

# Causes and Consequences of the Drought



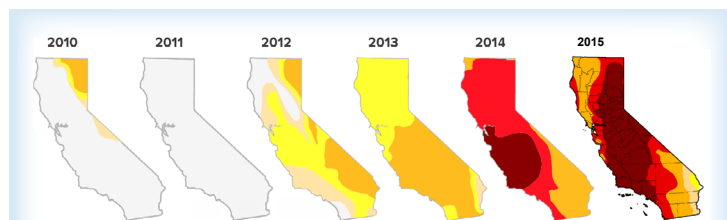
*Sandy Wool Lake, CA (Amber Kerr)*

## Background

The term “drought” is generally used to refer to deficits in water supply, but it can also refer to meteorological (precipitation), hydrological (streamflow), or agricultural (crop yield) deficits compared to a long term average. The US Drought Monitor uses a number of measurements including precipitation, snowpack, streamflow and more, which it uses to sort droughts into 5 categories of intensity. Almost half of California is currently under Exceptional Drought conditions, which are expected only once per 50 or more years <sup>1</sup>.

## How bad is the current drought?

How this drought compares to past droughts depends on the timeframe, location, and metric of concern. In terms of snowpack, this drought is the worst in California’s instrumental record. Snowpack in April 2015 was at a mere 5% of the average—the lowest level ever recorded <sup>2</sup>.



*Graphic: Water in the West, Stanford University, 2015 U.S. Drought Monitor map courtesy of NDMC-UNL*

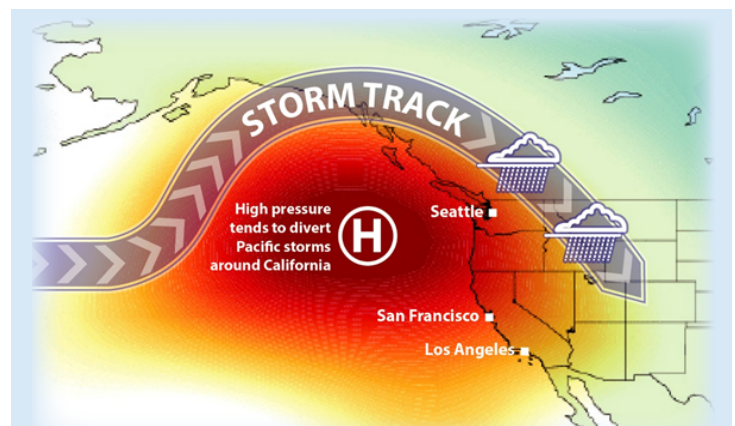
The US Drought monitor maps of July 2010-2015 show the drought’s increasing severity.

By one assessment of the drought’s cumulative severity (PDSI) that included both precipitation and temperature, 2014 was California’s worst drought year in roughly 1,200 years <sup>3</sup>. These severe conditions have significant consequences for water users in California. For instance, the State Water Project, which provides water for 2/3 of Californians, was only able to supply 20% of its contracted supply in 2015 to the 29 public water agencies it serves <sup>4</sup>.

## What is causing the current drought?

Some models suggest that climate change may have increased the likelihood of the drought due to a possible but uncertain relationship with the so-called “Ridiculously Resilient Ridge” <sup>5, 6</sup>. This ridge is a large region of high atmospheric pressure that persisted northwest of California from 2012 to 2014. This pressure formation brought on the drought by diverting winter storms and blocking the typical northwesterly winds that would otherwise cool the state <sup>7</sup>.

Widespread scientific consensus has not yet been reached about whether the current drought is attributable to climate change. However, it is understood that future droughts will likely become more frequent and more severe as temperatures rise in California. This is due to numerous factors, including the effects of increasing temperatures on the Sierra snowpack, a critical water resource for all sectors. As a result of reduced snowfall and accelerated melting, the amount of water stored in the April snowpack is expected to fall 25-40% from its historic average by the year 2050 <sup>8</sup>.



*Graphic courtesy of David Pierce / KQED*

Effects of the Ridiculously Resilient Ridge on the trajectory of storm events off of the Western US.

## How long is the drought likely to continue?

We do not have a way of confidently predicting when the drought will end. Short-range climate forecasting (over one to several years) is still a highly uncertain science, and the effects of phenomena like El Niño are difficult to predict with confidence <sup>9</sup>.

While NOAA suggests that El Niño will likely persist until late spring or early summer of 2016<sup>10</sup>, its effects may differ across the state. For instance, El Niño is more likely to bring above-average precipitation to Southern California than Northern California<sup>11</sup>. Many water users may still experience significant deficits, as El Niño may not replenish the northern and central reservoirs for the state's largest water projects.

Therefore, the end of California's drought remains difficult to pin down, and the time needed for average water users to recover is even more so.

## What actions are being taken at state and local levels?

The state is taking numerous executive and legislative actions, including the following:

- September 2014: Sustainable Groundwater Management Act (SGMA) (AB 1739, SB 1168, and SB 1319).
- November 2014: Governor Brown's water bond (AB 1471, Proposition 1), a \$7.5 million measure. Over 1/3 of funds go to water storage projects; other funding goes to water infrastructure projects, safe drinking water, groundwater cleanup and sustainability, water recycling, flood prevention, and more<sup>12</sup>.
- March 2015: Emergency legislation that allocated over \$1 billion to drought relief and water infrastructure (AB 91 and 92).
- April 2015: Governor Brown's mandatory 25% residential water use reduction through February 2016.



*Photo courtesy of Peter Stine*

California residents are switching to xeriscaped lawns to reduce their water demand.

Local entities are also playing a role by implementing and enforcing residential cuts—for instance, by limiting the timing of and quantity of water allocated for lawn irrigation. In addition, the state has taken legislative steps through the SGMA to empower select local agencies to enforce groundwater pumping restrictions in accordance with sustainability plans.

Conscientious individuals are also contributing by changing their land use practices, improving their water use habits, and switching to water-efficient technologies. This collaborative effort at the local and individual level has been the momentum needed to meet and surpass the Governor's 25% residential water use reduction goals.

## How is drought affecting different sectors?

Nearly every sector in CA has been impacted by drought. We highlight agriculture, forestry, and rangeland in other briefs in this series.

### Where can I get more information?

- <http://drought.ucdavis.edu/>
- <http://www.water.ca.gov/waterconditions>
- [http://ciwr.ucanr.edu/California\\_Drought\\_Expertise/](http://ciwr.ucanr.edu/California_Drought_Expertise/)
- <http://www.cdfa.ca.gov/drought/>
- <http://waterinthewest.stanford.edu/>
- <http://ca.gov/drought/>
- <http://saveourwater.com/>

### What options and resources are available for land owners struggling with drought?

- Drought brochure: <http://ca.gov/drought/pdf/Drought-Assistance-Brochure-2015.pdf>
- State/federal programs, by stakeholder type: <http://ca.gov/drought/pdf/DROPS-State-Fed-Funding-Program-Matrix-04-08-15.pdf>
- State programs: <http://ca.gov/drought/pdf/State-Funding-Program-Matrix-04-08-15.pdf>

1. <http://droughtmonitor.unl.edu/Home/StateDroughtMonitor.aspx?CA>
2. <http://www.weather.com/climate-weather/drought/news/california-sierra-snowpack-record-low-april-2015>
3. <http://onlinelibrary.wiley.com/doi/10.1002/2014GL062433/pdf>
4. <http://www.water.ca.gov/news/newsreleases/2015/030215allocation.pdf>
5. [http://www2.ametsoc.org/ams/assets/File/publications/BAMS\\_EEE\\_2013\\_Full\\_Report.pdf](http://www2.ametsoc.org/ams/assets/File/publications/BAMS_EEE_2013_Full_Report.pdf)
6. <http://onlinelibrary.wiley.com/doi/10.1002/2014GL059748/full>
7. <http://www.weatherwest.com/archives/1797>

8. <http://www.water.ca.gov/climatechange/docs/ClimateChangeWhitePaper.pdf>
9. <http://cdec.water.ca.gov/cgi-progs/products/WSFCastDiscussion.pdf>
10. [http://www.cpc.ncep.noaa.gov/products/analysis\\_monitoring/ens0\\_advisory/ensodisc.html](http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/ens0_advisory/ensodisc.html)
11. [http://www.cpc.noaa.gov/products/predictions/long\\_range/seasonal.php?lead=1](http://www.cpc.noaa.gov/products/predictions/long_range/seasonal.php?lead=1)
12. <http://www.acwa.com/sites/default/files/post/2014-water-bond/2014/09/updated-proposition-1-fact-sheet.pdf>