



seek to lessen the strain on California’s scarce water supply. The state will work with local water suppliers to monitor and enforce conservation measures, though the details of this arrangement - including the penalties for failure to comply - are not fully in place.

What remains to be seen is how Californians will respond to these measures. Will residents commit themselves to conservation and find new and creative ways to reduce water use? Will they fight against the mandatory urban conservation, and call for reduced agricultural water use instead (which commands about 60% of the state’s supply)? Farmers and ranchers have been hit hard in the past few years as their water allocations have decreased, and farmers who grow particularly thirsty crops, like alfalfa, have been compelled to reduce acreage. But with some residents using twelve times the amount of water considered sufficient for personal use, and agriculturalists raising animals or growing nut trees that require hundreds of gallons of water to produce a single serving of food – one can argue that there is room for improvement in both sectors. But will consumers’ tastes match conservation needs? One possibility is that Californians will increasingly turn to technology to alleviate the drought, looking to desalination as a potential solution. Carlsbad and Santa Barbara will soon be able to get a portion of their water through the conversion of ocean water to potable water. Desalination, however, is extremely energy-intensive, expensive, and comes with environmental costs for the oceans. With alarmingly-low snowpack and water supply in reservoirs, officials see no time to lose in calling for unprecedented attention to an important fact: California is an arid state that nevertheless supports the largest population and economy of any other state in the nation. As climate change affects broader weather patterns, California’s conservation measures will likely provide instructive models for other parts of the country.

**Updated Timeline:**

**January 2015:** one of the driest Januarys on record in California.

**April 2015:** Governor Brown issues an executive order calling for mandatory water reductions: [http://gov.ca.gov/docs/4.1.15\\_Executive\\_Order.pdf](http://gov.ca.gov/docs/4.1.15_Executive_Order.pdf)

**May 2015:** The State of California mandates 25% urban water use reduction. To learn more about state drought measures, see: [http://www.waterboards.ca.gov/waterrights/water\\_issues/programs/drought/](http://www.waterboards.ca.gov/waterrights/water_issues/programs/drought/)

This month marks an historic moment in California – Governor Jerry Brown and the State Water Resources Control Board issued the state’s first-ever mandatory reduction in urban water use. This development comes sixteen months after the governor declared a drought state of emergency, in what is now the fourth consecutive year of drought conditions and the lowest ever recorded snowpack (at only 5% of average), and after Californians, as a whole, have made only modest voluntary reductions in water use. The new mandate calls for a 25% reduction in urban water use. This drastic measure reflects, in the words of a state water official, the fact that “This is the drought of the century, with greater impact than anything our parents and grandparents experienced.”

The mandatory conservation totals vary by community, and are based upon a community’s average residential water use during the past two years. The state believes that every Californian could feasibly limit personal, indoor water use to around 55 gallons per day. Communities closest to this mark will be given smaller reduction targets, while communities that have far exceeded this amount will be forced to make cuts sometimes as great as 36%. It is estimated that somewhere between 50-80% of residential water goes to outdoor use. Ostensibly, communities facing the greatest cuts – where residents currently use up to 600 gallons per person, per day – will have to rethink their landscaping, pools, and other ornamental features.

But mandatory water conservation is not the only measure meant to mitigate the impact of the drought. The state recently approved the construction of a salinity barrier across the Sacramento-San Joaquin Delta channel in order to halt saltwater intrusion. In non-drought years saline is kept at bay through reduced pumping out of the Delta or by the release of more water from upstream reservoirs. This year, neither option is available to protect the valuable drinking and irrigation water of the Delta. Other approaches, such as regulations for the use of potable water for landscaping, a state-led initiative to replace lawns with drought tolerant landscapes, and rebates and new standards for water efficient appliances, all

-Shelley Brooks, Ph.D., CHSSP Statewide Office

# California DROUGHT



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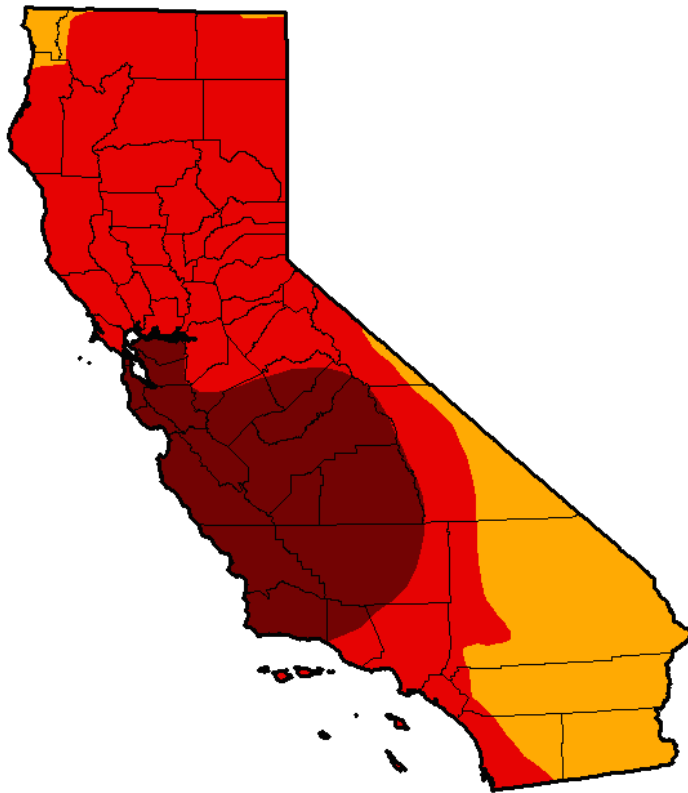
**Update  
5.19.15**

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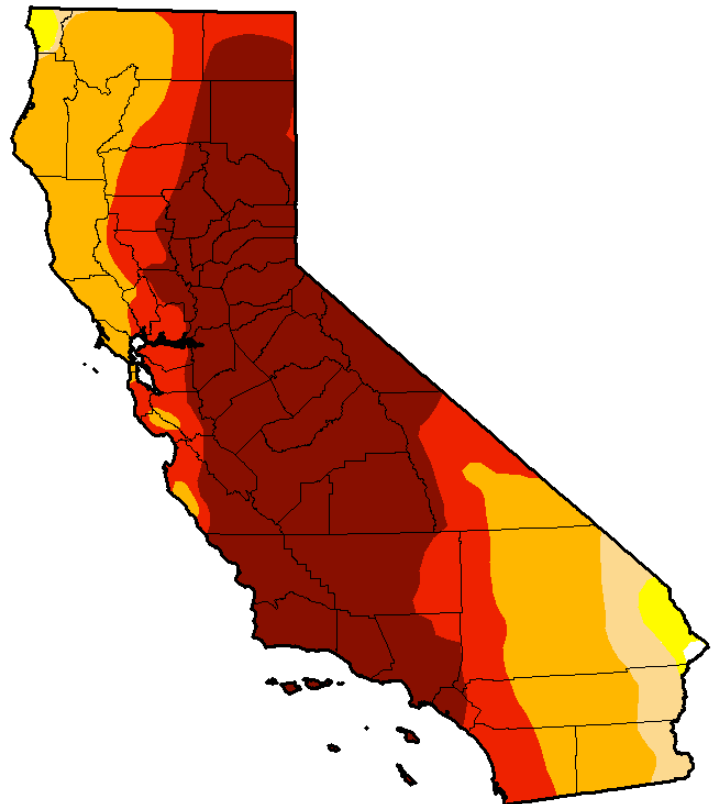
## U.S. Drought Monitor



**May 13, 2014**



**May 12, 2015**



Note the considerable increase from 2014 to 2015 in exceptional drought conditions in portions of the Sierra Nevada Range, which supplies critical water to other parts of the state. Visit the [CHSSP blog](#) for more on the Sierra Nevada watershed.

Author: Richard Tinker, NOAA/NWS/NCEP/CPC.  
Image from the National Drought Mitigation Center:  
<http://droughtmonitor.unl.edu/Home/StateDroughtMonitor.aspx?CA>

Author: Mark Svoboda and Brian Fuchs, National Drought Mitigation Center. Image from the National Drought Mitigation Center:  
<http://droughtmonitor.unl.edu/Home/StateDroughtMonitor.aspx?CA>

# California DROUGHT



## CURRENT CONTEXT

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After three consecutive dry years, a full 58% of California is experiencing what is known as an exceptional drought. California, like most states west of the 100<sup>th</sup> meridian, is arid, with average annual rainfall around 30 inches or below. But the term “average” is misleading, as rainfall varies dramatically not only from the northwest corner of the state to the southeastern desert, but from one year to the next. And in years with little snowfall or rain, drought strikes hard against California, the state that supports the largest population and economy. Municipal water restrictions threaten more than residents’ quality of life; the statewide economic cost of the 2014 drought is \$2.2 billion, including 17,100 job cuts. Wildlife suffers too, as aquatic habitats are compromised. Water is the life source for California, and there is almost never enough of it. As the population increases, and climate change brings more unpredictable weather patterns, long-term drought becomes an even more likely scenario. And the mega-drought is not unknown in this region; tree rings suggest that multiple dry periods lasting 10-20 years have occurred over the past 1000 years.

California’s rich agricultural sector is deeply implicated in the drought’s impact. The crops and animals grown for market consume more than 60% of California’s water. With water allocations reduced or eliminated, farmers have faced difficult choices, sometimes deciding to lay fallow fields, plow under crops, and transition to less water-intensive crops. This year, with only 14% of average snowpack (which, through rivers, provides a significant portion of the state’s water), farmers and cities are relying more heavily on groundwater. As groundwater pumping draws down the water table, some land has become unstable and simply sunk in, known as subsidence. It will take years of good rain to replenish the tapped aquifers. Ironically, dry fields are contributing to faster snowmelt by creating more dust that settles on the snow and absorbs the sun’s energy. An additional challenge is felt in the Sacramento-San Joaquin River Delta, where low river flows can allow too much saltwater intrusion from the San Francisco Bay. The Delta, which provides drinking water for 25 million residents and irrigation water for the Central Valley, must deliver fresh, not salt water to its consumers.

Governor Jerry Brown, who also presided over the state during the memorable ’76-’77 drought, declared a drought State of Emergency in January 2014, and asked

Californians to cut back on their water usage. Despite this plea, parts of the state recorded increased water usage this spring, most notably southern coastal cities. Some cities, like Santa Cruz, have imposed limits on residential usage that will meet indoor needs but not outdoor irrigation. Santa Cruz residents who exceed their allotment (249 gallons/day for a family of four) face steep fines. Despite all of these dramatic developments, however, no one can claim surprise over California’s predicament. California’s aridity has long prompted extensive hydraulic engineering in an effort to overcome a limited and unpredictable water supply.

California’s earliest inhabitants recognized the scarcity of fresh water, especially during the summer growing season. Few California Native American groups practiced agriculture, but the Mojave and Yuma Indians employed basic irrigation techniques in order to grow crops in the dry Colorado Desert region. By the late nineteenth century California farmers organized themselves into irrigation districts to try and finance the costly process of bringing water to their fields. Storing water and preventing floods during the winter rains, and channeling water during the long dry season, was too big of a task for individuals, municipalities, and even the state, thereby prompting the arrival of the federal Bureau of Reclamation in the early twentieth century. But it wasn’t until the massive work projects of the Great Depression that headway was made, when the state and federal government joined forces to create the Central Valley Project (CVP) on the heels of a six year drought. California’s rapid development during and after WWII meant that additional manipulation would be necessary to meet agricultural and municipal needs. With massive population and industrial growth in the South - the region with the lowest natural water supply - the state explored ways to bring water from the North to the thirsty South. In 1960, amidst great debate between northerners who feared loss of their local supply, and southerners who worried what the long term implications of this arrangement would be, California voters approved the State Water Project (SWP) to augment the CVP. With hundreds of miles of canals, numerous storage facilities and pumping stations, the SWP is the nation’s largest state-built water and power development and distribution system.

In short, California’s water resources have been continuously managed to accommodate a growing number of people and industries in areas that lack sufficient natural water supply. This is an impressive feat even during wet years; in dry years the challenge seems nearly insurmountable. Californians have always tapped the state’s natural resources to create abundance and opportunity, but for all their innovation and adaptation, Californians cannot increase the quantity of the water. Instead, during this exceptional drought, Californians are challenged to adjust their expectations and decrease water demands, not just to lessen the impact for 2014 or 2015, but for the inevitable droughts of the future as well.

*-Shelley Brooks, Ph.D., CHSSP Statewide Office*

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**1869** - John Wesley Powell explores the West and concludes that it is an arid region that will require distinctive land management in order to harness the water supply and “redeem” the lands through irrigation.

**1873** - President Grant commissions an Army Corps of Engineers report, which surveys the Central Valley and recommends systematic development of the Sierra Nevada watersheds.

**1878** – California’s State Engineer office creates a report under William Hammand Hall, calling for flood control and navigation improvements on the Sacramento, Feather, Yuba, and Bear rivers and in the Sacramento-San Joaquin Delta. Like the Army Corps of Engineers report, Hall’s report argues that the Central Valley rivers should be harnessed for the “benefit of the state.”

**1884** – California court bans hydraulic mining in the Sierra Nevada Mountains because of its negative impact on rivers – causing floods and reducing navigation.

**1886** – Lux v. Haggin case in which the California Supreme Court rules in favor of Lux’s riparian rights to the Kern River, over Haggin’s prior appropriation rights. Ultimately both types of rights would shape California water law, but landowners without water frontage were usually at a disadvantage.

**1887** – In response to the challenge of irrigation for those without water frontage, the Irrigation District Act allows agricultural communities to come together with governing rights to build and operate collectively the needed irrigation facilities.

**1902** – The federal Bureau of Reclamation forms to reclaim, or make productive, arid lands through federal construction projects.

**1913** – The Los Angeles Aqueduct is completed, delivering water from the Owens Valley approximately 250 miles to Los Angeles.

**1919** – USGS proposes statewide water development project for California that would deliver Sacramento River water to San Joaquin Valley and to Southern California.

**1928-1934** – A six-year drought in California

**1934** – Completion of the Hetch Hetchy Aqueduct from Yosemite, to deliver water 160 miles to the SF Bay Area.

**1935** – The Central Valley Project (CVP) – conceived of by California but too expensive to achieve – is launched with federal aid. Ultimately responsible for meeting current water demands, irrigating over 10 million acres of additional land, generating electricity, managing flood control, and delivering water to municipalities.

**1960** – California voters approved the creation of the State Water Project (SWP) to augment the CVP. The CVP and SWP make up one of the world’s largest water storage and transport systems. Includes flood control; improvement of river navigation; development of hydroelectric power, irrigation, and municipal and industrial water supply; protection of the Delta from seawater encroachment; and protection and enhancement of fish and wildlife.

**1972** – California Wild and Scenic Rivers Act to preserve in “free-flowing state” rivers with particular scenic, fish, wildlife, or recreational value.

**1982** – California voters reject peripheral canal proposition to circumvent the Delta and deliver water to central and southern California.

**1987-1992** – A five year drought in California.

**1992** - Congress passes the Central Valley Project Improvement Act, to reapportion about 10% of the CVP’s water to protect fisheries and endangered wildlife habitats. Also permits transfers of project water anywhere in the state, allowing rural water districts to sell a portion of their allocations to the cities.

**1995** – Creation of the CALFED Bay-Delta Program, a collaboration of 25 state and federal agencies working to “improve California’s water supply and the ecological health of the San Francisco Bay/Sacramento-San Joaquin River Delta.”

**Dec 2013 – July 2014** - Bay Delta Conservation Plan open to public comment. The plan includes a 50-year habitat conservation plan to restore the Delta’s ecosystem and to secure water supplies through the construction of a new water delivery and operating system (sometimes called the twin tunnels plan).

**January 2014** – Governor Brown declares a drought state of emergency, and calls on Californians to reduce their water use by 20%, and prevent water waste.

**January-June 2014** – During this period the average temperature in California sits 4.6 degrees above historical average - hotter than any other equivalent period since record-keeping began in 1895. High temperatures exacerbate the drought conditions.

**July 2014** – California Water Board adopts emergency regulation that limits outdoor irrigation, decorative water features, and cleaning cars and pavement with drinking water. Punishable by fine.

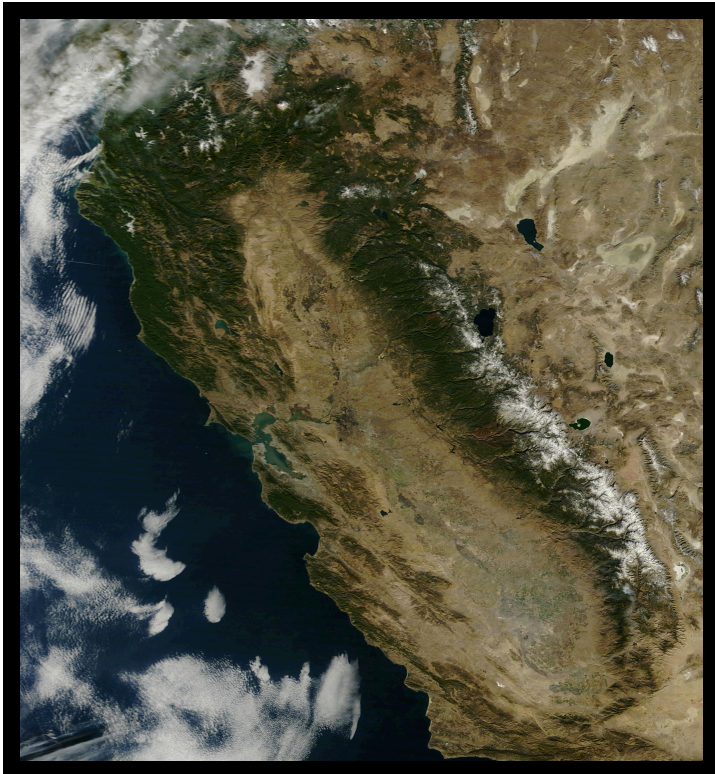
**August 2014** – California legislators approve \$7.5 billion water bond to create new reservoirs, pending voter approval.

# California DROUGHT

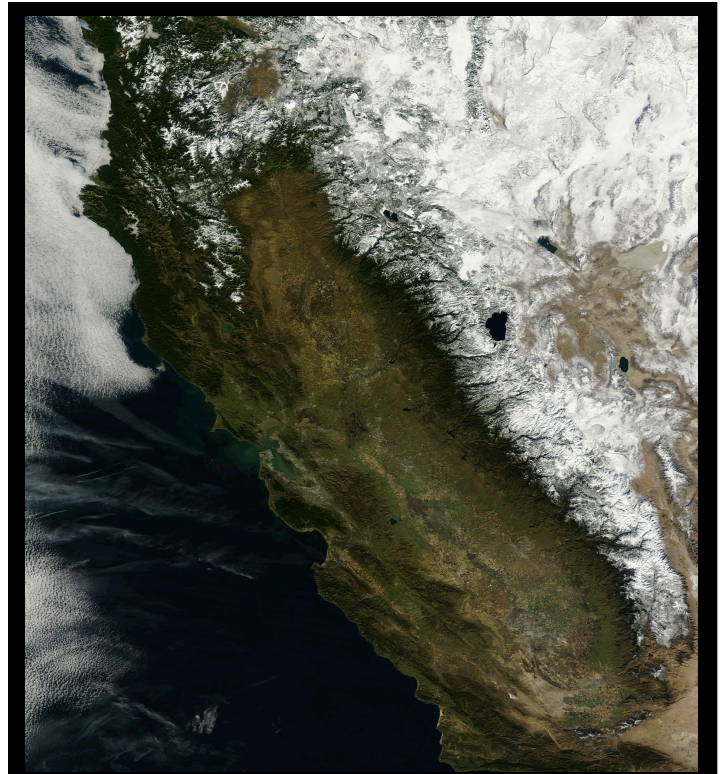


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NASA satellite image acquired  
January 18, 2014, note the  
difference in snowpack from 2013.



NASA satellite image acquired  
January 18, 2013.

Images from NASA: <http://earthobservatory.nasa.gov/IOTD/view.php?id=82910>



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Visit our blog for teaching suggestions for this issue: [http://chssp.ucdavis.edu/copy\\_of\\_blog/engaging-students-in-thinking-about-the-drought](http://chssp.ucdavis.edu/copy_of_blog/engaging-students-in-thinking-about-the-drought)

## Additional Resources\*

### Background Materials:

- CA.gov: <http://ca.gov/drought/>
- UC Davis: <http://drought.ucdavis.edu/>
- United States Drought Monitor: <http://droughtmonitor.unl.edu/Home.aspx>
- National Public Radio: <http://www.npr.org/2014/07/20/333019977/despite-californias-drought-taps-still-flowing-in-la-county>
- KQED, The California Report: [http://www.californiareport.org/search/index.jsp?q=drought&cx=011559425877339893065%3Av\\_phemqmlc&cof=FORID%3A11&sa.x=0&sa.y=0&siteurl=www.californiareport.org%2Farchive%2FR201408200850%2Fc&ref=www.californiareport.org%2F&ss=718j111332j7](http://www.californiareport.org/search/index.jsp?q=drought&cx=011559425877339893065%3Av_phemqmlc&cof=FORID%3A11&sa.x=0&sa.y=0&siteurl=www.californiareport.org%2Farchive%2FR201408200850%2Fc&ref=www.californiareport.org%2F&ss=718j111332j7)
- *USA Today*: <http://www.usatoday.com/story/news/nation/2014/08/11/record-heat-extreme-drought-california/13904797/>
- *National Geographic*: <http://news.nationalgeographic.com/news/2014/03/140325-california-drought-subsidence-groundwater/>
- *Bloomberg*: <http://www.bloomberg.com/news/2014-08-11/california-drought-transforms-global-food-market.html>
- *Huffington Post*: <http://www.huffingtonpost.com/news/california-drought/>
- *San Francisco Gate*: <http://www.sfgate.com/drought/>

### Podcasts:

- National Public Radio: <http://hereandnow.wbur.org/2014/08/04/california-drought-swrch>
- KCBA, San Francisco: [http://sanfrancisco.cbslocal.com/?podcast\\_url=http%3A%2F%2Fwww.podtrac.com%2Fpts%2Fredirect.mp3%2Fnyc.podcast.play.it%2Fmedia%2Fd0%2Fd0%2Fd1%2Fd5%2FdV%2FdE%2FdX%2F15VEX\\_3.MP3%3Fauthtok%3D55624736792762304](http://sanfrancisco.cbslocal.com/?podcast_url=http%3A%2F%2Fwww.podtrac.com%2Fpts%2Fredirect.mp3%2Fnyc.podcast.play.it%2Fmedia%2Fd0%2Fd0%2Fd1%2Fd5%2FdV%2FdE%2FdX%2F15VEX_3.MP3%3Fauthtok%3D55624736792762304)

### Images:

- *The Atlantic*: <http://www.theatlantic.com/infocus/2014/03/californias-historic-drought/100706/>
- *The Washington Post*: [http://www.washingtonpost.com/national/health-science/wests-historic-drought-stokes-fears-of-water-crisis/2014/08/17/d5c84934-240c-11e4-958c-268a320a60ce\\_story.html](http://www.washingtonpost.com/national/health-science/wests-historic-drought-stokes-fears-of-water-crisis/2014/08/17/d5c84934-240c-11e4-958c-268a320a60ce_story.html)

\*The resources listed above are provided for further research and do not imply an endorsement by the California History-Social Science Project or the University of California.