Conveyance — Delta

Miner's Slough, Sacramento-San Joaquin Delta. In the area near Ryer Island, levees along Miner's Slough protect the surrounding agricultural land and the island from flooding, the potential for which has increased due to subsidence of the surrounding land to a level lower than the waterway.

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Chapter 5. Conveyance — Delta

The Delta — A Brief Overview

The Sacramento-San Joaquin Delta (Delta) is the confluence point of the Sacramento and San Joaquin rivers as water is naturally conveyed westward from upstream water basins to the bays connected to the Pacific Ocean (Figure 5-1). In its natural state, the Delta was a vast marsh and floodplain dissected by meandering channels and sloughs. Even in today's highly altered environment, the Delta remains a critical ecosystem and dynamic habitat that is home to hundreds of aquatic and terrestrial species, including many species endemic to the area and a number that are designated as threatened or endangered by the federal Endangered Species Act (ESA) and California Endangered Species Act (CESA).

The Delta is also a centerpiece of California's water system. The conveyance of water through the Delta supplies water for more than 25 million Californians. The water conveyed through the Delta also supports farms and ranches stretching from the north Delta to California-Mexico border, which collectively produce nearly half of the nation's domestically grown fresh produce and supports a $27 billion agricultural industry. In addition to being a key agricultural region itself and recreational destination, the Delta supports extensive infrastructure of statewide importance, such as aqueducts, natural gas pipelines, electricity transmission lines, railroads, shipping channels, and highways.

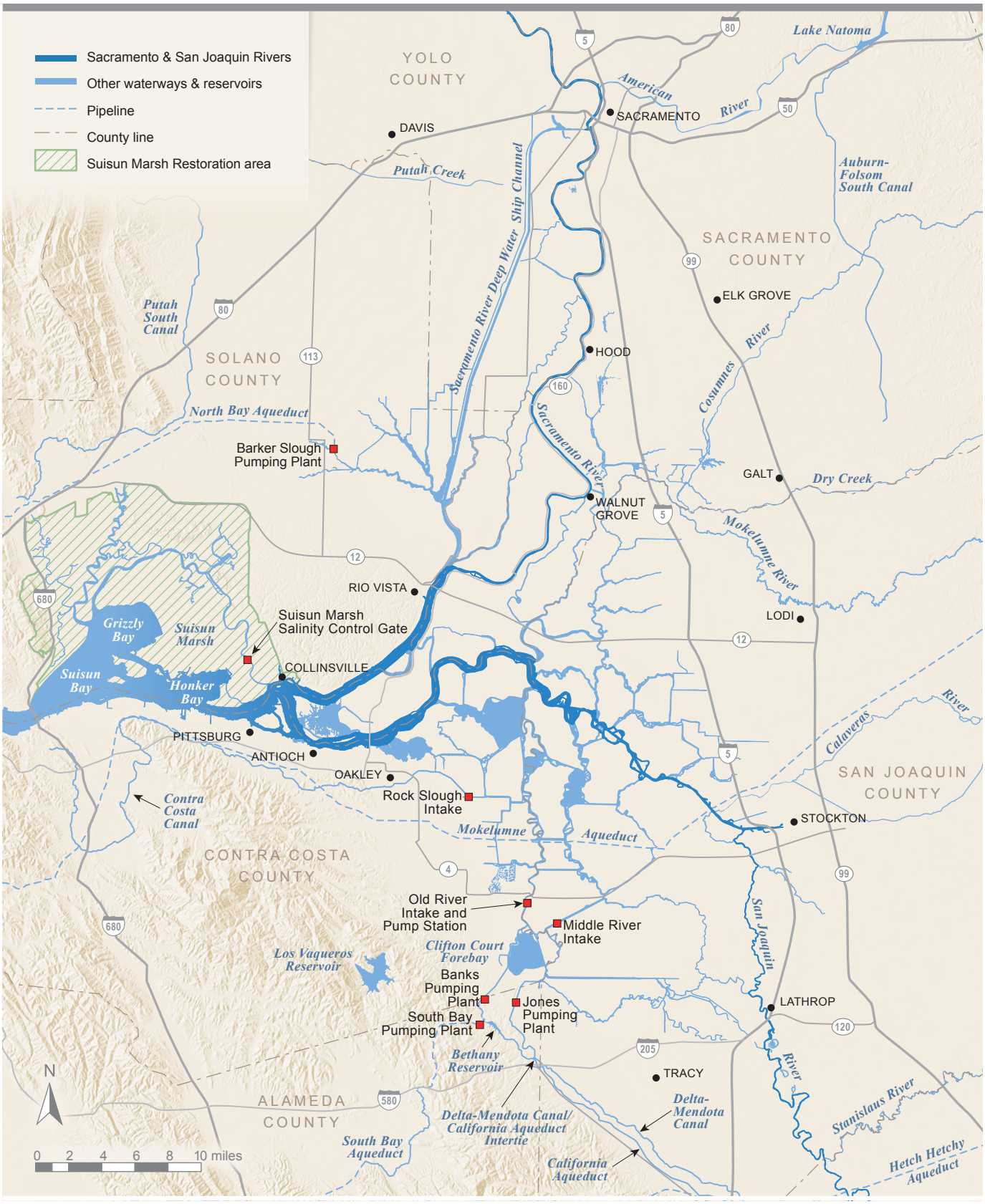
Infrastructure Changes to Delta Conveyance — A Brief History

Concerted efforts to control and redirect the flow of water through the Delta began as early as the 1850s. Early water supply diversion projects included the construction of the network of levees that facilitated the conveyance of water for agriculture and human consumption uses. The straightening, widening, and dredging of channels similarly increased shipping access to the Central Valley and improved downstream water conveyance for flood control.

California's post-World War II growth resulted in the planning and construction of two large-scale water projects with an emphasis on conveying water to develop and sustain California's agricultural economy and urban growth. The Central Valley Project (CVP), which was initiated in 1933 and is operated and maintained by the U.S. Bureau of Reclamation (USBR), is comprised of 20 dams and reservoirs with a combined storage capacity of more than 11 million acre-feet (maf), 11 power plants, and more than 500 miles of major canals and aqueducts. The CVP provides sufficient water to irrigate one-third of California's agricultural land and to meet the municipal and industrial needs of close to 1 million households annually.

The State Water Project (SWP), which was initially authorized by voters in 1960 and is operated and maintained by the California Department of Water Resources (DWR), is a complex system comprised of 20 pumping plants, five hydroelectric power plants, 34 storage reservoirs and lakes with combined storage capacity of approximately 5.8 maf, and approximately 700 miles of pipelines and canals. The SWP provides water for more than 20 million Californians, about 660,000 acres of irrigated farmland, and distributes water under contract to 29 urban and agricultural water suppliers (SWP contractors).

Figure 5-1 Sacramento-San Joaquin Delta



The Delta is a critical component of both water projects, which rely on the Delta conveyance system to provide water at their diversion facilities in the south Delta for use in the San Francisco Bay Area, the Central Valley, and Southern California. Other agencies and facilities, such as the Contra Costa Water District, the East Bay Municipal Utility District, the City of Stockton, and the Folsom South Canal also rely on the Delta as a source of supply or as a transportation corridor for their water supply facilities.

Current Diversion and Future Impacts on the Delta Ecosystem — A Brief Overview

Once a vast marsh and floodplain dissected by meandering channels and sloughs, the Delta provided a dynamic habitat for a rich diversity of fish, wildlife, and plants. The Delta of today has been altered by the construction of levees and reservoirs and dredged waterways to support farming and urban development, as well as to provide flood protection on lands that historically supported marshes and floodplains. The water flow in the Delta is also affected by the movement of water for operations of the SWP and CVP. Many other factors have compounded the alteration of the Delta and include:

- Introduction of invasive non-native fish, wildlife, and plant species.
- Barriers to fish migration.
- Changes in Delta water quality constituents.
- Turbidity and toxicity from both natural and human sources.
- Unscreened power plant and agricultural diversion.
- Illegal fish harvesting.
- Improper fish hatchery management practices.

The Delta's future will be affected by increasing land subsidence, heightened seismic risk, and possible effects of climate change that include rising temperatures, changes in runoff timing, sea level rise, and changes in storm timing, intensity, and frequency.

In this highly altered environment, several native and non-native fish species have declined to the lowest population numbers in their recorded histories. In response, federal regulatory actions to protect threatened and endangered fish species have limited through-Delta conveyance and have made water supplies increasingly variable.

The Bay Delta Conservation Plan (BDCP) — Achieving the Coequal Goals of Ecosystem Restoration and Water Supply Reliability

Brief History and Purpose of the BDCP

During the past several decades, the increasing demand for the Delta's resources has escalated the conflict between the needs of water users and the efforts to sustain the estuary's aquatic ecosystem and support the protection of State and federally threatened or endangered fish. These conflicts have led to a crisis regarding the ability to protect Delta fisheries, maintain water quality,

and meet the needs of both in-Delta and export area agricultural and municipal water users. This situation has resulted in the need to address these competing beneficial uses and sustainability concerns.

The Sacramento-San Joaquin Delta Reform Act of 2009 (Delta Reform Act) mandates developing a comprehensive Delta management plan (Delta Plan) with the coequal goals of (1) protecting, restoring, and enhancing the Delta ecosystem, and (2) providing a more reliable water supply for California. The proposed Bay Delta Conservation Plan (BDCP) is anticipated to be the 50-year comprehensive conservation strategy component of the Delta Plan.

The Delta Reform Act establishes the framework to achieve the coequal goals of providing a more reliable water supply and restoring and enhancing the Delta ecosystem. The coequal goals will be achieved in a manner that protects and enhances the unique cultural, recreational, natural resource, and agricultural values of the Delta. The Delta Reform Act creates the Delta Stewardship Council, ensures the California Department of Fish and Wildlife and the State Water Resources Control Board identify the water supply needs of the Delta estuary for use in determining the appropriate water diversion amounts associated with the BDCP, establishes the Sacramento-San Joaquin Delta Conservancy to implement ecosystem restoration activities within the Delta, restructures the current Delta Protection Commission, and appropriates funding from Proposition 84.

The Delta Stewardship Council adopted the Delta Plan, which furthers the coequal goals of Delta restoration and water supply reliability, which includes determining the consistency of the BDCP with coequal goals.

The BDCP is being developed in compliance with the federal ESA, the CESA, and the Natural Community Conservation Planning Act (NCCPA). The BDCP's comprehensive conservation plan is also undergoing intensive environmental review in the form of both a State Environmental Impact Report (EIR) and a federal Environmental Impact Statement (EIS). The EIR and EIS will evaluate the conservation plan's impact on all aspects of the environment and will identify alternatives and mitigation actions.

Delta Ecosystem Restoration and Protection — The Conservation Plan

The federal and State ESAs presently regulate the operational impacts of the SWP and CVP on a species-by-species basis. The BDCP is a joint habitat conservation plan (HCP) and Natural Community Conservation Plan (NCCP) that seeks to improve the health of the Delta's ecological system using a comprehensive conservation strategy to address the collective impacts associated with the SWP, CVP, and certain existing and anticipated future actions within the area covered by the BDCP. The BDCP takes into account multiple stressors on the ecosystem, the needs of multiple species, and the diverse natural communities that support them, including species listed under the federal and State ESAs as threatened, endangered, or candidates for listing, inclusive of habitat, if any, designated for these species.

The BDCP aims to enhance the Delta's ecosystem processes and function, including seasonal floodplain habitat, intertidal and associated subtidal habitat, hydrologic conditions, and salinity within the Delta estuary including a reduction in the direct loss of fish and other aquatic

organisms. Specific problems to be addressed include the reconnection of floodplains, the development of new tidal marsh habitat, the restoration of river banks to a more natural state, invasive species control, decreasing water toxicity levels, and modifying water operations to include attributes of more natural seasonal flow patterns.

An overriding goal of the BDCP is to contribute to the recovery of at-risk species in the Delta. The BDCP seeks to accomplish this goal by identifying specific conservation and management actions, or conservation measures, to improve habitat conditions within the Delta's natural communities. The overall BDCP conservation strategy includes 22 conservation measures that are designed to achieve biological goals and objectives specific to 11 conservation zones comprising the Delta.

BDCP — Taking Conveyance a New Direction

Central to the BDCP is the proposal to develop an improved conveyance system. Specifically, the BDCP proposes the creation of dual water conveyance delivery system comprised of the existing (through-Delta) conveyance and a new conveyance system that will route water through an isolated facility conveyance system to be exported via the SWP and CVP. As proposed, the North Delta Diversion would become the primary diversion point and would be subject to water delivery operation rules. The new facility would help meet the coequal goals of the Delta Plan by providing for a more reliable supply of water while simultaneously maintaining sufficient bypass flows for State and federally listed species of concern.

Water Supply Reliability

There are many factors that influence water supply reliability. The distribution of precipitation and water demand in California is unbalanced because most of the state's precipitation falls in the north and a substantial amount of the state's water demand is south and west of the Delta. This includes irrigation water for southern Central Valley agriculture, and municipal and industrial uses in Southern California and the Bay Area. Additionally, federal- and State-mandated regulatory actions to protect threatened and endangered species in the Delta have further limited the levels of through-Delta water conveyance, which makes available water supplies even more unreliable.

To compound these challenges further, the Delta is not a static ecological system and fundamental changes are certain to occur. The anticipated effects of climate change indicate elevated sea levels, altered annual and inter-annual hydrological cycles, changed salinity, and water temperature regimes in and around the Delta, and accelerated shifts in species composition and distribution. These changes further add to the difficulty of resolving the increasingly intensifying conflict between the ecological needs of at-risk Delta species and natural communities and the need to provide adequate and reliable water supplies for people, communities, agriculture, and industry. Anticipating, preparing for, and adapting to these changes are key underlying drivers associated with implementation of the proposed BDCP.

Existing Delta conveyance does not provide long-term reliability to meet current and projected needs. Conveyance through the Delta during drought is especially challenging considering the various demands from agriculture, municipalities, and environmental regulations. To improve through-Delta conveyance water supply reliability, provide greater operational flexibility,

and improve ecosystem function, improvements to existing facilities should be made. These improvements include updating aging infrastructure, increasing existing capacities, adding redundancy to the system, constructing additional facilities, and restoration of habitat may be needed.

The major issues pertaining to reliability of water supply transferred through the Delta include the following items:

- The health of the Delta ecosystem is paramount considering water-related activities within the Delta. Continuing declines in some native species populations migrating through or living in the Delta, such as salmon and delta smelt, highlight the increasing influence of the Delta ecosystem on water supply reliability. Any activity proposed for Delta conveyance will need to consider the restoration and preservation of native habitat.
- The integrity of more than 385 miles of Project levees (State Plan of Flood Control facilities) and over 730 miles of non-Project levees (neither State Plan of Flood Control facilities nor other State-federal flood protection facilities) throughout the Delta is continually tested by such elements as storm events creating floods and seawater surges, island subsidence, natural levee erosion, poor quality peat soils used to build the original levees, seismic activity, burrowing animals, and sea level rise. (For a discussion of Project and non-Project levees, see *Delta Levees Special Flood Control Projects,* at http://www.water.ca.gov/floodsafe/fessro/docs/special_guidelines2014.pdf.)
- Maintaining optimal water quality within the Delta for both drinking water and for native species habitat is paramount. Control of water quality in a tidal estuary with seasonal and yearly fluctuating hydrology will require well-understood and adaptive strategies. As water quality requirements can vary, and at times conflict among users, the challenge will be to agree upon the implementation strategy.
- Maintenance of in-Delta projects for beneficial uses such as recreational boating and swimming, sport fishing, shipping, and agriculture, industrial, and drinking water supply will be an ongoing management challenge as political and fiscal climates evolve and resources for competing priorities become scarcer.

Potential Benefits

Implementation of the proposed dual conveyance will enhance the operational flexibility. The use of an alternative conveyance strategy will also allow for the restoration of a more natural flow from east to west toward the Pacific Ocean.

Key beneficial effects of the BDCP:

- Improve south Delta flows.
- Protect and restore more than 100,000 acres of natural communities to promote improved ecosystem function.
- Increased climate change adaptation in the Plan Area.
- Reduce other stressors such as stranding, invasive aquatic species, localized predation, and low dissolved oxygen.

Net beneficial effects on fish species:

- Increase suitable habitat such as restored tidal and channel margin habitat.

- Increase food sources and availability from restored habitat.
- Decreased entrainment.
- Reduced entry into interior Delta.
- Reduced predation.
- Reduced illegal harvest.

Potential Costs

Dual Conveyance — Implementation Costs and Funding Sources

A detailed discussion of the estimated costs associated with the implementation of the BDCP over the proposed 50-year term of the conservation plan is in Chapter 8 of the proposed BDCP at http://baydeltaconservationplan.com/.

Major Implementation Issues

While conservation plans like the BDCP are meant to be beneficial to the environment, specific actions in the plan can have an impact on natural and human environments. These impacts must be evaluated and actions identified to mitigate them. State and federal environmental laws require a review of potential impacts of the BDCP before it is approved and implemented.

The BDCP Environmental Impact Report/Environmental Impact Statement (EIR/EIS) was prepared in compliance with the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA).

The term "mitigation," as used in the EIR/EIS, refers to measures used to reduce environmental impacts after considering all of the environmental commitments described for each resource. The BDCP EIR/EIS was released for a 120-day public review on December 13, 2013.

Climate Change

Northern California is expected to experience changes to the physical environment as a result of climate change. It is expected that climate change will result in more precipitation falling as rain rather than snow, leading to reduced snowpack, earlier snowmelt, and reduced river flows and reservoir storage in summer, causing changes to the seasonal timing of flows in rivers. Air temperatures will continue to rise, which will increase water temperatures. Accelerated rates of relative sea level rise will increase the intrusion of seawater into the upper estuary and when combined with an increase in coastal storms, storm surge, and river runoff will increase shoreline flooding and erosion. Sea level rise will continue to threaten infrastructure, increase flooding at the mouths of rivers, place additional stress on levees in the Delta, and will intensify the difficulty of managing the Delta as the heart of the state's water supply system.

Adaptation

Both the increase in winter runoff and more intense storm events that are anticipated with climate change may require larger conveyance capacity and reservoir storage to manage water successfully for flood risk reduction and water supply reliability. Delta conveyance improvements can provide additional resiliency for minimizing these impacts while providing more flexibility in managing water supplies and reducing flood risk, while achieving the coequal goals. Expected climate change adaptation benefits of Delta conveyance improvements include:

- Enhanced ecosystem services through restoration of wetlands, floodplains, and riparian habitats will restore ecosystem services that benefit humans as well as ecosystems.
- Increased protection of upland habitat and structures from flooding and storm surges due to sea level rise.
- Improved floodplain connections to rivers to restore the ability of floodplains to absorb flood flows and to provide a water reservoir to help aquatic species withstand droughts.
- Increased resilience to invasive species from creation of seasonally inundated floodplains by increasing numbers and health of native species and excluding invasive species.
- Increased habitat variability helping to support species diversity by providing a mosaic of habitats that can be used by different species that have evolved to use specific habitats.
- Increased habitat complexity from wetland restoration, which will include networks of channels within marshes that are used by fish for foraging, refuge, and movement in and out of the marsh.
- Increased habitat patch size and connectivity through the protection and restoration of a variety of natural communities. Increasing patch size will tend to increase population sizes of native species, which provides more resiliency against a changing climate.
- Additional flexibility in managing water supplies under more frequent dry conditions and periods of prolonged drought.

Mitigation

Despite the overall positive benefits of the BDCP Conservation Strategies, implementation will result in some negative impacts. For example, there are tradeoffs between BDCP environmental benefits with its negative impacts on greenhouse gas (GHG) emissions from construction as well as potential indirect project effects from growth and development. As stated in the EIR/EIS, BDCP will develop a GHG Mitigation Program prior to the commencement of any construction or other physical activities associated with water facilities and operations that would generate GHG emissions. The GHG Mitigation Program will consist of feasible options that, taken together, will reduce construction-related GHG emissions to net zero (i.e., emissions will be reduced to the maximum extent feasible and any remaining emissions from the project will be offset elsewhere by emissions reductions of equal amount). The BDCP proponents will determine the nature and form of the components of the GHG Mitigation Program after consultation with the various local air control agencies.

As a part of ongoing operations of the Delta conveyance, improving conveyance system efficiency could reduce energy use in pumping plants, power supply, and water diversion, which contributes to GHG reduction for climate change mitigation. Furthermore, promoting water

conservation, efficiency, and sustainable use will also reduce energy use for GHG reduction that is beneficial for climate change mitigation.

Recommendations

As one of California's most invaluable natural resources, the Delta has been stretched to the breaking point. The Delta ecosystem is in steep decline, which jeopardizes the native fish and wildlife species, threatens reliable water supplies for millions of Californians, and puts the state's broader economy at serious risk. To reach the coequal goals necessary to successfully improved Delta conveyance, the following recommendations include:

1. Legally acknowledge the coequal status of restoring the Delta ecosystem and creating a more reliable water supply for California.
2. Recognize and enhance the unique cultural, recreational, and agricultural values of the Delta as an evolving place.
3. Restore the Delta ecosystem as the heart of a healthy estuary.
4. Promote water conservation, efficiency, and sustainable use.
5. Build facilities to improve the existing water conveyance system and expand statewide storage, and operate both to achieve the coequal goal.
6. Reduce risks to people, property, and state interests in the Delta by effective emergency preparedness, appropriate land uses, and strategic levee investments.
7. The California Urban Water Management Planning Act requires urban water suppliers to adopt water management plans every five years and submit to DWR. In these plans, urban water suppliers must assess whether their current and planned water supplies will be enough to meet the water demands during the next 20 years. DWR is required to review local water management plans and report on the status of these plans.
8. The Water Conservation Act of 2009 includes distinct requirements related to both urban and agricultural water use. DWR is required to report on progress toward meeting urban per-capita water use goals.
9. Through its Agricultural Water Management Planning and Implementation Program, DWR helps water districts develop agricultural water management plans and implement cost-effective efficient water management practices.
10. DWR will participate in workshops and technical discussions about managing for extreme drought and floods.

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