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The Military Engineer

The Water Issue

The California Experience

Water Management in the Land of Drought and Flood

In California, federal, state and local agencies are working together to turn the crisis caused by the extended drought into an opportunity for change.

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California's climate and hydrology have challenged populations back to its earliest inhabitants. Variable annual precipitation patterns, frequent floods triggered by Pacific atmospheric rivers, and prolonged droughts are all part of the state's hydrologic cycles.

Entering its fifth year of drought, California is now bracing for floods amidst a strong El Niño season. Future climate changes will raise sea levels, alter precipitation patterns further and reduce snow pack in California's largest frozen reservoir, the Sierra Nevada Mountains. Every aspect of the state's water management system will be affected by these changes—assuring that as it has in the past, water will continue to shape California's future.

COMPLEX WATER SYSTEM

Today, California's water system supplies water to 38 million people and 10-million-acres of irrigated agricultural lands. It delivers water to major industrial facilities that fuel the largest economy in the nation and the seventh largest in the world. An extensive network of reservoirs and canals were built during the last century to store winter precipitation and augment natural river systems to move water hundreds of miles when and where it is needed.

Two major systems, the State Water Project, operated by the State of California, and the Central Valley Project, operated by the U.S. Bureau of Reclamation, play a key

role in delivering water to people, farms, and industry. Under the jurisdiction of the U.S. Army Corps of Engineers (USACE), much of this same system of reservoirs and leveed rivers serves to reduce the risk of flooding for millions of people. This dual role leads to divergent purposes at times.

Both the state and federal water supply systems also rely on water moving through the Sacramento-San Joaquin River Delta, the largest estuary on the west coast, before being pumped into aqueducts that pass the water further south. Protecting the vital and fragile Delta ecosystem significantly influences overall operation of the system.

A RECORD DROUGHT

During the last four years of drought, residents across California watched water wells dry up and agricultural lands subside. Coastal and mountain streams that salmon and steelhead depend on dwindled without rain. Agricultural communities were severely stressed as thousands of acres of cropland were fallowed. Cities and towns were forced to make hard decisions aimed at boosting water conservation efforts and developing new sources of supply. The environmental impacts, particularly to anadromous species, have been significant.

The prolonged drought amid population and agricultural growth has taken a toll on regional water supply reliability and sustainability. In many areas, a growing imbalance between surface water availability and demand has led to increased groundwater pumping and depletion of groundwater basins. Currently, 127 of California's 515 groundwater basins are considered medium or high priority in terms of overdraft concerns. Collectively, these basins account for 96 percent of the state's annual groundwater pumping and supply water to 88 percent of the population residing over groundwater basins. Of these, 21 basins have been identified as critically over-drafted.



TAKING STEPS TO RESPOND

California's water is supplied through five distinct systems, with local projects providing the majority of water at an average of 38.3-million-acre-ft, or 55 percent of state water supply annually. Federal projects meanwhile provide 12 percent; state projects provide 4 percent; groundwater provides 22 percent; and the Colorado River supplies 7 percent, or 4.8-million-acre-ft. While the quantities vary by year and those totals do not include reuse or recycling, it has become paramount that federal, state and local agencies work together in taking steps to respond to the record drought.

Executive action. Over the last two years, Gov. Edmund G. Brown Jr. (D-Calif.) issued several executive orders that resulted in establishment of a successful multi-agency drought emergency program and



California's climate and hydrology have challenged populations back to its earliest inhabitants. Variable annual precipitation patterns, floods triggered by Pacific atmospheric rivers, and droughts are all part of the state's hydrologic cycles. (Right) Lake Isabella has been hit hard by the four-year drought while flooding in 1997, including at Sutter Buttes (above), caused \$2 billion in damages and 48 counties declared disasters. PHOTOS COURTESY USACE SACRAMENTO DISTRICT

Governor's Drought Task Force, along with a mandatory conservation program to reduce urban water use by 25 percent. Californians stepped up to the challenge. From June through November 2015, urban areas exceeded the 25 percent goal—many areas by wide margins. Urban areas cut their water use by a cumulative 26.3 percent, which equates to 328.9-billion-gal of water, enough to supply five million people for a year. The governor's orders also resulted in delivery of financial assistance and drinking water to those communities most impacted by the drought, in many cases with complementary federal assistance from the Bureau

of Reclamation and the Department of Agriculture. Proposition 1, approved by California voters in 2014, provides over \$7.5 billion to address water management challenges. Also in 2014, the state released the California Water Action Plan. Envisioned as a roadmap toward sustainable water management, the plan outlines 10 primary actions, ranging in focus from drought preparedness and response to improved groundwater management, flood



protection and sustainable financing.

Implementing the Water Action Plan requires the unified efforts of a broad array of affected entities, including federal, state, local and tribal partners, as well as the public. While not all-inclusive, the Water Action Plan provides a much-needed focal point and begins to frame the common



Source: Department of Water Resources, CWP 2013

California's water system supplies water to more than 38 million people and 10-million-acres of irrigated agricultural lands.

IMAGE COURTESY CALIFORNIA DEPARTMENT OF WATER RESOURCES

vision of the cooperative efforts needed to achieve sustainable management of the state's water resources. Already California has authorized nearly \$5 billion of Proposition 1 funds for Water Action Plan implementation in the current fiscal year.

Improving water supply reliability. There also are broad efforts by state, local and federal agencies to improve water supply reliability. Many of these large-scale efforts—such as additional storage reservoirs and major conveyance system changes—will take years to implement, but the planning, coordination and analysis is aggressively underway at many levels. In the interim, steps are being taken to increase the efficiency of existing surface storage projects, update reservoir operating rules, and integrate weather data to optimize runoff storage while not increasing flood risk. Agencies across the state are working to find innovative ways to capture storm and flood flows in a manner that increases supplies for people, farms and industry, while maintaining flows for ecosystem health.

Regional water management. While state and federal agencies operate vast infrastructure to store and deliver water, significant water infrastructure is controlled at the local and regional level. Over the past decade, California has provided technical support and financial assistance to implement a myriad of regional projects to improve water sustainability and provide other benefits. The state's actions to incentivize regional cooperation complements the federal push for watershed-based planning and management. In fact, USACE Los Angeles District is working collaboratively with the Santa Ana Watershed Project Authority (one of California's 48 recognized regional water management groups) to pilot watershed-based budgeting. The program is being evaluated by USACE leadership as a methodology to regionally allocate expenditures nationwide.

A significant step towards achieving sustainable regional management came in fall 2014 with the passage of the *Sustainable Groundwater Management Act* by the California legislature. For the first time in history, the state must manage groundwater use in a sustainable and transparent manner. The landmark law requires water and land use agencies, in the context of an

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overall regional water balance, to collectively govern groundwater use sustainably.

Reducing flood risk and mitigating impacts. Adopting lessons learned from previous California floods and significant events like Hurricane Katrina, a deeper understanding of flood risk was presented in a 2013 report prepared by the state's Department of Water Resources (DWR) in partnership with USACE. "California's Flood Future - Recommendations for Managing the State's Flood Risks" revealed that more than seven million people and \$580 billion in assets are exposed to flooding hazards in California, with all 58 counties at risk. The state's Central Valley Flood Protection Plan of 2012 and the Corps' Central Valley Integrated Flood Management Study, a watershed level study of the Sacramento River being finalized spring 2016, detail water resource-related problems and opportunities for flood risk management, ecosystem restoration and water supply improvements and serve to provide the overall framework to align efforts across government agencies at all levels. Progress towards implementing improvements has been steady, with four USACE-led projects authorized by Congress in the *Water Resources Reform and Development Act of 2014*. Two more projects focused on reducing flood risk in Sacramento are making their way towards consideration by Congress later this year.

Power of collaboration. USACE Sacramento District has taken steps to formalize its partnership with California. In 2015, the district and DWR signed a first-of-its-kind Memorandum of Agreement, agreeing to work together in a programmatic fashion on regional and statewide initiatives. As a first step, USACE is focusing on the Sacramento River Basin and the Yolo Bypass, a project built during the last century to protect the Sacramento metropolitan area communities from flooding.

Located in the heart of the Pacific Flyway, the Yolo Bypass Wildlife Area's 16,600-acres is a haven for fish, waterfowl, and other wildlife, and much of the land supports agricultural uses. Due to the way this bypass functions within the watershed, it is integral to state and federal water supply operations. The project's overall goals are to improve flood protection while enhancing agricultural sustainability, water supply reliability, and the economic health of state. This unique opportunity will serve as a model for integrated flood management.

MOVING FORWARD WITH OPTIMISM

As the saying goes, with crisis comes opportunity. The extended drought in California has created the crisis, and agencies across the state are using that as an opportunity for change. The history of litigation between interests is ebbing as genuine collaboration and coordination takes root. The water infrastructure in California, like elsewhere in the United States, is rapidly aging while climate and environmental factors continue to complicate operations. The renewed interest in cooperation at all levels is encouraging—but this is a long and complex road that will require sustained leadership and commitment to navigate successfully.

One of the greatest challenges is securing sustainable financing over the next few decades. As highlighted in a March 2014 report by the Public Policy Institute of California, "Paying for Water in California," the state faces serious funding gaps—on the order of \$2 billion to \$3 billion a year—in five key areas of water management: safe drinking water in small, disadvantaged communities; flood protection; management of stormwater and other polluted runoff; aquatic ecosystem management; and integrated water management.

Federal, state and local water leaders must work collaboratively, leverage resources, and find new ways to pay for sustainable solutions for California's water resources. Because as history has shown, while the rain will come again, so too will another drought.

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