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What California Should Learn From a Decade of Water Extremes

Years of extreme drought and wet weather have helped highlight problems with California’s water management, something from which we can learn crucial lessons, writes Jay Lund of the U.C. Davis Center for Watershed Sciences.


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Debris removal continues in the diversion pool below Lake Oroville flood control spillway on April 6, 2017. Extreme drought followed by heavy precipitation has highlighted some problems in California's water management. Florence Low / California Department of Water Resources

CALIFORNIA IS A LAND OF EXTREMES – where preparing for extremes must be constant and eternal.

The past six years have demonstrated California's precipitation extremes. From 2012 to 2015, California endured one of its driest periods on record. And 2016 was an additional near-average year, classified into drought because water storage levels were so low.

It seems likely that 2017 will be the wettest year on record in northern California and one of the wettest years ever in most of California. Most of California so far has over 160 percent of average precipitation, with over 150 percent of average snowpack. Reservoirs are now about 2 million acre-feet above their long-term average for this date (having been

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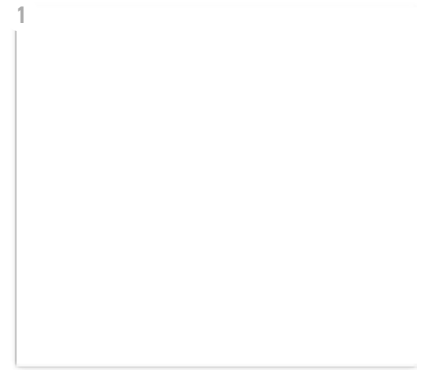
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about 8 million acre-feet below average two years ago).

After wondering for years if the drought would end, the drought is definitively over, even as some impacts to forests, fish populations and groundwater levels will persist for decades. Last Friday, Governor Brown lifted his drought emergency declaration for the state, with a few exceptions. But to keep drought lessons alive, this lifting also stressed a need to reduce wasteful water use and was accompanied by a state plan to make “conservation a way of life.”

What should we have learned (or re-learned) from this decade’s dance with extremes?

- **California is a land of water extremes.**
California is a dry place, which is sometimes much drier than usual for long periods of time – we call these droughts. California also can become very wet – which can cause floods if inadequately managed and prepared for.
- **California must manage for both extremes.**
Wet years allow the gathering of water into aquifers and reservoirs, but we can never economically capture all water in wet years. Even in dry years, we need to prepare for floods, in preparing infrastructure and emergency management. In all years we need to improve



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capabilities and coordination among water agencies (local, state and federal).

- **Conditions can change quickly.** The drought took two years to develop and two years to end (although some effects will last for decades). Floods move faster and more violently, seen when Oroville's spillways tore themselves apart in mere hours.
- **Groundwater is key to sustainability and prosperity** for California's human water uses. Increased groundwater pumping replaced about 70 percent of the drought's agricultural water shortage. Groundwater provides by far the most water storage in California, and is the predominant storage for longer droughts. The 2014 Sustainable Groundwater Management Act shows that this lesson was learned, but implementation remains a challenge.
- **The southern Central Valley will see large reductions in net water use.** This uncomfortable truth is now widely accepted following the drought. About 15 percent of the southern Central Valley's agricultural land depends on groundwater overdraft. Problems in the Delta and increased outflows of the San Joaquin River threaten perhaps another 15 percent of supplies. Soil salinization, urbanization of agricultural land, technology and climate change will also mostly push to reduce irrigated acreage.

- **Preparation is key to managing extremes** – for both droughts and floods. Most cities and farmers did well in the recent drought and floods. A roughly 30 percent loss of water supply reduced statewide agricultural revenue by about 2-3 percent, and urban losses were financially inconvenient but economically negligible. Local impacts were sometimes much worse, especially for some rural communities. The biggest losses were in the areas least prepared. Ecosystems were unprepared for this drought, with often devastating effects. This wet year saw widespread minor flooding, but little major flooding, and identified some areas as needing more attention and funding.
- **Future droughts and floods will be a bit different.** This drought was worsened by higher temperatures, hit an agricultural economy with many more permanent (and more profitable) crops and hit a system with more effective water supply agency cooperation, and a different composition of species in the Delta ecosystem. We need to prepare for future droughts (and floods).
- **We need to do better.** The extreme drought and wet year served to identify weaknesses in California's water management. We must learn from these tests and improve local, regional and statewide water management. Learning from past droughts and floods has made

California's water management as successful as it has been, and remains vital for sustaining a major dynamic civilization in such a dry and increasingly variable climate.

The past few years have shown some major problems:

- **Groundwater.** Implementing the Sustainable Groundwater Management Act remains one of California's greatest water challenges.
- **The Sacramento-San Joaquin Delta** is a second key to sustainability and prosperity for California's water system. We are still struggling with this one.
- **Rural water supplies.** Some 1-2 percent of California's population still have drinking water of substandard quality. The drought highlighted the problems of these mostly small rural water systems. Some progress is occurring, but it will require stronger county responsibility, oversight and capability, aided by others.
- **Ecosystem management.** The drought showed the weakness of the remaining native ecosystems and the agencies' pretty dreadful drought capability and preparation for their environmental responsibilities. State and federal agencies are neither organized nor funded to succeed here.

- **Investments in flood infrastructure.** While most of California's flood infrastructure did pretty well, the floods showed a need to invest in the maintenance and updating of major flood infrastructure – and Californians will need to pay for this.
- **California lacks a coherent state water technical and scientific program,** integrated across agencies. Lack of a common effective water balance, inadequately organized, transparent and expeditious data and modeling, fragmented science, and incoherent fragmentation of technical efforts add confusion, delays, costs and hassles. The state's major drought, flood, groundwater, water rights, rural drinking water and environmental management problems mostly span agency responsibilities, requiring a common coherent technical program. State effectiveness is hobbled without this.

As a mostly dry place with a highly variable climate, California's water problems are eternal and will always be punctuated by floods, droughts and other emergencies. These are tests that invite and focus attention and can help guide improvements.

If we want to continue to move forward, we cannot go back.

The views expressed in this article belong to the author and do not necessarily reflect the editorial policy of Water Deeply.

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