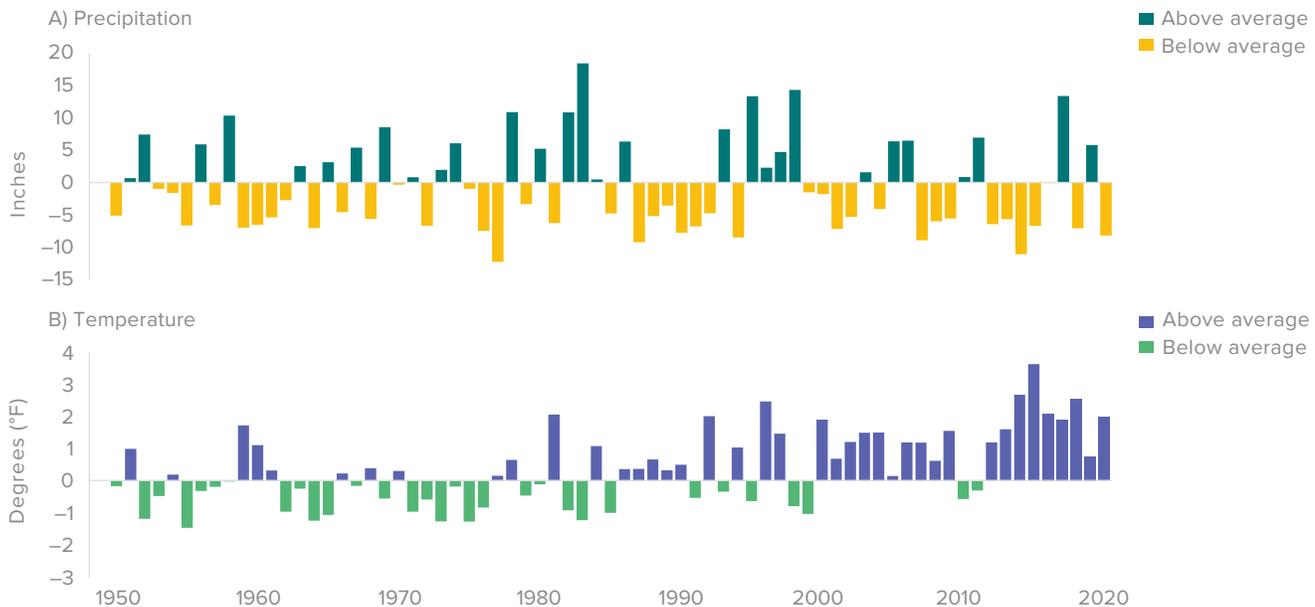


Water and a Changing Climate

The pandemic and its economic fallout are affecting many aspects of water management, while climate change has major implications. And a much-needed national conversation about racism has illuminated water equity issues—such as how we address climate change, safe drinking water, and water scarcity.

- ▶ California’s water managers have been busy keeping water systems safe and operational during the COVID-19 pandemic. But the fiscal consequences of the economic recession are just beginning to be felt.
- ▶ Some California communities—especially those served by small systems lacking resources and economies of scale—did not have safe drinking water before the pandemic, and the recession has made affordability of water and wastewater an urgent crisis.
- ▶ California’s climate is warming and becoming more variable. Rising temperatures are making droughts more intense, and dry years are occurring more frequently. At the same time, winter storms are becoming warmer—with less snow and more rain—leading to larger floods.
- ▶ Freshwater ecosystem health has been declining for decades—a trend made worse by long-term drought and rising air and water temperatures. The pandemic and resulting downturn have made this even harder to manage.
- ▶ Headwater forests are a critical part of the state’s natural infrastructure, but tree die-offs and rising wildfire intensity—fueled by a warming climate—have heightened the need to better manage these forests.
- ▶ Agriculture has faced many challenges from the pandemic—particularly regarding worker safety and market disruptions. But its grand challenge is to manage groundwater sustainably for the benefit of the economy, local communities, and the environment—a task made harder by the changing climate.

CALIFORNIA HAS BEEN HOT AND DRY FOR THE PAST 20 YEARS



SOURCE: *California Climate Tracker*, Western Regional Climate Center.

NOTES: Bars in the top panel show the number of inches above and below the 1950–2000 statewide average of 24.3 inches, based on October–September water years. Bars in the lower panel show the annual difference in average temperature from 1950–2000 average (57.2°F). The 2020 precipitation anomaly is based on cumulative precipitation from October 2019 through May 2020, and is compared to the cumulative precipitation for the same months in the 1950–2000 period (23.5 inches). Temperature anomaly for October 2019 through May 2020 was extrapolated through September 2020. The 1950–present range was chosen based on higher-quality climate data suitable for close comparison.

Climate change has major implications for managing water

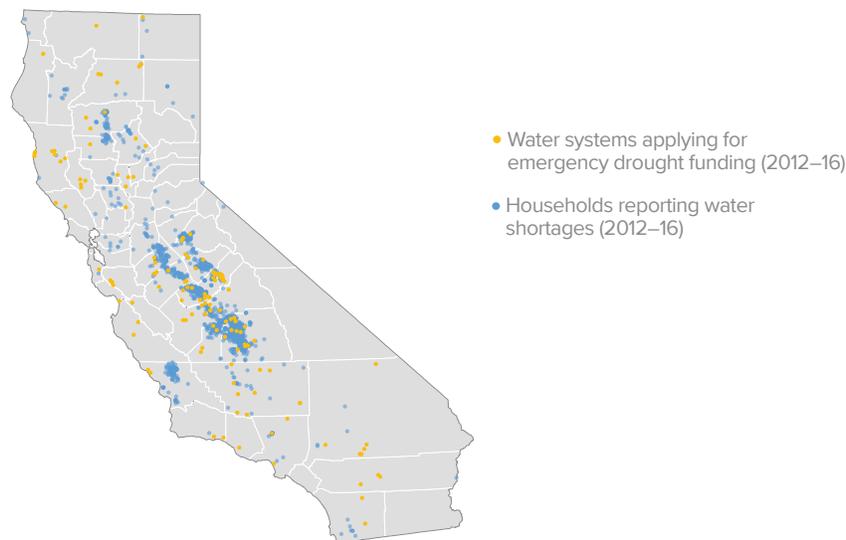
Increasing drought intensity and frequency makes it hard to manage aquifers. The state relies heavily on groundwater as a drought reserve. More intense and frequent droughts increase demand for groundwater and reduce the opportunity for recharge. This makes supplies for agriculture and many rural communities more expensive and less reliable.

The state's flood control infrastructure is inadequate for 21st-century conditions. Most efforts to manage flood risk—including planning, dams, levees, and other structures—are based on past climate conditions rather than a future with floods that are likely to be more intense. Adapting to these changes will be costly and disruptive. Low-income communities are disproportionately at risk and will need more assistance with adaptation.

Sea level rise will affect water quality and flood risks. Estuaries and coastal aquifers will see declines in water quality as sea level goes up. This will also increase the risks of coastal flooding and the costs of wastewater and stormwater management.

Climate stress is affecting the state's fragile freshwater ecosystems and headwater forests. California's plant and animal communities are adapted to occasional drought, but water and forest management practices—combined with a warming climate—have made these communities much more vulnerable.

DURING DROUGHTS, RURAL COMMUNITIES ARE MORE LIKELY TO SUFFER WATER SHORTAGES



SOURCE: *Managing Drought in a Changing Climate* (PPIC, 2018). Developed by the authors using data from the Department of Water Resources (household water shortages) and the State Water Board (small water systems).

The COVID-19 recession has made it harder to manage water and ecosystems

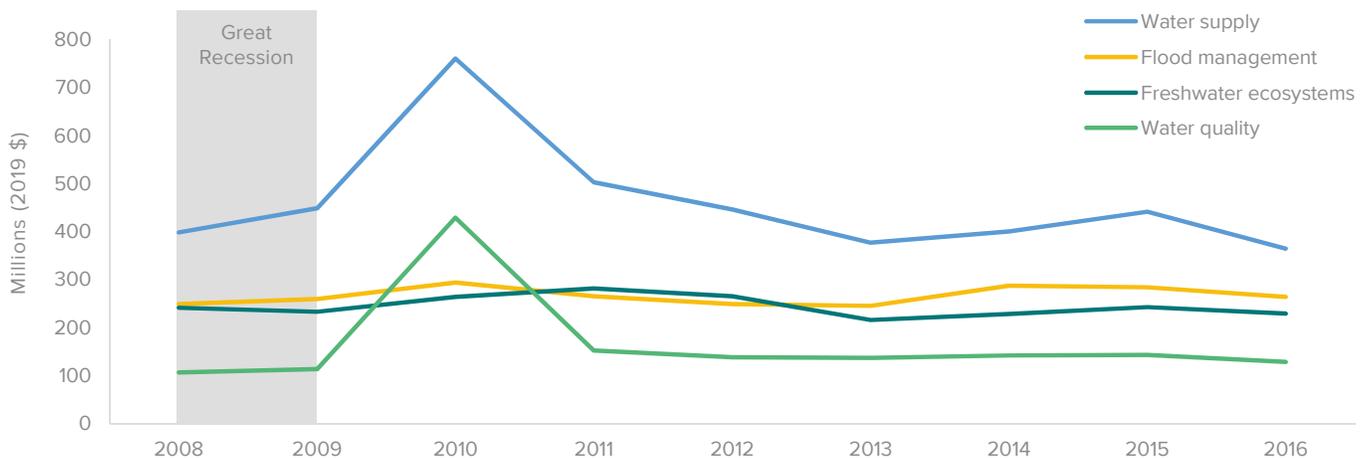
The pandemic could have lasting effects on utility finances, affecting their ability to maintain safe and resilient systems. A moratorium on shutoffs helped ensure access for residents who lost income during the pandemic, but also reduced revenues. Utility managers are worried about a longer-term rise in nonpayment, and the Great Recession of the late 2000s showed that water and wastewater revenues can be significantly impacted. Stimulus funds can play an important role in filling revenue gaps, helping utilities maintain and upgrade aging infrastructure.

Hundreds of mostly small, rural water systems—and thousands of domestic wells—do not provide safe drinking water. Many more water systems are on the brink of failure. This problem disproportionately affects low-income communities of color. The Safe and Affordable Funding for Equity and Resilience (SAFER) program was created in 2019 to help tackle these problems, but its revenue source is at risk and a more stable source may be needed.

The recession is not likely to impair funding for wildfire suppression, but funding for forest management to reduce wildfire risk is now less certain. Management on the scale needed to reduce the risk of severe wildfire in the headwater forests region requires a robust funding portfolio. The downturn provides an opportunity to reexamine funding strategies and consider options that are better suited to the urgent need to manage forests.

The recession could set back critical freshwater ecosystem programs for years. Ecosystem management is expensive, and years of investment are needed to achieve results. Yet most funding comes from state bonds and is vulnerable to cutbacks during downturns. We estimate that roughly \$700 million is spent annually on aquatic ecosystems in California—but an additional \$400–\$700 million is needed to address existing gaps. The key is finding ways to put ecosystem management on a better footing for an uncertain future.

FEDERAL SPENDING BOOSTED WATER AND WASTEWATER INFRASTRUCTURE DURING THE LAST ECONOMIC RECOVERY



SOURCE: Updated from *Paying for Water in California* (PPIC, 2014).

NOTES: Water quality includes wastewater and stormwater spending. Deflated using Consumer Price Index. The Great Recession began in December 2007 and the recovery started in July 2009.

Prioritizing urgent needs can help avoid higher long-term costs

California will be addressing the fallout of the COVID-19 crisis for some time to come. But failure to address other critical issues now can result in bigger, harder-to-solve problems in the future.

Ensure safe and affordable drinking water. In areas with unsafe or unreliable water supply, promoting consolidation of small, at-risk water systems with larger systems is an important approach. Safeguarding existing state funding (for example, the SAFER program) is critical. Addressing the affordability of both water and wastewater must avoid incentivizing non-payment of bills, which could hinder upkeep of water systems and create new public safety risks. A broader array of funding to support lifeline rates for poor households is needed. To expand local funding options, Californians should consider reforming Propositions 218 and 26, which currently limit the use of water lifeline rates. A federal water lifeline program, similar to one that helps with energy bills, would be valuable in California and nationally.

Make groundwater sustainability planning work. Getting to groundwater sustainability, as required by the state's Sustainable Groundwater Management Act, calls for a concerted effort to balance water accounts, mitigate the undesirable effects of overdraft, and prepare for increasing drought intensity. There are no simple, inexpensive solutions. Sustainability will require major reductions in demand; improvements in supply; investments in infrastructure, trading, and banking of water; and strategic land fallowing. More cooperation is needed to develop alternative supplies, manage demands effectively, and address undesirable effects of pumping, including on drinking water for poor rural communities. Federal stimulus funds and state grants could support planning, piloting, and water infrastructure that provides multiple benefits.

Change how we prepare for droughts and floods to reflect a changing climate. Enhancing groundwater storage is a top priority for building a more drought-resilient water supply. This will require managing surface- and groundwater storage as one system to increase their combined potential. Improving drought planning, especially for communities served by small, vulnerable water systems and domestic wells, is also key. And as the potential for large-scale flooding increases with climate warming, California should expand efforts to steer new development away from high-flood-risk areas. The state also needs to continue improving emergency preparations and encourage those who live in areas at risk of flooding to purchase insurance. Finally, expanded investments in flood management planning and infrastructure are sorely needed. It will be important to design policies to protect lower-income communities from the losses they disproportionately incur.

Steward the environment. Efforts to arrest environmental decline are often sidelined during crises such as the pandemic. But healthy ecosystems are part of California's natural infrastructure and integral to human health and well-being. Failing to address ecosystem decline makes it more difficult and expensive to tackle in the future, especially given climate trends. California needs new strategies that make the most of resources dedicated to improving the environment. This includes increasing investment in forest health to reduce wildfire risk and maintain the benefits forests provide, and adopting new approaches—including restoring more-natural variability of river flows and simplifying permitting—that improve the health of freshwater ecosystems.

Make every drop and dollar count. Money is a perennial issue, but it's even more of a brake on progress now. To be more efficient and effective with limited resources, priority should be given to approaches that yield multiple benefits. For example, managing high spring flows for the combined purposes of flood protection, groundwater recharge, and habitat can broaden cooperation and leverage more funding sources. Similarly, federal stimulus funds can support economic recovery and jobs while boosting the resilience of our natural and built water systems.

Collaboration and leadership are key. Durable and equitable solutions to California's water problems take much more than better planning and money. Coalition-building and the adoption of cooperative approaches will be necessary. Multi-benefit approaches can help bring together these coalitions. But perhaps most important, this cannot happen without strong leadership that is committed to collaborative solutions, innovation, and risk-taking.

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Sources: For more details, see Hanak et al., *Priorities for California's Water* (PPIC, 2020) and Mount et al., *Managing Drought in a Changing Climate* (PPIC, 2018).



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