completed and came online over time, and some USACE-constructed units also have been incorporated into the project.[6] The New Melones Unit

[4] 49 Stat. 1028.

[5] Transfer of the project to Reclamation was pursuant to a presidential directive in 1935 and subsequent congressional enactment of the Rivers and Harbors Act of 1937 (50 Stat. 844, 850).

[6] Although Reclamation constructed much of the Central Valley Project (CVP) and maintains control over its operations, the U.S. Army Corps of Engineers (USACE) also has been involved in the project over the course of its history. Some dams, such as Folsom Dam and New Melones Dam, initially were built by USACE but have been turned over to Reclamation for operations and maintenance and incorporated into the CVP. Additionally, USACE constructed

was the last unit of the CVP to come online; it was completed in 1978 and began operations in 1979.

The CVP made significant changes to California's natural hydrology to develop water supplies for irrigated agriculture, municipalities, and hydropower, among other things. Most of the CVP's major units, however, predated major federal natural resources and environmental protection laws such as the Endangered Species Act (ESA; 87 Stat. 884. 16 U.S.C. §§1531-1544) and the National Environmental Policy Act (NEPA; 42 U.S.C. §§4321 et seq), among others. Thus, much of the current debate surrounding the project revolves around how to address the project's changes to California's hydrologic system that were not major considerations when it was constructed.

Today, CVP water serves a variety of different purposes for both human uses and fish and wildlife needs. The CVP provides a major source of support for California agriculture, which is first in the nation in terms of farm receipts.[7] CVP water supplies irrigate more than 3 million acres of land in central California and support 7 of California's top 10 agricultural counties. In addition, CVP M&I water provides supplies for approximately 2.5 million people per year. CVP operations also are critical for hydropower, recreation, and fish and wildlife protection. In addition to fisheries habitat, CVP flows support wetlands, which provide habitat for migrating birds.

Overview of the CVP and California Water Infrastructure

The CVP (**Figure 1**) is made up of 20 dams and reservoirs, 11 power plants, and 500 miles of canals, as well as numerous other conduits, tunnels, and storage and distribution facilities.[8] In an average year, it delivers approximately 5 million acre-feet (AF) of water to farms (including some of the nation's most valuable farmland); 600,000 AF to M&I users; 410,000 AF to wildlife refuges; and 800,000 AF for other fish and wildlife needs, among other purposes. A separate major project owned and operated by the State of California, the State Water Project (SWP), draws water from many of the same sources as the CVP and coordinates its operations with the CVP under several agreements. In contrast to the CVP, the SWP delivers about 70% of its water to urban users (including water for approximately 25 million users in the San Francisco Bay, Central Valley, and Southern California); the remaining 30% is used for irrigation.

At their confluence, the Sacramento and San Joaquin Rivers flow into the San Francisco Bay (the Bay-Delta, or Delta). Operation of the CVP and SWP occurs through the storage, pumping, and conveyance of significant volumes of water from both river basins (as well as trans-basin diversions from the Trinity River Basin in Northern California) for delivery to users. Federal and state pumping facilities in the Delta near Tracy, CA, export water from Northern California to Central and Southern California and are a hub for CVP operations and related debates. In the context of these controversies, *north of Delta* (NOD) and *south of Delta* (SOD) are important categorical distinctions for water users.

CVP storage is spread throughout Northern and Central California. The largest CVP storage facility is Shasta Dam and Reservoir in Northern California (**Figure 2**), which has a capacity of

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and continues to operate several major dams in and around the Central Valley for flood control and other purposes, including Terminus Dam, Isabella Dam, Pine Flat Dam, and Success Dam in the San Joaquin Valley. Since USACE operates these dams for flood control, Reclamation administers contracts to use surplus water from these reservoirs for irrigation.

[7] U.S. Department of Agriculture, Economic Research Service, *Cash Receipts by State, Commodity Ranking and Share of U.S. Total, 2016*, at https://data.ers.usda.gov/reports.aspx?ID=17843#Pcb53fbff4c3c47c9b0afcc74d03a7403_3_17iT0R0x5.

[8] Bureau of Reclamation, "About the Central Valley Project," at http://www.usbr.gov/mp/cvp/about-cvp.html.

2.4 million AF. Other major storage facilities, from north to south, include Trinity Dam and Reservoir (2.4 million AF), Folsom Dam and Reservoir (977,000 AF), New Melones Dam and Reservoir (2.4 million AF), Friant Dam and Reservoir (520,000 AF), and San Luis Dam and Reservoir (1.8 million AF of storage, of which half is federal and half is nonfederal).

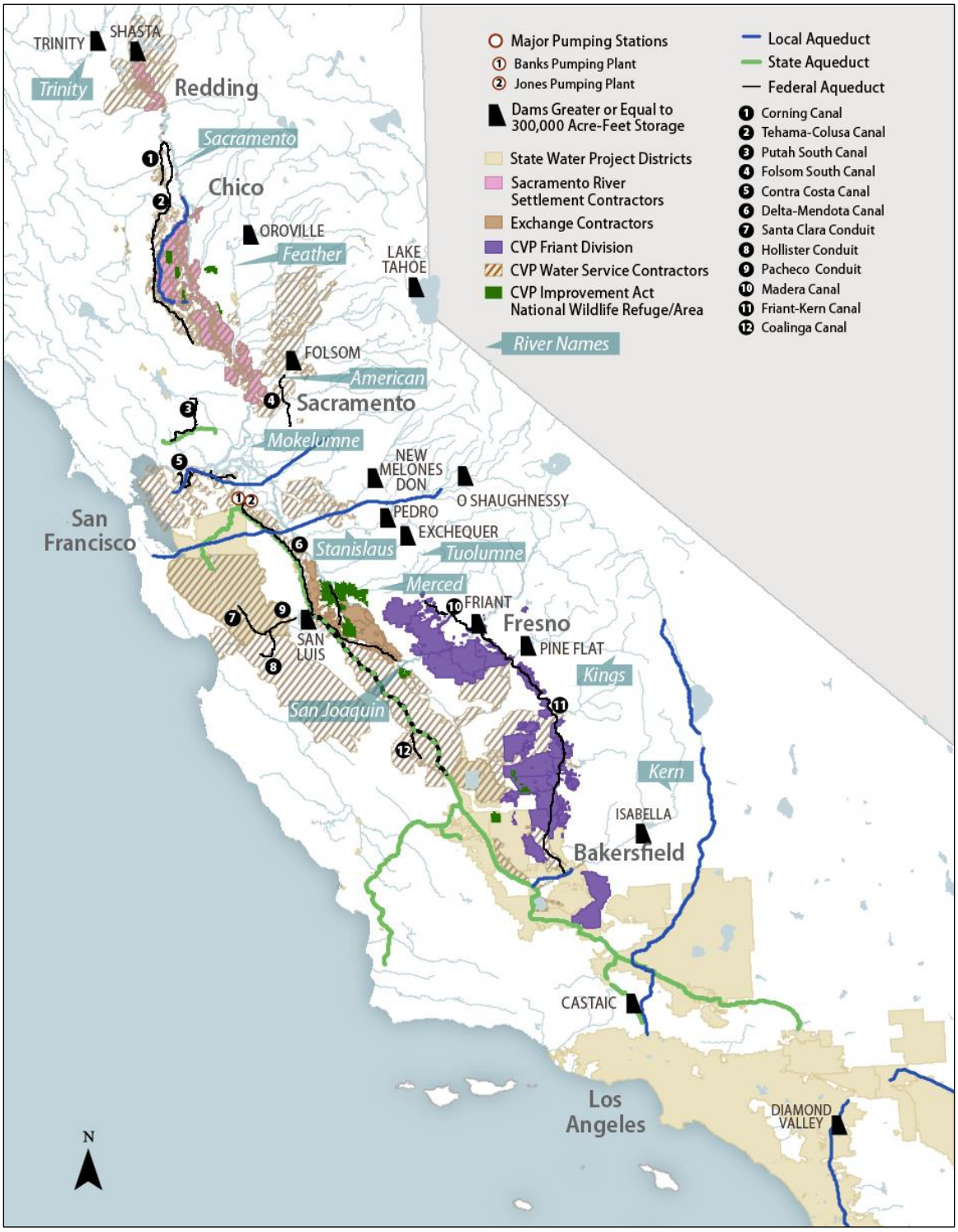
The CVP also includes numerous water conveyance facilities, the longest of which are the Delta-Mendota Canal (which runs for 117 miles from the federally operated Bill Jones pumping plant in the Bay-Delta to the San Joaquin River near Madera) and the Friant-Kern Canal (which runs 152 miles from Friant Dam to the Kern River near Bakersfield).

Non-CVP water storage and infrastructure also is spread throughout the Central Valley and in some cases is integrated with CVP operations. Major non-CVP storage infrastructure in the Central Valley includes multiple storage projects that are part of the SWP (the largest of which is Oroville Dam and Reservoir in Northern California), as well as private storage facilities (e.g., Don Pedro and Exchequer Dams and Reservoirs) and local government-owned dams and infrastructure (e.g., O'Shaugnessy Dam and Hetch-Hetchy Reservoir and Aqueduct, which are owned by the San Francisco Public Utilities Commission).

In addition to its importance for agricultural water supplies, California's Central Valley also provides valuable wetland habitat for migratory birds and other species. As such, it is home to multiple state, federal, and private wildlife refuges north and south of the Delta. Nineteen of these refuges (including 12 refuges within the National Wildlife Refuge system, 6 State Wildlife Areas/Units, and 1 privately managed complex) provide managed wetland habitat that receives water from the CVP and other sources. Five of these units are located in the Sacramento River Basin (i.e., North of the Delta), 12 are in the San Joaquin River Basin, and the remaining 2 are in the Tulare Lake Basin.[9]

[9] Tulare Lake, a freshwater dry lake in the San Joaquin River Valley, historically was one of the largest freshwater lakes west of the Great Lakes. Under most normal (nonflood) conditions, the lake was "terminal," meaning it had no outlet and did not drain downstream. Damming in the mid-20th century by the USACE of the Kaweah (Terminus Dam), Kern (Isabella Dam), Kings (Pine Flat Dam), and Tule Rivers (Success Dam), coupled with development of the basin for irrigated agriculture, dried up the lake bed under most conditions.

Figure 1. Central Valley Project (CVP) and Related Facilities



Source: Congressional Research Service (CRS).

Notes: Colored areas are based on water and irrigation district boundaries and do not correspond to the amount of water delivered from the Central Valley Project or the State Water Project. For example, some large areas have relatively small contracts for water compared with other, smaller areas.

Figure 2. Shasta Dam and Reservoir

Source: Bureau of Reclamation.

Central Valley Project Water Contractors and Allocations

In normal years, snowpack accounts for approximately 30% of California's water supplies and is an important factor in determining CVP and SWP allocations. Water from snowpack typically melts in the spring and early summer, and it is stored and made available to meet water needs throughout the state in the summer and fall. By late winter, the state's water supply outlook typically is sufficient for Reclamation to issue the amount of water it expects to deliver to its contractors.[10] At that time, Reclamation announces estimated deliveries for its 250 CVP water contractors in the upcoming water year.[11]

More than 9.5 million AF of water per year is *potentially* available from the CVP for delivery based on contracts between Reclamation and CVP contractors.[12] However, most CVP water contracts provide exceptions for Reclamation to reduce water deliveries due to hydrologic conditions and other conditions outside Reclamation's control.[13] As a result of these stipulations,

[10] A *water contractor*, as described in this report, has a contract for specified water deliveries from conveyance structures managed by the U.S. Bureau of Reclamation. Reclamation typically estimates these deliveries as a percentage of the total contract allocation to be made available for contractors within certain divisions, geographic areas, and/or contractor types (e.g., south-of-Delta agricultural contractors).

[11] A *water year* is a hydrologic unit for measuring a 12-month total for which precipitation totals are measured. In California, the water year typically is measured from October 1 of one year to September 30 of the following year.

[12] Water service contracts charge users a per-acre foot rate based on the amount of water delivered. In contrast, repayment contracts (the most common type of Reclamation contract outside of the Central Valley Project [CVP]) charge users based on the amount of water storage allocated to a contractor, among other things.

[13] See U.S. Bureau of Reclamation, Mid-Pacific Region, *Final Form of Contract,4-19-2004*, Articles 3b, 11, 12a, and 12b, at http://www.usbr.gov/mp/cvpia/3404c/lt_contracts/index.html.

Reclamation regularly makes cutbacks to actual CVP water deliveries to contractors due to drought and other factors.

Even under normal hydrological circumstances, the CVP often delivers much less than the maximum contracted amount of water; since the early 80s, an average of about 7 million AF of water has been made available to CVP contractors annually (including 5 million AF to agricultural contractors). However, during drought years deliveries may be significantly less. For example, in the extremely dry water years of 2012-2015, CVP annual deliveries averaged approximately 3.45 million AF.[14]

CVP contractors receive varying levels of priority for water deliveries based on their water rights and other related factors, and some of the largest and most prominent water contractors have a relatively low allocation priority. Major groups of CVP contractors include *water rights* contractors (i.e., senior water rights holders such as the Sacramento River Settlement and San Joaquin River Exchange Contractors, see box below), North and South of Delta water service contractors, and Central Valley refuge water contractors. The relative locations for these groups are shown in **Figure 1**.

Water Rights Contractors

California's system of state water rights has a profound effect on who gets how much water and when, particularly during times of drought or other restrictions on water supply. Because the waters of California are considered to be "the property of the people of the State," anyone wishing to use those waters must acquire a right to do so. California follows a dual system of water rights, recognizing both the riparian and prior appropriation doctrines. Under the riparian doctrine, a person who owns land that borders a watercourse has the right to make reasonable use of the water on that land (riparian rights). Riparian rights are reduced proportionally during times of shortage. Under the prior appropriation doctrine, a person who diverts water from a watercourse (regardless of his location relative thereto) and makes reasonable and beneficial use of the water acquires a right to that use of the water (appropriated rights). Appropriated rights are filled in order of seniority during times of shortage. Before exercising the right to use the water, appropriative users must obtain permission from the state through a permit system run by the State Water Resources Control Board (SWRCB).

Both the Central Valley Project (CVP) and the State Water Project (SWP) acquired rights for water use from the State of California, receiving several permits for water diversions at various points between 1927 and 1967. Since the Bureau of Reclamation found it necessary to take the water rights of other users to construct the CVP, it entered into *settlement* or *exchange* contracts with water users who had rights predating the CVP (and thus were senior users in time and right). Many of these special contracts were entered into in areas where water users were diverting water directly from the Sacramento and San Joaquin Rivers.

Sacramento River Settlement Contractors include the contractors (both individuals and districts) that diverted natural flows from the Sacramento River prior to the CVP's construction and executed a settlement agreement with Reclamation that provided for negotiated allocation of water rights. San Joaquin River Exchange Contractors are the irrigation districts that agreed to "exchange" exercising their water rights to divert water on the San Joaquin and Kings Rivers for guaranteed water deliveries from the CVP (typically in the form of deliveries from the Delta-Mendota Canal and waters north of the Delta). In contrast to water service contractors, water rights contractors receive 100% of their contracted amounts in most water-year types. During water shortages, their annual maximum entitlement may be reduced but not by more than 25%.

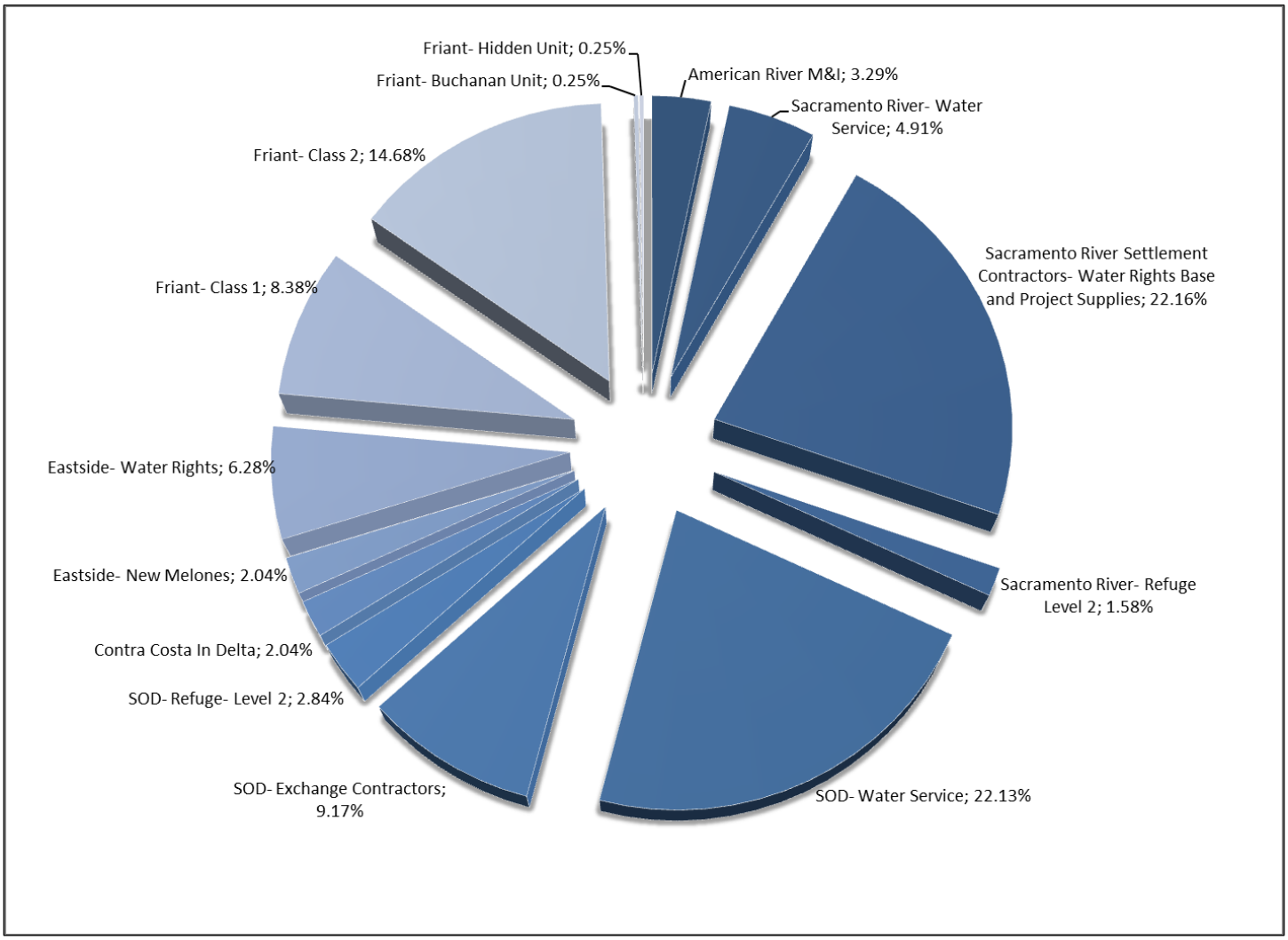
The largest contract holders of CVP water by percentage of total contracted amounts are Sacramento River Settlement Contractors, located on the Sacramento River, and SOD water service contractors (including Westlands Water District, the CVP's largest contractor), located in the area south of the Delta. Other major contractors include San Joaquin River Exchange Contractors, located west of the San Joaquin River and Friant Division contractors, located on the east side of the San Joaquin Valley. Central Valley refuges and several smaller contractor groups

[14] CRS analysis of CVP contract water delivery information by the Bureau of Reclamation, October 3, 2018.

(e.g., Eastside Contracts, In-Delta-Contra Costa Contracts, and SOD Settlement Contracts) also factor into CVP water allocation discussions.[15] **Figure 3** depicts an approximate division of *maximum* available CVP water deliveries pursuant to contracts with Reclamation. The largest contractor groups and their relative delivery priority are discussed in more detail in the **Appendix** to this report.

Figure 3. Central Valley Project: Maximum Contract Amounts

(relative share of total maximum contracted CVP supplies)



Source: CRS, using 2016 Bureau of Reclamation contractor data.

Notes: SOD = South-of-Delta; M&I = municipal and industrial water service contractors. Sacramento River Settlement Contractors includes both "base" water rights supplies (18.6%) and additional CVP "project" supplies (3.5%). For SOD Refuges, chart does not reflect "Level 4" supplies (for more information on Level 4 supplies, see below section, "Central Valley Wildlife Refuges").

[15] Central Valley Project refuges are discussed more in the below section, "Central Valley Project Improvement Act."

CVP Allocations

Reclamation provided allocations for the 2018 water year in a series of announcements in early 2018. Due to late-season storms, Reclamation increased its allocations in March and April to provide for an additional 1.5 million AF above its initial allocations, for a total of approximately 6.9 million AF. Although this allocation was less than the 8.8 million AF of supplies that was made available in the relatively wet water year 2017, the 2018 total was more than was delivered in the 2012-2016 drought years (**Table 1**).

Most CVP contractor groups were expected to receive 100% of their contract allocations in 2018. One major exception is SOD agricultural water service contractors, which were allocated 50% of their contracted supplies. Prior to receiving a full allocation in 2017, the last time these contractors received a 100% allocation was 2006, and they have received their full contract allocations only four times since 1990.[16]

[16] Full allocations were made in 1995, 1998, 2006, and 2017. Bureau of Reclamation, "Summary of Water Supply Allocations," at http://www.usbr.gov/mp/cvo/vungvari/water_allocations_historical.pdf.

Table 1. CVP Water Allocations by Water Year, 2011-2018

(percentage of maximum contract allocation made available)

	2011	2012	2013	2014	2015	2016	2017	2018
North-of-Delta Users								
Agricultural	100%	100%	75%	0%	0%	100%	100%	100%
M&I	100%	100%	100%	50%	25%	100%	100%	100%
Settlement Contractors	100%	100%	100%	75%	75%	100%	100%	100%
Refuges (Level 2)	100%	100%	100%	75%	75%	100%	100%	100%
American River M&I	100%	100%	75%	50%	25%	100%	100%	100%
In Delta- Contra Costa	100%	100%	75%	50%	25%	100%	100%	100%
South-of-Delta Users								
Agricultural	80%	40%	20%	0%	0%	5%	100%	50%
M&I	100%	75%	70%	50%	25%	55%	100%	70%
Exchange Contractors	100%	100%	100%	65%	75%	100%	100%	100%
Refuges (Level 2)	100%	100%	100%	65%	75%	100%	100%	100%
Eastside Division	100%	100%	100%	55%	0%	0%	100%	100%
Friant Class 1	100%	50%	62%	0%	0%	65%	100%	88%
Friant Class 2	20%	0%	0%	0%	0%	13%	100%	9%

Source: U.S. Bureau of Reclamation, "Summary of Water Supply Allocations," at http://www.usbr.gov/mp/cvo/vungvari/water_allocations_historical.pdf. 2018 data as of June 15, 2018.

Notes: CVP = Central Valley Project. M&I = municipal and industrial water service contractors. "Settlement" refers to contractors on the Sacramento River (north of Delta), and "Exchange" refers to contractors on the San Joaquin River (south of Delta) with special contracts and minimum delivery levels recognizing state water rights predating those acquired by the Bureau of Reclamation for construction and operation of the CVP. Contra Costa, Eastside Division, and Friant Class 1 and Class 2 represent individual or groups of water contractors.

State Water Project Allocations

The other major water project serving California, the SWP, is operated by California's Department of Water Resources (DWR). The SWP primarily provides water to M&I users and some agricultural users, and it integrates its operations with the CVP. Similar to the CVP, the SWP has considerably more contracted supplies than it typically makes available in its deliveries. SWP contracted entitlements are 4.23 million AF, but from 2006 to 2016, average annual deliveries were roughly 2.11 million AF.

SWP water deliveries were at their lowest point in 2014 and 2015, and they were significantly higher in the wet year of 2017. In May 2018, the state increased the initial annual SWP allocation for its contractors to 35% of the maximum contract allocation.[17] SWP water supply allocations for water years 2012-2018 are shown in **Table 2**.

Table 2. California State Water Project (SWP) Allocations by Water Year, 2012-2018

(percentage of maximum contract allocation)

	2012	2013	2014	2015	2016	2017	2018 (est.)
State Water Project	65%	35%	5%	20%	60%	85%	35%

Source: California Department of Water Resources.

Combined CVP/SWP Exports

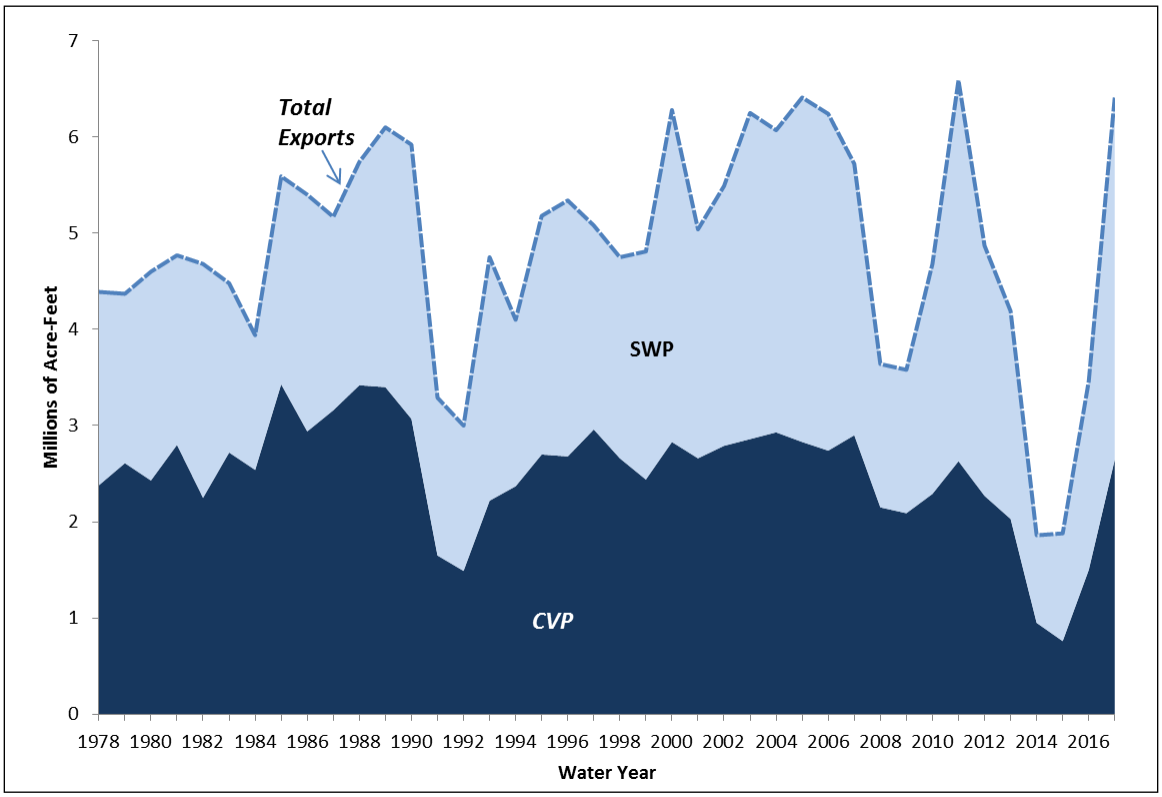
Combined CVP and SWP exports (i.e., water transferred from north to south of the Delta) is of interest to many observers because it reflects trends over time in the transfer of water from north to south (i.e., *exports*) by the two projects, in particular through pumping. Exports of the CVP and SWP, as well as total combined exports since 1978, have varied over time (**Figure 4**). Most recently, combined exports dropped significantly during the 2012-2016 drought but have rebounded since 2016. Prior to the drought, overall export levels had increased over time, having averaged more from 2001 to 2011 than over any previous 10-year period. The 6.42 million AF of combined exports in 2017 was the second most on record, behind 6.59 million AF in 2011.

Over time, CVP exports have decreased on average, whereas SWP exports have increased. Additionally, exports for agricultural purposes have declined as a subset of total exports, in part due to those exports being made available for other purposes (e.g., fish and wildlife).

[17] California Department of Water Resources, "Water Supply Allocation Increases Slightly for State Water Contractors," May 21, 2018, at https://water.ca.gov/News/News-Releases/All-News-Articles/Water-Supply-Allocation-Increases-Slightly-for-State-Water-Contractors.

Figure 4. Central Valley Project (CVP) and State Water Project (SWP) Exports

(exports in millions of acre-feet, 1978-2017)



Source: CRS from data provided by the U.S. Dept. of the Interior, Bureau of Reclamation, email communication, March 29, 2018, *Total Annual Pumping at Banks, Jones, and Contra Costa Pumping Plants 1976-2017 (MAF).*

Constraints on CVP Deliveries

Concerns over CVP water supply deliveries persist in part because even in years with high levels of precipitation and runoff, some contractors (in particular SOD water service contractors) have regularly received allocations of less than 100% of their contract supplies. Allocations for some users have declined over time; additional environmental requirements in recent decades have reduced water deliveries for human uses. Coupled with reduced water supplies available in drought years, some have increasingly focused on what can be done to increase water supplies for users. At the same time, others that depend on or advocate for the health of the San Francisco Bay and its tributaries, including fishing and environmental groups and water users throughout Northern California, have argued for maintaining or increasing existing environmental protections (the latter of which likely would further constrain CVP exports).

Hydrology and state water rights are the two primary drivers of CVP allocations. However, at least three other regulatory factors affect the timing and amount of water available for delivery to CVP contractors and are regularly the subject of controversy

- State water quality requirements pursuant to state and the federal water quality laws (including the Clean Water Act [CWA, 33 U.S.C. §§1251-138]);

- Regulations and court orders pertaining to implementation of the federal Endangered Species Act (ESA, 87 Stat. 884. 16 U.S.C. §§1531-1544);[18] and
- Implementation of the Central Valley Project Improvement Act (CVPIA; P.L. 102-575).[19]

Each of these factors is discussed in more detail below.

Water Quality Requirements: Bay-Delta Water Quality Control Plan

California sets water quality standards and issues permits for the discharge of pollutants in compliance with the federal CWA, enacted in 1972.[20] Through the Porter-Cologne Act (a state law), California implements federal CWA requirements and authorizes the State Water Resources Control Board (State Water Board) to adopt water quality control plans, or basin plans.[21] The CVP and the SWP affect water quality in the Bay-Delta depending on how much freshwater the projects release into the area as "unimpaired flows" (thereby affecting area salinity levels).

The first Water Quality Control Plan for the Bay-Delta (Bay-Delta Plan) was issued by the State Water Board in 1978. Since then, there have been three substantive updates to the plan—in 1991, 1995, and 2006. The plans generally have required the SWP and CVP to meet certain water quality and flow objectives in the Delta to maintain desired salinity levels for in-Delta diversions (e.g., water quality levels for in-Delta water supplies) and fish and wildlife, among other things. These objectives often affect the amount and timing of water available to be pumped, or exported, from the Delta and thus at times result in reduced Delta exports to CVP and SWP water users south of the Delta.[22] The Bay-Delta Plan is currently implemented through the State Water Board's Decision 1641 (or D-1641), which was issued in 1999 and placed responsibility for plan implementation on the state's largest two water rights holders, Reclamation and the California DWR.[23]

Pumping restrictions to meet state-set water quality levels—particularly increases in salinity levels—can sometimes be significant. However, the relative magnitude of these effects varies depending on hydrology. For instance, Reclamation estimated that in 2014, water quality

[18] Requirements of the California Endangered Species Act (CESA) currently are being satisfied through implementation of the federal Endangered Species Act (ESA) due to a California state determination that project operations under the federal biological opinions are consistent with requirements under CESA. Presumably, if protections afforded to threatened and endangered species under the federal ESA were no longer in place, the State of California could invoke protections under CESA.

[19] P.L. 102-575, Title 34, 106 Stat. 4706.

[20] The CWA requires the states to implement water quality standards that designate water uses to be protected and adopt water quality criteria that protect the designated uses. For application to California, see United States v. State Water Resources Control Board (Racanelli), 182 Cal. App. 3d 82, 109 (Cal. Ct. App. 1986).

[21] See Cal. Water Code §13160.

[22] Inability to reach agreement on water quality objectives through deliberation and litigation nearly shut down Delta pumping in the early 1990s and was a significant factor in the creation of the Bay-Delta Accord—a partnership between federal and state agencies with projects, responsibilities, and activities affecting the Delta. Habitat protection commitments in the accord were incorporated into the Bay-Delta Water Quality Control Plan, as were actions called for under the Vernalis Adaptive Management Program, and were included by the State Water Board in D-1641. (See U.S. Department of the Interior (DOI), Bureau of Reclamation, Mid-Pacific Region, *Long-Term Central Valley Project Operations Criteria and Plan*, Sacramento, CA, May 22, 2008, pp. 2-6.)

[23] California Environmental Protection Agency, State Water Resources Control Board, "Revised Water Right Decision 1641," March 15, 2000. https://www.waterboards.ca.gov/waterrights/board_decisions/adopted_orders/decisions/d1600_d1649/wrd1641_1999dec29.pdf.

restrictions accounted for 176,300 AF of the reduction in pumping from the long-term average for CVP exports.[24] In 2016, Reclamation estimated that D-1641 requirements accounted for 114,500 AF in reductions from the long-term export average.

Bay-Delta Plan Update

In mid-2018, the State Water Board released the final draft of the update to the 2006 Bay Delta Plan (i.e., the Bay-Delta Plan Update) for the Lower San Joaquin River and Southern Delta. It also announced further progress on related efforts under the update for flow requirements on the Sacramento River and its tributaries.[25] The Bay-Delta Plan Update requires additional flows to the ocean (generally referred to in these documents as "unimpaired flows") from the San Joaquin River and its tributaries (i.e., the Stanislaus, Tuolumne, and Merced Rivers). Under the proposal, the unimpaired flow requirement for the San Joaquin River would be 40% (within a range of 30%-50%); average unimpaired flows currently range from 21% to 40%.[26] The state estimates that the updated version of the plan would reduce water available for human use from the San Joaquin River and its tributaries by between 7% and 23%, on average (depending on the water year type), but it could reduce these water supplies by as much as 38% during critically dry years.[27]

A more detailed plan for the Sacramento River and its tributaries also is expected in the future. A preliminary framework released by the state in July 2018 proposed a potential requirement of 55% unimpaired flows from the Sacramento River (within a range of 45% to 65%).[28] According to the State Water Board, if the plan updates for the San Joaquin and Sacramento Rivers are finalized and water users do not enter into voluntary agreements to implement them, the board could take actions to require their implementation, such as promulgation of regulations and conditioning of water rights.[29]

Reclamation and its contractors likely would play key roles in implementing any update to the Bay-Delta Plan, as they do in implementing the current plan under D-1641. Pursuant to Section 8 of the Reclamation Act of 1902,[30] Reclamation generally defers to state water law in carrying out its authorities, but the proposed Bay Delta Plan Update has generated controversy. In a July 2018 letter to the State Water Board, the Commissioner of Reclamation opposed the proposed standards for the San Joaquin River, arguing that meeting them would necessitate decreased water in storage at New Melones Reservoir of approximately 315,000 AF per year (a higher amount than estimated by the State Water Board). Reclamation argued that such a change would be

[24] Personal communication with the Bureau of Reclamation, October 15, 2015.

[25] For more information, see the State Water Resources Control Board Bay Delta Plan update website at https://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/.

[26] California Water Boards, "State Water Board Seeks Public Comment on Final Draft Bay-Delta Plan Update for the Lower San Joaquin River and Southern Delta," July 6, 2018, at https://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/docs/Bay-Delta_Plan_Update_Press_Release.pdf.

[27] California Water Boards, "Summary of Proposed Amendments to the Bay-Delta Water Quality Control Plan," July 6, 2018, at https://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/docs/sed/lsjr_sdwq_summary_070618.pdf.

[28] California Water Boards, "July 2018 Framework for the Sacramento/Delta Update to the Bay-Delta Plan," July 6, 2018, at https://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/docs/sed/sac_delta_framework_070618%20.pdf. Hereinafter California Water Boards, "July 2018 Framework."

[29] California Water Boards, "July 2018 Framework."

[30] 43 U.S.C. §383.

contrary to the CVP prioritization scheme as established by Congress.[31] Accordingly, Reclamation noted that if DOI determines that the final amendments are inconsistent with Reclamation's responsibilities to operate the project, it will request that the U.S. Attorney General bring legal action against the State Water Board.[32]

Endangered Species Act

Several species that have been listed under the federal ESA are affected by the operations of the CVP and the SWP.[33] One species, the Delta smelt, is a small pelagic fish that is susceptible to entrainment in CVP and SWP pumps in the Delta; it was listed as threatened under ESA in 1993. Surveys of Delta smelt in 2017 found two adult smelt, the lowest catch in the history of the survey.[34] These results were despite the relatively wet winter of 2017, which is a concern for many stakeholders because low population sizes of Delta smelt could result in greater restrictions on water flowing to users. It also raises larger concerns about the overall health and resilience of the Bay-Delta ecosystem. In addition to Delta smelt, multiple anadromous salmonid species are listed under ESA, including the endangered Sacramento River winter-run Chinook salmon, the threatened Central Valley spring-run Chinook salmon, the threatened Central Valley steelhead, threatened Southern Oregon/Northern California Coast coho salmon, and the threatened Central California Coast steelhead.

Federal agencies consult with the U.S. Fish and Wildlife Service (FWS) in DOI or the Department of Commerce's National Marine Fisheries Service (NMFS) to determine if a federal project or action might jeopardize the continued existence of a species listed under ESA or adversely modify its habitat. If an effect is possible, formal consultation is started and usually concludes with the appropriate service issuing a BiOp on the potential harm the project poses and, if necessary, issuing reasonable and prudent measures to reduce the harm.

FWS and NMFS each have issued federal BiOps on the coordinated operation of the CVP and the SWP. In addition, both agencies have undertaken formal consultation on proposed changes in the operations and have concluded that the changes, including increased pumping from the Delta, would jeopardize the continued existence of several species protected under ESA. To avoid such jeopardy, the FWS and NMFS BiOps have included Reasonable and Prudent Alternatives (RPAs) for project operations.

CVP and SWP BiOps have been challenged and revised over time. Until 2004, a 1993 winter-run Chinook salmon BiOp and a 1995 Delta smelt BiOp (as amended) governed Delta exports for federal ESA purposes. In 2004, a proposed change in coordinated operation of the SWP and CVP known as OCAP (Operations Criteria and Plan) resulted in the development of new BiOps. Environmental groups challenged the agencies' 2004 BiOps; this challenge resulted in the development of new BiOps by the FWS and NMFS in 2008 and 2009, respectively. These BiOps

[31] Letter from Brenda Burman, Commissioner, Bureau of Reclamation, DOI, to Felicia Marcus, Chair, State Water Resources Control Board, July 27, 2018. https://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/docs/comments_lsjr_finalsed/Brenda_Burman_BOR.pdf. Hereinafter Letter from Brenda Burman to Felicia Marcus.

[32] Letter from Brenda Burman to Felicia Marcus.

[33] Act of December 28, 1973, P.L. 93-205; 87 Stat. 884, codified at 16 U.S.C. §§1531 et seq. This report assumes a basic knowledge of the act; an overview of the ESA and its major provisions may be found in CRS Report RL31654, *The Endangered Species Act: A Primer*, by (name redacted) .

[34] California Department of Fish and Wildlife, *Fall Midwater Trawl Monthly Abundance Index for Delta Smelt,* at http://www.dfg.ca.gov/delta/data/fmwt/indices.asp, accessed August 2, 2018.

placed additional restrictions on the amount of water exported via SWP and CVP Delta pumps and other limitations on pumping and release of stored water.[35] The CVP and SWP currently are operated in accordance with these BiOps, both of which concluded that the coordinated long-term operation of the CVP and SWP, as proposed in Reclamation's 2008 Biological Assessment, was likely to jeopardize the continued existence of listed species and destroy or adversely modify designated critical habitat. Both BiOps included RPAs designed to allow the CVP and SWP to continue operating without causing jeopardy to listed species or destruction or adverse modification to designated critical habitat. Reclamation accepted and then began project operations consistent with the FWS and NMFS RPAs, which continue to govern operations.

The exact magnitude of reductions in pumping due to ESA restrictions compared to the aforementioned water quality restrictions has varied considerably over time. In absolute terms, ESA-driven reductions typically are greater in wet years than in dry years, but the proportion of ESA reductions relative to deliveries is not necessarily constant and depends on numerous factors. For instance, Reclamation estimated that ESA restrictions accounted for a reduction in deliveries in 2014 of 62,000 AF from the long-term average for CVP deliveries in 2014 and 144,800 AF of CVP delivery reductions in 2015 (both years were extremely dry). In 2016, a wet year, ESA reductions accounted for a much larger amount (528,000 AF) in a wet year, when more water is delivered.[36] Some scientists estimate that flows used to protect all species listed under ESA accounted for approximately 6.5% of the total Delta outflow from 2011 to 2016.[37]

During the 2012-2016 drought, implementation of the RPAs (which generally limit pumping under specific circumstances and call for water releases from key reservoirs to support listed species) was modified due to temporary urgency change orders (TUCs). These TUCs, issued by the State Water Resources Control Board in 2014 and again in 2015, were deemed consistent with the existing BiOps by NMFS and FWS. Such changes allowed more water to be pumped during certain periods based on real-time monitoring of species and water conditions. DWR estimates that approximately 400,000 AF of water was made available in 2014 for export due to these orders.[38]

In August 2016, Reclamation and DWR requested reinitiation of consultation on long-term, system-wide operations of the CVP and the SWP based on new information related to multiple years of drought and related data.[39] In December 2017, the Trump Administration gave formal notice of its intent to prepare an environmental impact statement analyzing potential long-term modifications to the coordinated operations of the CVP and the SWP.[40] According to the notice,

[35] Among other things, the 2009 National Marine Fisheries Service biological opinion requires temperature considerations for the benefit of species in the Sacramento River and in the Bay-Delta. Operations of Shasta Dam and related facilities are thus affected by a separate plan, the Sacramento River Temperature Management Plan.

[36] Bureau of Reclamation, *Water Year 2016 CVIPA §3406(b)(2) Accounting*, at https://www.usbr.gov/mp/cvo/vungvari/FINAL_wy16_b2_800TAF_table_20170930.pdf.

[37] Peter B. Moyle, James A. Hobbs, and John R. Durand, "Delta Smelt and Water Politics in California," *Fisheries Magazine*, vol. 43, no. 1 (January 2018), pp. 42-60.

[38] California Environmental Protection Agency and State Water Resources Control Board, March 5, 2015 Order Modifying an Order That Approved in Part and Denied in Part a Petition for Temporary Urgency Changes to Permit Terms and Conditions Requiring Compliance with Delta Water Quality Objectives in Response to Drought Conditions, p. 4, at http://www.waterboards.ca.gov/waterrights/water_issues/programs/drought/docs/tucp/tucp_order030515.pdf.

[39] Letter from David Murillo, Regional Director, Bureau of Reclamation, and Mark W. Cowin, Director, Department of Water Resources, to Ren Lohoefener, Pacific Southwest Regional Director, August 2, 2016, at https://www.fws.gov/sfbaydelta/documents/08-02-2016_BOR-DWR_Reinitiation_Letter.pdf.

[40] Bureau of Reclamation, "Notice of Intent to Prepare a Draft Environmental Impact Statement, Revisions to the Coordinated Long-Term Operation of the Central Valley Project and State Water Project, and Related Facilities," 82

the actions under consideration will include those with the potential to "maximize" water and power supplies for users and that modify existing regulatory requirements, among other things.[41] The effort is widely viewed as an initial step toward potential long-term changes to CVP operations and existing BiOp requirements.

Central Valley Project Improvement Act

In an effort to mitigate many of the environmental effects of the CVP, Congress in 1992 passed the CVPIA as Title 34 of P.L. 102-575. The act made major changes to the management of the CVP. Among other things, it formally established fish and wildlife purposes as an official project purpose of the CVP and called for a number of actions to protect, restore, and enhance these resources. Overall, the CVPIA's provisions resulted in a combination of decreased water availability and increased costs for agricultural and M&I contractors, along with new water and funding sources to restore fish and wildlife. Thus, the law remains a source of tension, and some would prefer to see it repealed in part or in full.

Some of the CVPIA's most prominent changes to the CVP included directives to

- double certain anadromous fish populations by 2002 (which did occur);[42]
- allocate 800,000 AF of "(b)(2)" CVP yield (600,000 AF in drought years) to fish and wildlife purposes;[43]
- provide water supplies (in the form of "Level 2" and "Level 4" supplies) for 19 designated Central Valley wildlife refuges;[44]
- establish a fund, the Central Valley Project Restoration Fund (CVPRF), to be financed by water and power users for habitat restoration and land and water acquisitions.

Pursuant to prior court rulings since enactment of the legislation, CVPIA (b)(2) allocations may be used to meet other state and federal requirements that reduce exports or require an increase from baseline reservoir releases. Thus, in a given year, the aforementioned export reductions due to state water quality and federal ESA restrictions are counted and reported on annually as (b)(2) water, and in some cases overlap with other stated purposes of CVPIA (e.g., anadromous fish restoration). The exact makeup of (b)(2) water in a given year typically varies. For example, in 2014 (a critically dry year), out of a total of 402,000 AF of (b)(2) water, 176,300 AF (44%) was attributed to export reductions for Bay-Delta Plan water quality requirements.[45] Remaining (b)(2) water was comprised of a combination of reservoir releases classified as CVPIA anadromous fish

Federal Register 61789-61791, December 29, 2017. Hereinafter Reclamation, "Intent to Prepare a Draft Environmental Impact Statement."

[41] Reclamation, "Intent to Prepare a Draft Environmental Impact Statement."

[42] CVPIA's "fish doubling" goal was established on a baseline of average population levels during the period of 1967-1991.

[43] "*(b)(2) water*" references the provision in CVPIA that required these allocations.

[44] Authorized refuge water supply under CVPIA is divided into two categories: Level 2 and Level 4 supplies. Level 2 supplies (approximately 422,251 AF, except in critically dry years, when the allocation is reduced to 75%) are the historical average of water deliveries to the refuges prior to enactment of CVPIA. Reclamation is obligated to acquire and deliver this water under CVPIA, and costs are 100% reimbursable by CVP contractors through the Central Valley Project Restoration Fund. For more information, see **Appendix**.

[45] Bureau of Reclamation, *Water Year 2014 CVPIA Section 3406(b)(2) Operations and Accounting*, January 28, 2015, at https://www.usbr.gov/mp/cvo/data/FINAL_WY14_b2_presentation.pdf.

restoration and NMFS BiOp compliance purposes (163,500 AF) and export reductions under the 2009 salmonid BiOp (62,200 AF).[46] In 2016 (a wet year), 793,000 AF of (b)(2) water included 528,000 AF (66%) of export pumping reductions under FWS and NMFS BiOps and 114,500 AF (14%) for Bay-Delta Plan requirements. The remaining water was accounted for as reservoir releases for the anadromous fish restoration programs, the NMFS BiOp, and the Bay-Delta Plan.[47]

Ecosystem Restoration Efforts

Development of the CVP made significant changes to California's natural hydrology. In addition to the aforementioned CVPIA efforts to address some of these impacts, three ongoing, congressionally authorized restoration initiatives also factor into federal activities associated with the CVP

- The Trinity River Restoration Program (TRRP), administered by Reclamation, attempts to mitigate impacts and restore fisheries impacted by construction of the Trinity River Division of the CVP.
- The San Joaquin River Restoration Program (SJRRP) is an ongoing effort to implement a congressionally enacted settlement to restore fisheries in the San Joaquin River.
- The California Bay-Delta Restoration Program aims to restore and protect areas within the Bay-Delta that are affected by the CVP and other activities.

In addition to their habitat restoration activities, both the TRRP and the SJRRP involve the maintenance of instream flow levels that use water that was at one time diverted for other uses. Each effort is discussed briefly below.

Trinity River Restoration Program

TRRP—administered by DOI—aims to mitigate impacts of the Trinity Division of the CVP and restore fisheries to their levels prior to the Bureau of Reclamation's construction of this division in 1955. The Trinity Division primarily consists of two dams (Trinity and Lewiston Dams), related power facilities, and a series of tunnels (including the 10.7 mile tunnel Clear Creek Tunnel) that divert water from the Trinity River Basin to the Sacramento River Basin and Whiskeytown Reservoir. Diversion of Trinity River water (which originally required that a minimum of 120,000 AF be reserved for Trinity River flows) resulted in the near drying of the Trinity River in some years, thereby damaging spawning habitat and severely depleting salmon stocks.

Efforts to mitigate the effects of the Trinity Division date back to the early 1980s, when DOI initiated efforts to study the issue and increase Trinity River flows for fisheries. Congress authorized legislation in 1984 (P.L. 98-541) and in 1992 (P.L. 102-575) providing for restoration activities and construction of a fish hatchery, and directed that 340,000 AF per year be reserved for Trinity River flows (a significant increase from the original amount). Congress also mandated completion of a flow evaluation study, which was formalized in a 2000 record of decision (ROD)

[46] Bureau of Reclamation, *Water Year 2014 CVPIA Section 3406(b)(2) Operations and Accounting*, January 28, 2015, at https://www.usbr.gov/mp/cvo/data/FINAL_WY14_b2_presentation.pdf.

[47] Bureau of Reclamation, *Water Year 2016 CVIPA §3406(b)(2) Accounting*, at https://www.usbr.gov/mp/cvo/vungvari/FINAL_wy16_b2_800TAF_table_20170930.pdf.

that called for additional water for instream flows,[48] river channel restoration, and watershed rehabilitation.[49]

The 2000 ROD forms the basis for TRRP. The flow releases outlined in that document have in some years been supplemented to protect fish health in the river, and these increases have been controversial among some water users. From FY2013-FY2018, TRRP was funded at approximately $12 million per year in discretionary appropriations from Reclamation's Fish and Wildlife Management and Development activity.

San Joaquin River Restoration Program

Historically, the San Joaquin River supported large Chinook salmon populations. After the Bureau of Reclamation completed Friant Dam on the San Joaquin River in the late 1940s, much of the river's water was diverted for agricultural uses and approximately 60 miles of the river became dry in most years. These conditions made it impossible to support Chinook salmon populations upstream of the Merced River confluence.

In 1988, a coalition of environmental, conservation, and fishing groups advocating for river restoration to support Chinook salmon recovery sued the Bureau of Reclamation. A U.S. District Court judge eventually ruled that operation of Friant Dam was violating state law because of its destruction of downstream fisheries.[50] Faced with mounting legal fees, considerable uncertainty, and the possibility of dramatic cuts to water diversions, the parties agreed to negotiate a settlement instead of proceeding to trial on a remedy regarding the court's ruling. This settlement was agreed to in 2006 and enacted by Congress in 2010 (Title X of P.L. 111-11).

The settlement agreement and its implementing legislation form the basis for the SJRRP, which requires new releases of CVP water from Friant Dam to restore fisheries (including salmon fisheries) in the San Joaquin River below Friant Dam (which forms Millerton Lake) to the confluence with the Merced River (i.e., 60 miles). The SJRRP also requires efforts to mitigate water supply delivery losses due to these releases, among other things. In combination with the new releases, the settlement's goals are to be achieved through a combination of channel and structural modifications along the San Joaquin River and the reintroduction of Chinook salmon (**Figure 5**). These activities are funded in part by federal discretionary appropriations and in part by repayment and surcharges paid by CVP Friant water users that are redirected toward the SJRRP in P.L. 111-11.

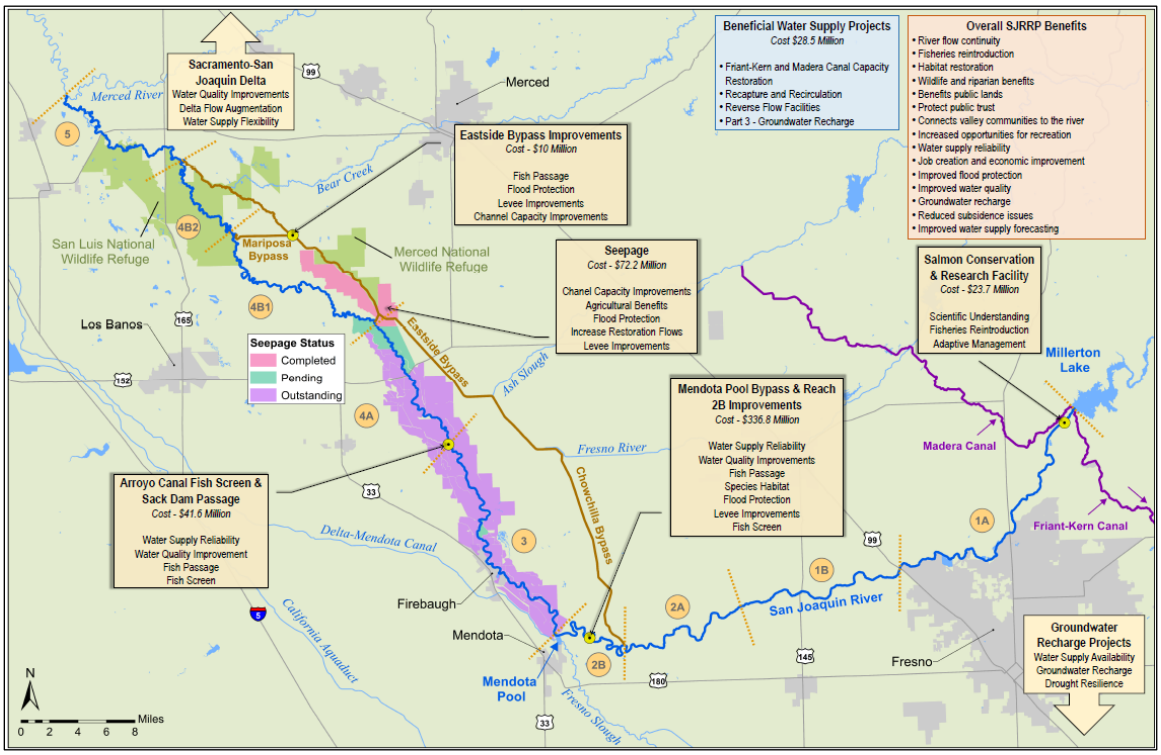
[48] The additional flows outlined in the 2000 record of decision are based on water-year type and range from 369,000 AF in critically dry years to 815,000 AF in extremely wet years. A greater proportion of Trinity River water goes to the river in dry years, and a greater proportion of the water goes to CVP contractors in wet years.

[49] DOI, Record of Decision for Trinity River Mainstem Fishery Restoration Final Environmental Impact Statement/Environmental Impact Report, December 2000, at http://www.restoresjr.net/?wpfb_dl=2163.

[50] NRDC v. Patterson, 333 F. Supp. 2d 906, 925 (E.D. Cal. 2004).

Figure 5. San Joaquin River Restoration Program: Costs, Benefits, and Project Status

Program Details as of May 2018



Source: Bureau of Reclamation, San Joaquin River Restoration Program, May 2018, at http://www.restoresjr.net/?wpfb_dl=2131.

Because increased water flows for restoring fisheries (known as *restoration flows*) would reduce CVP diversions of water for off-stream purposes, such as irrigation, hydropower, and M&I uses, the settlement and its implementation have been controversial. The quantity of water used for restoration flows and the quantity by which water deliveries would be reduced are related, but the relationship is not necessarily one-for-one, due to flood flows in some years and other mitigating factors. Under the settlement agreement, no water would be released for restoration purposes in the driest of years; thus, the agreement would not reduce deliveries to Friant contractors in those years. Additionally, in some years, the restoration flows released in late winter and early spring may free up space for additional runoff storage in Millerton Lake, potentially minimizing reductions in deliveries later in the year—assuming Millerton Lake storage is replenished. Consequently, how deliveries to Friant water contractors may be reduced in any given year is likely to depend on many factors. Regardless of the specifics of how much water may be released for fisheries restoration vis-à-vis diverted for off-stream purposes, the SJRRP will impact existing surface and groundwater supplies in and around the Friant Division service area and affect local economies. SJRRP construction activities are in the early stages, but planning efforts have targeted a completion date of 2024 for the first stage of construction efforts.[51]

[51] For more information, see San Joaquin River Restoration Program (SJRRP), *Funding Constrained Framework for Implementation*, May 2018.

CALFED Bay-Delta Restoration Program

The Bay-Delta Restoration Program is a cooperative effort among the federal government, the State of California, local governments, and water users to proactively address the water management and aquatic ecosystem needs of California's Central Valley. The CALFED Bay-Delta Restoration Act (P.L. 108-351), enacted in 2004, provided new and expanded federal authorities for six agencies to related to the 2000 ROD for the CALFED Bay-Delta Program's Programmatic Environmental Impact Statement.[52] These authorities were extended through FY2019 under the WIIN Act. The interim action plan for CALFED has four objectives: a renewed federal-state partnership, smarter water supply and use, habitat restoration, and drought and floodplain management.[53]

From FY2013-FY2018, Reclamation funded its Bay-Delta restoration activities at approximately $37 million per year; the majority of this funding has gone for projects to address the degraded Bay-Delta ecosystem and includes federal activities under California WaterFix (see below section, "California WaterFix").[54] Other agencies receiving funding to carry out authorities under CALFED include DOI's U.S. Fish and Wildlife Service and U.S. Geological Survey; the Department of Agriculture's Natural Resources Conservation Service; the Department of Defense's Army USACE of Engineers; the Department of Commerce's National Oceanic and Atmospheric Administration; and the Environmental Protection Agency. Similar to Reclamation, these agencies report on CALFED expenditures that involve a combination of activities under "base" authorities and new authorities that were provided under the CALFED authorizing legislation. The annual CALFED crosscut budget records the funding for CALFED across all federal agencies. The budget generally is included in the Administration's budget request and contains CALFED programs, their authority, and requested funding. For FY2019, the Administration requested $474 million for CALFED activities. This figure is an increase from the FY2018 enacted level of $415 million.

New Storage and Conveyance

Reductions in available water deliveries due to hydrological and regulatory factors have caused some stakeholders, legislators, and state and federal government officials to look at other methods of augmenting water supplies. In particular, proposals to build new or augmented CVP and/or SWP water storage projects have been of interest to some policymakers. Additionally, the State of California is pursuing a major water conveyance project, the California WaterFix, with a nexus to CVP operations.

New and Augmented Water Storage Projects

The aforementioned CALFED legislation (P.L. 108-351) also authorized the study of several new or augmented CVP storage projects throughout the Central Valley that have been ongoing for a number of years. These studies include Shasta Lake Water Resources Investigation, North of the

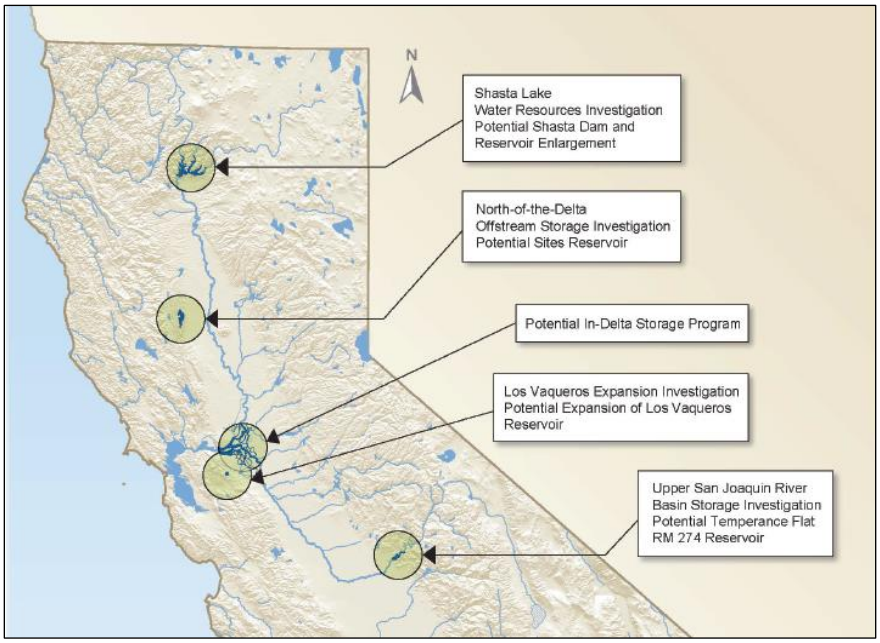
[52] CALFED Bay-Delta Program, *Programmatic Record of Decision*, August 28, 2000, at http://www.calwater.ca.gov/content/Documents/ROD8-28-00.pdf. Other key documents available at http://www.calwater.ca.gov/calfed/library/Archive_ROD.html.

[53] *Interim Federal Action Plan for the California Bay-Delta*, December 22, 2009, at http://www.doi.gov/news/doinews/upload/CAWaterWorkPlan.pdf.

[54] In addition to funding under its CALFED authorities, Reclamation counts funding under its other CVP restoration authorities (e.g., CVPIA, SJRRP) as CALFED activities in its annual reporting.

Delta Offstream Storage Investigation (also known as Sites Reservoir), In-Delta Storage, Los Vaqueros Reservoir Expansion, and Upper San Joaquin River/Temperance Flat Storage Investigation (**Figure 6**). Although the recommendations of these studies normally would be subject to congressional approval, Section 4007 of the WIIN Act authorized $335 million in Reclamation financial support for new or expanded federal and nonfederal water storage projects and provided that these projects could be deemed authorized, subject to a finding by the Administration that individual projects met certain criteria.[55]

Figure 6. CALFED Surface Water Storage Studies



Source: California Department of Water Resources, A Resource Management Strategy of the California Water Plan, July 29, 2016.

In 2018 reporting to Congress, Reclamation recommended an initial list of seven projects that it concluded met the WIIN Act criteria. The projects were allocated $33.3 million in FY2017 funding that was previously appropriated for WIIN Act Section 4007 projects. Congress approved the funding allocations for these projects in enacted appropriations for FY2018 (P.L. 115-141). Four of the projects receiving FY2017 funds ($28.05 million) were CALFED studies that would address water availability in the CVP[56]

- Shasta Dam and Reservoir Enlargement Project ($20 million for design and preconstruction);
- North-of-Delta Off-Stream Storage Investigation/Sites Reservoir Storage Project ($4.35 million for feasibility study);
- Upper San Joaquin River Basin Storage Investigation ($1.5 million for feasibility study); and

[55] For more information, see CRS In Focus IF10626, *Reclamation Water Storage Projects: Section 4007 of the Water Infrastructure Improvements for the Nation Act*, by (name redacted) .

[56] The study of several projects (including the Shasta, Sites, and Upper San Joaquin investigations) was originally authorized under P.L. 108-351.

- Friant-Kern Canal Subsidence Challenges Project ($2.2 million for feasibility study).

The enacted FY2018 Energy and Water appropriations bill further stipulated that $134 million of the amount set aside for additional water conservation and delivery projects be provided for Section 4007 WIIN Act storage projects (i.e., similar direction as FY2017). The enacted FY2019 bill set aside another $134 million for these purposes.[57] Future reporting and appropriations legislation is expected to propose allocation of this and any other applicable funding. Congress also may consider additional directives for these and other efforts to address water supplies in the CVP, including approval of physical construction for one or more of these projects.

Funding by the State of California also may influence the viability and timing of construction for some of the proposed projects. For example, in June 2018, the state announced significant bond funding for Sites Reservoir ($1.008 billion), as well as other projects.[58]

California WaterFix

In addition to water storage, some have advocated for a more flexible water conveyance system for CVP and SWP water. One proposed alternative is the California WaterFix (see **Figure 7**), a project initiated by the State of California in 2015 to address some of the water conveyance and ecosystem issues in the Bay-Delta. The stated objective of California WaterFix is to achieve three primary goals: (1) allow for more natural flows into the Bay-Delta to support salmon, smelt, and other species; (2) increase water supply reliability and allow for increased flexibility to manage water flows; and (3) protect the water conveyance system from the effects of natural hazards such as flooding and earthquakes.[59] The state also proposed a parallel initiative, California EcoRestore, at the same time as WaterFix. Along with WaterFix, the California EcoRestore initiative aims to restore 30,000 acres of habitat for native fish and wildlife species by 2020.[60] Restoration is to be done on tidal wetlands, floodplains, upland, riparian, and fish passage habitat within the Sacramento and San Joaquin Rivers Delta. The two proposals are derived from an earlier initiative, the Bay-Delta Conservation Plan.[61]

Although WaterFix initially was proposed as a project to jointly benefit both CVP and SWP contractors, its ultimate impact on the CVP is unclear. The project would divert water from the Sacramento River, north of the Bay-Delta, into twin tunnels running south along the eastern portion of the Bay-Delta and emptying into existing pumps that feed water into the CVP and SWP

[57] See CRS In Focus IF10841, *Bureau of Reclamation: FY2019 Appropriations,* by (name redacted) .

[58] California Water Commission, "Commission Approves Investing $2.7 Billion in Eight Water Storage Projects," July 24, 2018, at https://cwc.ca.gov/Documents/Press/MCEDPressRelease_072418.pdf.

[59] California Natural Resources Agency, *California WaterFix: Fast Facts*, June 2016, at http://cms.capitoltechsolutions.com/ClientData/CaliforniaWaterFix/uploads/CWF_FastFacts5.pdf. Hereinafter California Natural Resources Agency, *WaterFix: Fast Facts*.

[60] California Natural Resources Agency, *Restoring the Sacramento-San Joaquin Delta Ecosystem*, November 2016, at http://resources.ca.gov/docs/ecorestore/ECO_FS_Overview.pdf.

[61] The BDCP was an initiative put forth by the State of California, the federal government, and several local water agencies to address coequal goals of water supply reliability and ecosystem restoration. The primary activities identified in the BDCP were to construct a new conveyance system—to be operated in tandem with existing facilities—to provide water supplies to users south of the Bay-Delta and to restore and improve habitat for certain species. Key components of this "dual conveyance system" were (1) a conveyance structure that would send water in two twin tunnels underneath the Bay-Delta from intake areas on the Sacramento River north of the Bay-Delta to existing pumping areas and (2) the continued pumping of water directly from the Bay-Delta (from the south Delta) into existing canals, as is done today.

(**Figure 7**). The key difference from the existing conveyance system is that water would be diverted directly from the Sacramento River to CVP and SWP pumps, rather than flowing through the Bay-Delta and being drawn to state and federal pumping stations (thereby producing "reverse" flows in the Old and Middle Rivers that are harmful to species under certain circumstances).

The WaterFix plan is controversial for a number of reasons, including its potential environmental effects on the Delta and its costs, which are expected to be born largely by water users but also may be funded in part by federal appropriations. WaterFix initially was planned to be paid for by both SWP and CVP contractors, and the state's Department of Water Resources is planning and funding most of its design work. Although CVP contractors are eligible to participate in the project, with the exception of Santa Clara Valley Water District's provisional support vote, no CVP water contractors have approved funding for WaterFix.[62] Reclamation lacks the authority to compel SOD contractors to participate in the project; thus, it proposed that costs be allocated only to water contractors that choose to opt in. Under that scenario, contractors who choose to opt in would be responsible for the CVP's share of WaterFix costs but would not be guaranteed water supply benefits in proportion to their contributions. Some of the largest potential CVP contractors have argued that although they would gain no assurances from WaterFix, their water rates would rise to unaffordable levels.[63] In mid-2018, the state estimated the cost of WaterFix at $19.9 billion in 2018 dollars.[64]

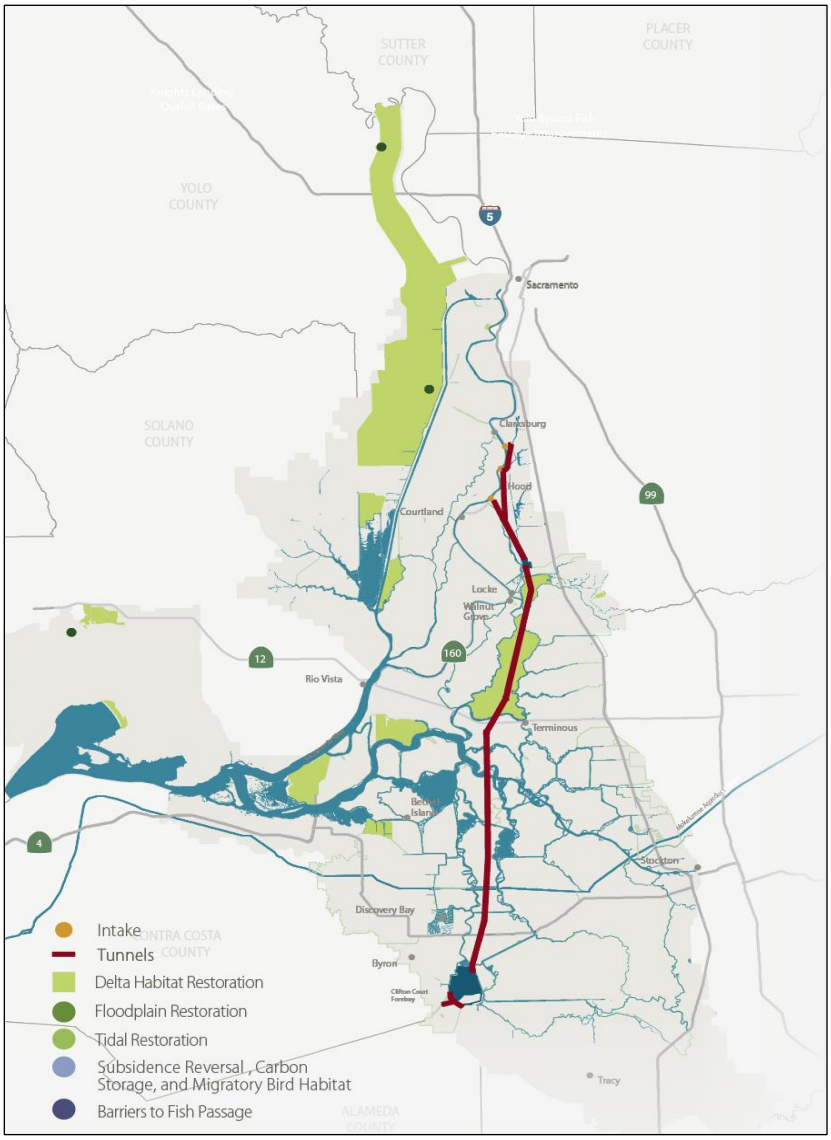
The exact amount of water that the project will yield is controversial, as are the potential effects of its operations on the Bay-Delta ecosystem and species listed as endangered or threatened under ESA, among other things. Despite the ultimate uncertainty of the project's integration into the CVP, the federal government remains involved in WaterFix through ongoing permitting (i.e., NEPA, ESA, Clean Water Act Sections 401 and 404, etc.) and potentially through financing. Regarding the latter, in July 2018 the Delta Conveyance Finance Authority (i.e., the entity formed to finance WaterFix) sent a letter to the Environmental Protection Agency expressing interest in a federal loan under the Water Infrastructure Finance and Innovation Act (WIFIA) for $1.9 billion for WaterFix. The letter also expressed interest in obtaining additional future federal financing for the project, to be repaid by contractors.

[62] The largest contractor participating in WaterFix, Metropolitan Water District, has approved participation in WaterFix and has also agreed to fund the portion of WaterFix costs that was initially assumed to be paid for by CVP contactors.

[63] See for example, Westlands Water District, "Westlands Water District Statement on California WaterFix," September 20, 2017. https://wwd.ca.gov/wp-content/uploads/2017/09/wwd-statement-on-ca-waterfix.pdf.

[64] Letter from Brian Thomas, Interim Director, Delta Conveyance Authority, to Andrew Wheeler, Administrator, U.S. Environmental Protection Agency, 2018. p. 24.

Figure 7. Proposed WaterFix Infrastructure



Source: California Natural Resources Agency, *California WaterFix: Fast Facts*, California Natural Resources Agency, 2016, at http://cms.capitoltechsolutions.com/ClientData/CaliforniaWaterFix/uploads/CWF_FastFacts5.pdf.

Congressional Interest

Congress plays a role in CVP water management and previously has attempted to make available additional water supplies in the region by facilitating efforts such as water banking, water transfers, and construction of new and augmented storage. In 2016, Congress enacted provisions aiming to benefit the CVP and the SWP, including major operational changes in the WIIN Act and additional appropriations for western drought response and new water storage that have benefited (or are expected to benefit) the CVP. Congress also continues to consider legislation that would further alter CVP operational authorities and responsibilities related to individual units of the project. The below section discusses some of the main issues related to the CVP that are likely to receive attention by Congress.

CVP Operational Authorities Under the WIIN Act[65]

Title II, Subtitle J of the WIIN Act (enacted in December 2016) included multiple provisions related to the Bureau of Reclamation's operations of the CVP. Most of the WIIN Act's operational provisions are set to expire in 2021 (five years after the bill's enactment). In addition to overseeing the implementation of these operational provisions, Congress may also consider their amendment, extension, or repeal.

The WIIN Act directed Reclamation to "maximize" CVP pumping (in accordance with applicable BiOps), allowed for increased pumping during certain temporary storm events, and authorized expedited reviews of water transfers, among other things.[66] The WIIN Act also established a new standard for measuring the effects of water operations on species listed as endangered or threatened under the ESA, allowing most of the bill's actions to go forward unless they are determined to cause additional adverse effects on listed species beyond the range of the effects anticipated to occur for the duration of the species BiOp.

Although the WIIN Act included some provisions from legislation that had been proposed dating back to the 112th Congress, many of the controversial provisions from prior bills were not included in the act. Supporters of WIIN Act operational changes contended that these changes had the potential to make additional water available to users facing curtailed deliveries, while also improving the flexibility and responsiveness of the management and operations of the CVP and SWP.[67] Opponents worried that the changes may have detrimental effects on species' survival in both the short and long terms and may limit agency efforts to manage water supplies for the benefit of species.[68] Some of the notable CVP operational provisions in the WIIN Act aimed to provide the Administration with authority to make available more water supplies during periods in which pumping otherwise would have been limited.

According to Reclamation, some changes authorized under the WIIN Act were implemented during the winter of 2017-2018. In particular, communication and transparency were reportedly increased for some operational decisions, allowing for reduced or rescheduled pumping restrictions. Additionally, as of spring 2018, WIIN Act allowances relaxed restrictions on inflow-to-export ratios related to the voluntary sale, transfer, or exchange of water that were used to affect a transfer resulting in additional exports of 50,000-60,000 AF.[69]

Reclamation has noted that hydrology has affected its ability to implement some of the act's provisions. Many of the WIIN Act changes have the potential to make their greatest impact during drought years. At the same time, some federal operational changes pursuant to the WIIN

[65] For more information on these provisions, see CRS Report R44986, *Water Infrastructure Improvements for the Nation (WIIN) Act: Bureau of Reclamation and California Water Provisions*, by (name redacted), (name redacted), and (name redacted).

[66] Pursuant to §4013 of the WIIN Act, most of the CVP operational provisions expire in December 2021.

[67] U.S. Congress, Senate Committee on Energy and Natural Resources, *Statement of Dan Keppen, Executive Director, Family Farm Alliance*, 114th Cong., 1st sess., October 8, 2015, p. 4, at http://www.energy.senate.gov/public/index.cfm/hearings-and-business-meetings?Id=65220e15-0479-492e-8423-ca1a381c1078&Statement_id=378db42f-6b60-44a7-a16c-3d2b7d712984.

[68] U.S. Congress, Senate Committee on Energy and Natural Resources, *Statement of Michael L. Connor, Deputy Secretary, U.S. Department of the Interior*, 114th Cong., 1st sess., October 8, 2015, p. 1, at http://www.energy.senate.gov/public/index.cfm/files/serve?File_id=fb299e7d-7de8-41c8-b8a2-365d544c8911.

[69] This provision of the WIIN Act generally lessened existing restrictions on the amount of water that could be exported for water transfers. Personal communication with the Bureau of Reclamation, April 18, 2017.

Act reportedly were proposed but were deemed incompatible with state requirements.[70] Despite these limitations, WIIN Act authorities are likely to continue as a topic of congressional interest.

Other Proposed Changes to CVP Operations[71]

Similar to recent Congresses, the 115th Congress is considering legislation that proposes additional changes to CVP operations. For instance, H.R. 23, the Gaining Responsibility on Water Act (GROW Act) incorporates a number of provisions that were included in previous California drought legislation in the 112th, 113th, and 114th Congresses but were not enacted in the WIIN Act. Generally speaking, the GROW Act includes provisions that would weaken some environmental protections and restrictions that are currently imposed under the CVPIA, ESA, CWA, and SJRRP, and has the potential to increase exports under some scenarios. However, the magnitude of the effects that would occur as a result of these changes is unclear, and would depend on a number of factors. Among other things, the GROW Act would

- amend the CVPIA by changing the baseline for calculating fish protection and restoration targets, making CVPIA b(2) water optional rather than mandatory, requiring a plan for replacement water for CVP contractors whose allocations are reduced as a result of the CVPIA's requirements, and directing actions that potentially would reduce payments to the CVPRF;
- repeal some of the most important parts of the SJRRP (P.L. 111-11), including altering the metrics of successful completion of the SJRRP; and
- establish specific CVP allocations for contractors based on certain hydrologic conditions and tie the CVP's operations to a 1994 plan (the Bay-Delta Accord)[72] that included lesser limits on operational restrictions to protect fish and wildlife and water quality.

In addition to legislation proposing operational changes, the Administration has indicated its intent to propose administrative changes to CVP operations (see previous section, "Endangered Species Act"). The actions under consideration reportedly will include those with the potential to "maximize" water and power supplies for users and that modify existing regulatory requirements, among other things.[73]

New Water Storage Projects

As previously noted, Reclamation and the State of California have funded the study of new water storage projects in recent years, and future appropriations legislation and reporting may provide additional directions for these and other efforts to develop new water supplies for the CVP. As such, Congress may consider oversight, authorization, and/or funding for these projects. Some

[70] Personal communication with the Bureau of Reclamation, April 18, 2017.

[71] For more information, see CRS Report R44889, *H.R. 23, the Gaining Responsibility on Water Act of 2017 (GROW Act)*, by (name redacted), (name redacted), and (name redacted) .

[72] The Bay-Delta Accord, previously in effect from 1994-1997, set varying maximum restrictions on water exports from the Delta depending on the time of year, guaranteed a reliable supply of water for the three main groups of stakeholders, ensured real time monitoring of water levels, and promised to comply with all environmental regulations through restoration efforts. It has subsequently lapsed and has been replaced with other efforts. See *Principles for Agreement on Bay-Delta Standards Between the State of California and the Federal Government*, Washington, DC, December 15, 1994, http://www.calwater.ca.gov/content/Documents/library/SFBayDeltaAgreement.pdf.

[73] Reclamation, "Intent to Prepare a Draft Environmental Impact Statement."

projects, such as the Shasta Dam and Reservoir Enlargement Project, have the potential to augment CVP water supplies but also have generated controversy for their potential to conflict with the intent of certain state laws.[74] Although Reclamation has indicated its interest in pursuing the Shasta dam raise project, the state has opposed the project under Governor Jerry Brown's Administration, and it is unclear how such a project might proceed absent state regulatory approvals and financial support. As previously noted, in early 2018, Reclamation proposed and Congress agreed to $20 million in design and preconstruction funding for the project.[75]

In addition to the Shasta Dam and Reservoir Enlargement Project, Reclamation allocated and Congress approved study funding for Sites Reservoir/North of Delta Offstream Storage (NODOS), Upper San Joaquin River Basin Storage Investigation, and the Friant-Kern Canal Subsidence Challenges Project. Overall, from FY2017 to FY2019 Congress provided Reclamation with $335 million for new water storage projects authorized under Section 4007 of the WIIN Act. Some of this total is expected to be used on CVP and related water storage projects in California. Similar to the WIIN Act's operational provisions, funding for storage projects under Section 4007 may need to be extended by Congress once the appropriations ceiling for these projects has been met.

CVP Policy Riders in Appropriations Bill

Other policy issues associated with the CVP have been proposed in legislation and/or as general provisions in annual appropriations bills (sometimes referred to as *policy riders*). For instance, Section 437 of House-passed H.R. 6147 (Interior, Environment and Related Agencies appropriations bill for FY2019), would stipulate that the final environmental impact statement and any resulting agency decisions for the California WaterFix project would not be subject to judicial review under any federal or state law.[76] This could render ineffective future and ongoing legal challenges to the project. Section 441 of H.R. 6147 would similarly direct that operations of the CVP and the SWP hereinafter shall not be subject to judicial review. Finally, Section 454 of H.R. 6147 would provide that no federal funds made available under the bill would be available to modify operations of New Melones Reservoir for the purposes of executing the State Water Board's Bay-Delta Plan. Releases from New Melones Dam would be key to instituting new Delta outflow requirements for water quality; thus, such a restriction would potentially complicate implementation of the updated plan.[77] The Senate bill contains no similar provisions.

All of the aforementioned proposals have been the subject of considerable debate among water users and environmental advocates. In a letter to the California delegation, Secretary for California Secretary for Natural Resources John Laird expressed opposition to all three of these

[74] In particular, §5093.542 of the California State Public Resources Code prevents participation (other than technical or economic feasibility studies of the Shasta dam raise project) by state departments or agencies in facilities that would have an adverse effect on the free-flowing condition of the McCloud River. In previous documents, Reclamation has indicated that this requirement could limit some state agency participation in the project.

[75] This funding was provided from a pool of funds appropriated for FY2017 that was designated for water storage projects authorized under Section 4007 of the WIIN Act. Enacted appropriations in FY2018 and FY2019 have included similar funding amounts. For more information, see CRS In Focus IF10692, *Bureau of Reclamation: FY2018 Appropriations*, by (name redacted) .

[76] The provision does not specify any specific agencies or agency decisions.

[77] See prior section, "Water Quality Requirements: Bay-Delta Water Quality Control Plan."

water-related proposals.[78] Some of these provisions may also be proposed in regular (i.e., nonappropriations) legislation.

Conclusion

The CVP is one of the largest and most complex water storage and conveyance projects in the world. Congress previously has expressed interest in CVP operations and allocations, in particular restrictions on pumping in the Bay-Delta. In addition to ongoing oversight of project operations and previously enacted authorities, a number of developing issues and proposals related to the CVP have been of interest to congressional decisionmakers. These include study and approval of new water storage and conveyance projects in California (including the California WaterFix), updates to the state's Bay-Delta water quality requirements, and efforts by the Trump Administration to make available more water for CVP water contractors, in particular those south of the Delta. Any future drought or other hydrological constraints on water supplies in California likely will further magnify these issues.

[78] Letter from John Laird, Secretary for California Natural Resources, to The Honorable Richard Shelby, The Honorable Patrick Leahy, The Honorable Rodney P. Frelinghuysen, and The Honorable Nita M. Lowey, Senate Committee on Appropriations and House Committee on Appropriations, July 17, 2018.

Appendix. CVP Water Contractors

The below sections provide a brief discussion some of the major contractor groups and individual contractors served by the CVP.

Sacramento River Settlement Contractors and San Joaquin River Exchange Contractors (Water Rights Contractors)

CVP water generally is made available for delivery first to those contractors north and south of the Delta with water rights that predate construction of the CVP: the Sacramento River Settlement Contractors and the San Joaquin River Exchange Contractors. (These contractors are sometimes referred to collectively as *water rights contractors*.) Water rights contractors typically receive 100% of their contracted amounts in most water year types. During water shortages, their annual maximum entitlement may be reduced, but not by more than 25%.

Sacramento River Settlement Contractors include the 145 contractors (both individuals and districts) that diverted natural flows from the Sacramento River prior to the CVP's construction and executed a settlement agreement with Reclamation that provided for negotiated allocation of water rights. Reclamation entered into this agreement in exchange for these contractors withdrawing their protests related to Reclamation's application for water rights for the CVP.

The San Joaquin River Exchange Contractors are four irrigation districts that agreed to "exchange" exercising their water rights to divert water on the San Joaquin and Kings Rivers for guaranteed water deliveries from the CVP (typically in the form of deliveries from the Delta-Mendota Canal and waters north of the Delta). During all years except for when critical conditions are declared, Reclamation is responsible for delivering 840,000 AF of "substitute" water to these users (i.e., water from north of the Delta as a substitute for San Joaquin River water). In the event that Reclamation is unable to make its contracted deliveries, these Exchange Contractors have the right to divert water directly from the San Joaquin River, which may reduce water available for other San Joaquin River water service contactors.

Friant Division Contractors

CVP's Friant Division contractors receive water stored behind Friant Dam (completed in 1944) in Millerton Lake. This water is delivered through the Friant-Kern and Madera Canals. The 32 Friant Division contractors, who irrigate roughly 1 million acres on the San Joaquin River, are contracted to receive two "classes" of water: Class 1 water is the first 800,000 AF available for delivery;[79] Class 2 water is the next 1.4 million AF available for delivery. Some districts receive water from both classes. Generally, Class 2 waters are released as "uncontrolled flows" (i.e., for flood control concerns), and may not necessarily be scheduled at a contractor's convenience.

Deliveries to the Friant Division are affected by a 2009 congressionally enacted settlement stemming from Friant Dam's effects on the San Joaquin River.[80] The settlement requires reductions in deliveries to Friant users for protection of fish and wildlife purposes. In some years, some of these "restorations flows" have been made available to contractors for delivery as Class 2 water.

[79] This water typically is provided for municipal and industrial use or for districts without access to groundwater.

[80] When constructed, Friant Dam impounded the entire flow of the San Joaquin River, except for releases to manage flooding and provide water for some riparian water rights holders immediately below the dam. For more information, see below section, "San Joaquin River Restoration Program."

Unlike most other CVP contractors, Friant Division contractors have converted their water service contracts to repayment contracts and have repaid their capital obligation to the federal government for the development of their facilities. In years in which Reclamation is unable to make contracted deliveries to Exchange Contractors, these contractors can make a "call" on water in the San Joaquin River, thereby requiring releases from Friant Dam that otherwise would go to Friant contractors.

South-of-Delta (SOD) Water Service Contractors: Westlands Water District

As shown in **Figure 3**, SOD water service contractors account for a large amount (2.09 million AF, or 22.1%) of the CVP's contracted water. The largest of these contractors is Westlands Water District, which consists of 700 farms covering more than 600,000 acres in Fresno and Kings Counties. In geographic terms, Westlands is the largest agricultural water district in the United States; its lands are valuable and productive, producing more than $1 billion of food and fiber annually.[81] Westlands' maximum contracted CVP water is in excess of 1.2 million AF, an amount that makes up more than half of the total amount of SOD CVP water service contracts and significantly exceeds any other individual CVP contactor.[82] However, due to a number of factors, Westlands often receives considerably less water on average than it did historically (see previous section, "Constraints on CVP Deliveries").

Westlands has been prominently involved in a number of policy debates, including proposals to alter environmental requirements to increase pumping south of the Delta. Westlands also is involved in a major proposed settlement with Reclamation, the San Luis Drainage Settlement. The settlement would, among other things, forgive Westlands' share of federal CVP repayment responsibilities in exchange for relieving the federal government of its responsibility to construct drainage facilities to deal with toxic runoff associated with naturally occurring metals in area soils.

Central Valley Wildlife Refuges

The 20,000 square mile California Central Valley provides valuable wetland habitat for migratory birds and other species. As such, it is the home to multiple state and federally-designated wildlife refuges north and south of the Delta. These refuges provide managed wetland habitat that receives water from the CVP and other sources.

The Central Valley Project Improvement Act (CVPIA; P.L. 102-575),[83] enacted in 1992, sought to improve conditions for fish and wildlife in these areas by providing them coequal priority with other project purposes. CVPIA also authorized a Refuge Water Supply Program to acquire approximately 555,000 AF annually in water supplies for 19 Central Valley refuges administered by three managing agencies: California Department of Fish and Wildlife, U.S. Fish and Wildlife Service, and Grassland Water District (a private landowner). Pursuant to CVPIA, Reclamation entered into long-term water supply contracts with the managing agencies to provide these supplies.

[81] Westlands Water District, "Who We Are," at https://wwd.ca.gov/who-we-are/.

[82] CRS analysis of Bureau of Reclamation, "Central Valley Project Water Contractors," March 30, 2016, at https://www.usbr.gov/mp/cvp-water/docs/latest-water-contractors.pdf.

[83] P.L. 102-575, Title 34, 106 Stat. 4706.

Authorized refuge water supply under CVPIA is divided into two categories: Level 2 and Level 4 supplies. Level 2 supplies (approximately 422,251 AF, except in critically dry years, when the allocation is reduced to 75%) are the historical average of water deliveries to the refuges prior to enactment of CVPIA.[84] Reclamation is obligated to acquire and deliver this water under CVPIA, and costs are 100% reimbursable by CVP contractors through a fund established by the act, the Central Valley Project Restoration Fund (CVPRF; see previous section, "Central Valley Project Improvement Act"). Level 4 supplies (approximately 133,264 AF) are the additional increment of water beyond Level 2 supplies for optimal wetland habitat development. This water must be acquired by Reclamation through voluntary measures and is funded as a 75% federal cost (through the CVPRF) and 25% state cost.

In most cases, the Level 2 requirement is met; however, Level 4 supplies have not always been provided in full for a number of reasons, including a dearth of supplies due to costs in excess of available CVPRF funding and a lack of willing sellers. In recent years, costs for the Refuge Water Supply Program (i.e., the costs for both Level 2 and Level 4 water) have ranged from $11 million to $20 million.

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[84] Although this represents the historical average for deliveries, prior to the Central Valley Project Improvement Act (CVPIA; P.L. 102-575), refuges only had a legal entitlement to 121,700 acre-feet (AF).