

California Snowpack and the Drought

Snowpack, vital to California's water supply, has long replenished the state's reservoirs naturally in advance of the dry summer and fall months. Snowpack normally provides one-third of the water used by California's cities and farms each year. But if drought conditions persist, this year's April snowpack measurements could be among the lowest since state snow surveys began in 1930. The April 1 snow survey is critical because these measurements generally represent when snowpack is supposed to be at its peak, and readings in the lead-up to April 1 have been exceptionally low.

While this year's extremely low snowpack is due to the drought, warmer temperatures from climate change are expected to dramatically reduce April snowpack in the future, jeopardizing water supplies for California's dry summer and fall months for the long term. While there's no single solution to ensuring an adequate water supply, California needs to prepare for water uncertainty by investing in what works: a sensible suite of proven strategies that improve water efficiency and tap underused local supplies. By rethinking expensive new surface water reservoirs and outdated long-distance delivery systems, and instead embracing cost-effective, sustainable water management measures that build local self-reliance, California can build resilient water supplies for decades to come.

WHAT IS A SNOW SURVEY?

The Department of Water Resources (DWR) coordinates the California Cooperative Snow Survey Program, which involves more than 50 federal, state, and private agencies that contribute funding and/or data. Surveyors collect data manually at the beginning of each month from January through May to supplement and verify real-time electronic readings in three snow survey regions: Northern Sierra/Trinity, Central Sierra, and Southern Sierra. Using data from the survey, DWR issues Bulletin 120, which contains forecasts of the volume of seasonal runoff from major watersheds and summaries of precipitation, snowpack, reservoir storage, and runoff. The bulletin is issued four times each year: in the second week of February, March, April, and May, with periodic updates in between.

WHY IS SNOWPACK IMPORTANT?

California receives most of its precipitation during the winter months, so snowpack serves as an important natural storage reservoir. In a typical year (or what used to be typical), the state's snowpack stores 15 million acre-feet of water, more than all the water used by California cities in 2010. From October to March, snow accumulates at high elevations in the Sierra Nevada and southern Cascades. From April to July, warmer temperatures cause the snow to gradually melt and run off.

Snowpack is important to many water users in California, including those that divert water from rivers upstream of the Sacramento-San Joaquin Delta (Delta) as well as those that rely on the state's two major water supply networks, the State Water Project (SWP) and the Central Valley Project (CVP), which depend in part on this melting snowpack because they receive water from river basin systems fed by snowmelt. Collectively, the SWP and CVP provide a portion of the water for more than 25 million people and more than 3.6 million acres of farmland, although water exported from the Delta by the SWP and CVP accounts for only approximately 8 percent of the state's water supply.



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SWP exports are about 75 percent urban and are predominantly south of the Delta:

- The Metropolitan Water District of Southern California contracts for about 50 percent of SWP exports. Santa Clara and other Bay Area communities also receive some SWP water, as do some central coast cities.
- SWP water accounts for around 30 percent of Southern California's water supplies.
- The remaining 25 percent go to agribusinesses in Kern County, as well as some agricultural contractors on the Central Coast.

CVP exports from the Delta go primarily to agribusinesses in the San Joaquin Valley, with smaller deliveries to the Santa Clara Valley Water District (for municipal and industrial uses, though there is also a small agricultural allotment) and to wildlife refuges.

- Note: The CVP is a much larger system, with contractors upstream of the Delta on both the San Joaquin and Sacramento rivers.

WHAT ARE THE RESULTS OF THIS YEAR'S SNOW SURVEYS?

If conditions remain the same, 2014 snowpack could be the fifth lowest on record since the state snow survey began in 1930. The current record is 25 percent, which was set in 1977. To date this year, the meager amount of snowpack has been startling:

- At the beginning of February, the snowpack was only 10 percent of the average for that time of year; the reading was the lowest since World War II.
- Significant precipitation during February improved snowpack conditions at the time of the March Survey, but they still represented only 20 percent of the average for this date.
- As of March 30, snowpack statewide was only 29 percent of the April 1 average.
- Regional averages range from 19 percent in the Northern Sierra/Trinity area to 35 percent in the Central Sierra and 28 percent in the Southern Sierra.

WHAT CHANGES IN SNOWPACK ARE PROJECTED?

Because of climate change, snowpack is projected to decline by 25 to 40 percent by 2050, relative to historical averages. By 2100, estimated reductions of 50 percent to more than 75 percent are projected for April 1 snowpack.

In addition to reductions in snowpack, warmer temperatures from climate change are expected to change

streamflow patterns. Since the early 20th century, there has been a decline of 5 to 13 percent in spring runoff (as measured by the amount of runoff from April to July relative to the entire water year) for major rivers in Northern California. These observed changes are likely due to a combination of increased air temperatures and changes in winter storms—warmer storm temperatures lead to snowfall only at higher elevations, reducing the amount of snowpack and spring runoff. This shift in runoff results in higher flood risks as more winter precipitation falls as rain than snow, and potentially less water is available in the summer to meet agricultural, industrial, and municipal water needs.

INVESTING IN 21ST-CENTURY SUSTAINABLE WATER SOLUTIONS

The dramatic declines in snowpack and changes in streamflow timing raise serious flags about California's outdated approach to water supply storage, requiring the state to reconsider and change how new and existing reservoirs are managed. Big, new dams will not remedy California's water challenges. The state's current water storage systems were built for the double duty of water storage in dry months and flood protection during winter and spring. Yet new surface water reservoirs are neither the most cost-effective nor the most modern solution for addressing these hydrologic changes and the increasing water-related threats posed by climate change.

While California should plan on getting less water than in the past from snowpack, the opportunities for smarter water use on the farm and in our cities are only growing. Investments in water conservation and local water supplies have consistently been far more cost-effective and less environmentally damaging than investments in new, large reservoir projects in the state.

Urban and agricultural water efficiency, water recycling, better groundwater management, and stormwater capture are becoming California's most promising drought-resistant water supplies. In fact, these 21st-century solutions are the cheapest, easiest, and quickest remedies and have the greatest potential to create more water for California.

Equally critical is modernizing water delivery systems to help California farmers survive this drought and future droughts. According to the U.S. Department of Agriculture, more than half of the acres in California still use water-intensive, gravity-based systems to irrigate crops. And many farmers are unable to irrigate when needed, forced by their district to accept or reject irrigation water on a fixed and inflexible schedule. By upgrading the aging infrastructure that delivers water to farmers, agricultural water suppliers can encourage more efficient irrigation practices such as drip irrigation instead of flood/furrow irrigation, precise irrigation scheduling, and regulated deficit irrigation to greatly improve agricultural water efficiency.