

DROUGHT FREQUENTLY ASKED QUESTIONS

How is drought defined?

Defining when drought begins is a function of impacts to water users, and includes consideration of the supplies available to local water users as well as the stored water they may have available in surface reservoirs or groundwater basins. Different local water agencies will have different criteria for defining drought conditions in their jurisdictions. Urban water suppliers may issue drought watch or drought warning notices to their customers as a way of communicating drought conditions.

A single dry year normally does not constitute drought conditions for larger urban water suppliers. Impacts of a single dry year are typically felt most by people who rely on unmanaged water sources, such as ranchers using non-irrigated rangeland.

How often does California experience significant droughts?

Multi-year droughts of statewide scale occur relatively infrequently, as shown below.

Multi-Year Droughts of Large-Scale Extent Since 1900 (Based on statewide runoff)

1918-20	1976-77
1923-26	1987-92
1928-35	2001-02
1947-50	2007-09
1959-62	

Three twentieth century droughts were of particular importance from a water supply standpoint – the droughts of 1928-35, 1976-77, and 1987-92. The 1928-35 Dustbowl drought established hydrologic criteria widely used in used in designing storage capacity and yield of large Northern California reservoirs. The 1976-77 drought, when statewide runoff in 1977 hit an all-time, low served as a wake-up call for California water agencies that were unprepared for major cut-backs in their supplies. Forty-seven of the State’s 58 counties declared local drought-related emergencies at that time. Probably the most iconic symbol of the 1976-77 drought was construction of an emergency pipeline across the San Rafael Bridge to bring water obtained through a complex system of exchanges to Marin Municipal Water District in southern Marin County.

The 1987-92 drought was notable for its six-year duration and, relatedly, its impacts on reservoir carry-over storage. In the fifth, and driest single year, of the drought, DWR implemented a first-ever drought water bank. Twenty-three counties had declared local drought emergencies by the end of 1991. Santa Barbara experienced the greatest water supply reductions among the larger urban areas. In addition to adoption of measures such as a 14-month ban on all lawn watering, the city installed a temporary emergency desalination plant and an emergency pipeline was constructed to make

State Water Project supplies available to southern Santa Barbara County. The City of Willits, like Santa Barbara, also needed to construct a temporary emergency pipeline. San Francisco, with at one point only 25 percent of its total reservoir storage remaining, constructed interties to the California Aqueduct to be able to access water transfers. Thousands of private residential wells were deepened.

How are drought impacts characterized?

Drought impacts may be directly related to managed water supplies for urban and agricultural purposes, or linked to unmanaged water supplies (precipitation) that support in-stream values, non-irrigated agriculture, or forest health. Public safety impacts related to managed water supplies deal with the lack of water for basic domestic purposes, for maintaining required distribution system pressures in public water systems, or for maintaining distribution system fire flows. These public safety impacts have historically been experienced by the state's smallest water systems in rural areas, not by large urban water agencies. Wildfire dominates the category of public safety impacts associated with unmanaged water supplies.

The risk of impacts increases with the duration of sustained dry conditions. Impacts are normally felt earliest by those relying on unmanaged water supplies, such as agricultural businesses carrying out dryland grazing or non-irrigated crop production. In contrast, most large urban water agencies can manage three to four years of dry conditions without significant impacts to their customers because they have the resources to invest in providing a high level of water supply reliability.

The risks of impacts that Californians might experience in association with a three- to four-year dry period, for example, could be categorized as:

- ▶ Health and safety and economic: catastrophic wildfires, as occurred in Southern California in 2003 and 2007.
- ▶ Health and safety: drinking water supply impacts to small water systems (and private well owners) on unreliable fractured rock groundwater sources in rural areas.
- ▶ Environmental: continued land subsidence in the San Joaquin Valley, affecting water supply and flood protection facilities.
- ▶ Economic: loss of rangeland carrying capacity and minimal water allocations to some agricultural water users, particularly in the San Joaquin Valley.

Am I at risk?

With respect to municipal and industrial water users, historical experience has shown that the most significant effects – those related to actual public health and safety impacts – are typically experienced by small, isolated rural communities relying on marginal water supply sources, and individual rural homeowners whose wells rely on groundwater in low-yield rock formations. The at-risk geographic areas (areas relying on fractured rock groundwater or groundwater in small coastal terrace deposits) are the

North and Central Coasts, Sierra Nevada foothills, and inland Southern California foothills/mountains.

Can we predict when droughts will occur?

No, much work remains to be done on the science associated with predictions at this timescale. Weather forecasts have skill out to ten days to two weeks at most. Currently, the scientific community has found only the El Niño-Southern Oscillation (ENSO) to provide some predictive capability at intraseasonal to interannual (ISI) timescales. The skill of ISI forecasting, however, is very limited in comparison to that of a short-term weather forecast. For example 2010 and 2011 were both La Niña years, but one was wet and the other dry, illustrating the influence of climate patterns (notably in this case the Arctic Oscillation) other than ENSO on water year conditions. ISI forecasting remains a subject for further research.

Where can I find information about reservoir levels or streamflow, or groundwater conditions?

DWR's California Data Exchange Center (<http://cdec.water.ca.gov>) provides information for the state's major reservoir and rivers, together with seasonal runoff forecasts. Additional information on realtime streamflows can be found at <http://waterdata.usgs.gov/ca/nwis/current/?type=flow>. Groundwater information can be found at <http://www.water.ca.gov/groundwater/index.cfm>.

What is a water year?

Water agencies often report hydrologic data on a water year basis. The water year extends from October 1st through September 30th. This is in contrast to the National Weather Service's reporting of precipitation data, which uses a year defined by July 1st through June 30th.

How will global climate change affect drought in California? Is the current drought being caused by climate change?

Attributing a particular extreme event (drought or flood) to climate change is not easily done. Human-induced climate change acts over long-term time periods and interacts with natural climate variability. Modeling performed by multiple climate researchers suggests a trend toward increasing aridity (warmer and drier) in the U.S. Southwest, including in Southern California, exacerbating drought conditions. Climate model outlooks for the northern part of the state are more uncertain with respect to precipitation changes, but have higher agreement with respect to warming temperatures. Even with no change in precipitation, warmer temperatures can stress water supply conditions by reducing water stored as mountain snowpack and by increasing vegetation water needs.

Are water suppliers required to plan for droughts?

State law requires that urban water suppliers serving more than 3,000 connections or more than 3,000 acre-feet annually prepare an urban water management plan and submit it to DWR. The plans, which must be updated every five years, must show how the water supplier would respond to a multi-year drought and a single-year cutback of

up to 50 percent in their supplies. This requirement applies to more than 400 water suppliers statewide; having an approved plan is a statutory condition for eligibility to receive certain types of state financial assistance.

Why isn't seawater desalination the answer to meeting water needs during droughts?

Typically, it would not be possible to construct a seawater desalting plant during a drought as a response to the impacts of that drought – among other things, the environmental regulatory and permitting processes are too lengthy. Even if state permitting requirements were waived through an emergency declaration, seawater desalting is relatively costly compared to other alternatives that might be available to a local water supplier. California's only example of a seawater desalination plant constructed specifically as a drought response measure was the temporary emergency plant constructed by the City of Santa Barbara during the early 1990s. (The present capacity of California municipal seawater desalting plants represents less than one-tenth of one percent of California's urban water use.)

Does weather modification help during droughts?

Weather modification ("cloud seeding") requires cloud masses suitable for seeding. Its use during droughts is limited by the number of available storms, which are typically being blocked from reaching California by atmospheric high pressure zones. For more information about weather modification, see:

http://www.nap.edu/catalog.php?record_id=10829#toc.

What were common response actions in past droughts?

Many urban water agencies increased their water conservation education and outreach programs and called for voluntary or mandatory rationing programs. Increased groundwater pumping was another typical response. Short-term water transfers were a common tool for both urban and agricultural water agencies. Most of California's major urban centers and agricultural production areas – with the exception of the Salinas Valley – are within reach of a regional conveyance facility or natural waterway that provides access to water transfers.