



CALIFORNIA HYDROLOGY UPDATE

CONDITIONS AS OF MARCH 31, 2024



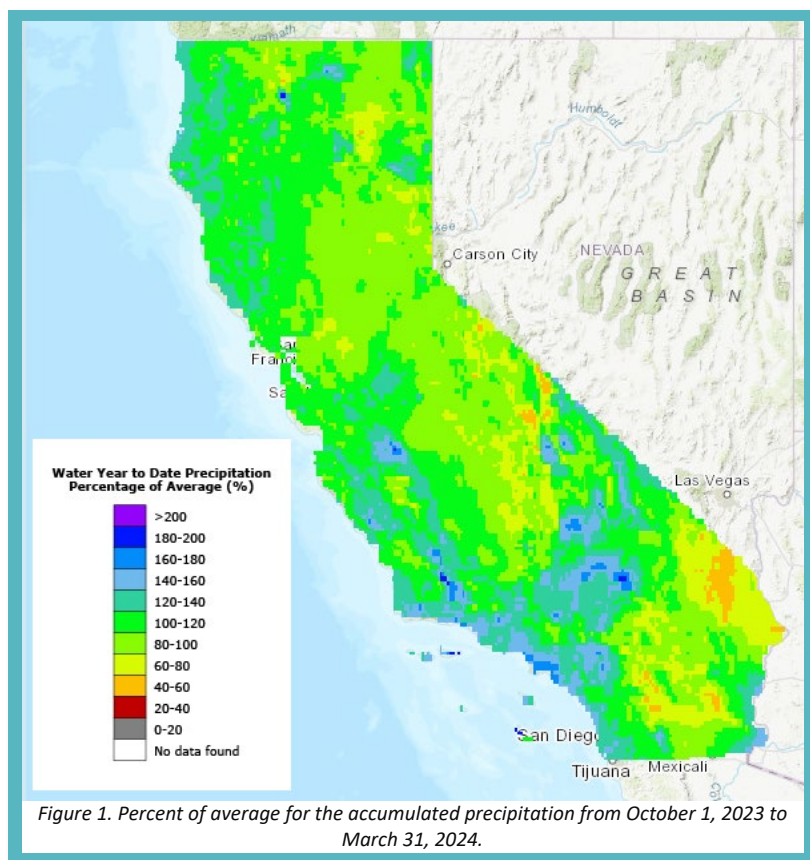
The California Hydrology Update is a regular summary of current weather conditions in the State of California and serves as a supplement to the data on the [California Water Watch](https://www.waterwatch.ca.gov/) website. It is produced by the California Department of Water Resources Hydrology Section and Sustainable Groundwater Management Office teams. For tips and resources on how to make water conservation a way of life, please visit [saveourwater.com](https://www.saveourwater.com/).

PRECIPITATION

The statewide accumulated precipitation for the water year remains just above average at 107%, with 21.2 inches total, through the end of March. March started with blizzard conditions across the Sierra Nevada and an Atmospheric River (AR) during February 28 to March 3. Additional storms, mainly during March 23 to 25 and March 28 to 31, contributed to the total precipitation accumulation in California during the last month.

The AR made landfall in the far northern portion of California around February 28 as a trough off the west coast led to a second moisture pulse to start making its way towards California's coastline. The weak AR (category based on Center for Western Weather and Water Extremes [CW3E] descriptions) and the second moisture pulse slowly moved through Northern and Central California in the following days into March 3. The slow-moving system combined with a cold front reaching California at the end of February, primed for the beginning of March to have prolonged periods of precipitation and substantial snowfall across Northern California's Coast Ranges, Cascades, and along the Sierra Nevada. The AR and moisture pulse resulted in precipitation across the state with highest precipitation totals (for February 28 to March 3) as 3 to 10 inches for the North Coast and Sierra Nevada. Along with the heavy snowfall, there were high winds across the Sierra Nevada, with extreme wind gusts up to 120 mph near Lake Tahoe.

As shown in Figure 1, for the October 2023 to March 2024 period, nearly all areas of the State have had near average precipitation accumulation except for select areas in the Southern and Eastern Sierra Nevada and the Mojave Desert regions. The precipitation that fell during the month of March generally reached all regions of California with higher amounts in the North and Central Coast, Sierra Nevada, and Transverse Ranges. The North Coast has received 51.7 inches of precipitation for the water year through the end of March, which is 116% of average. The Central Coast has received 22 inches for the water year accumulated precipitation through March, which is 121% of average. The Sacramento River region received about 30.6 inches for the water year accumulated precipitation through March, which is 101% of average. The Southern California coastline has accumulated precipitation of 19.8 inches for the water year through March, which is 128% of average.

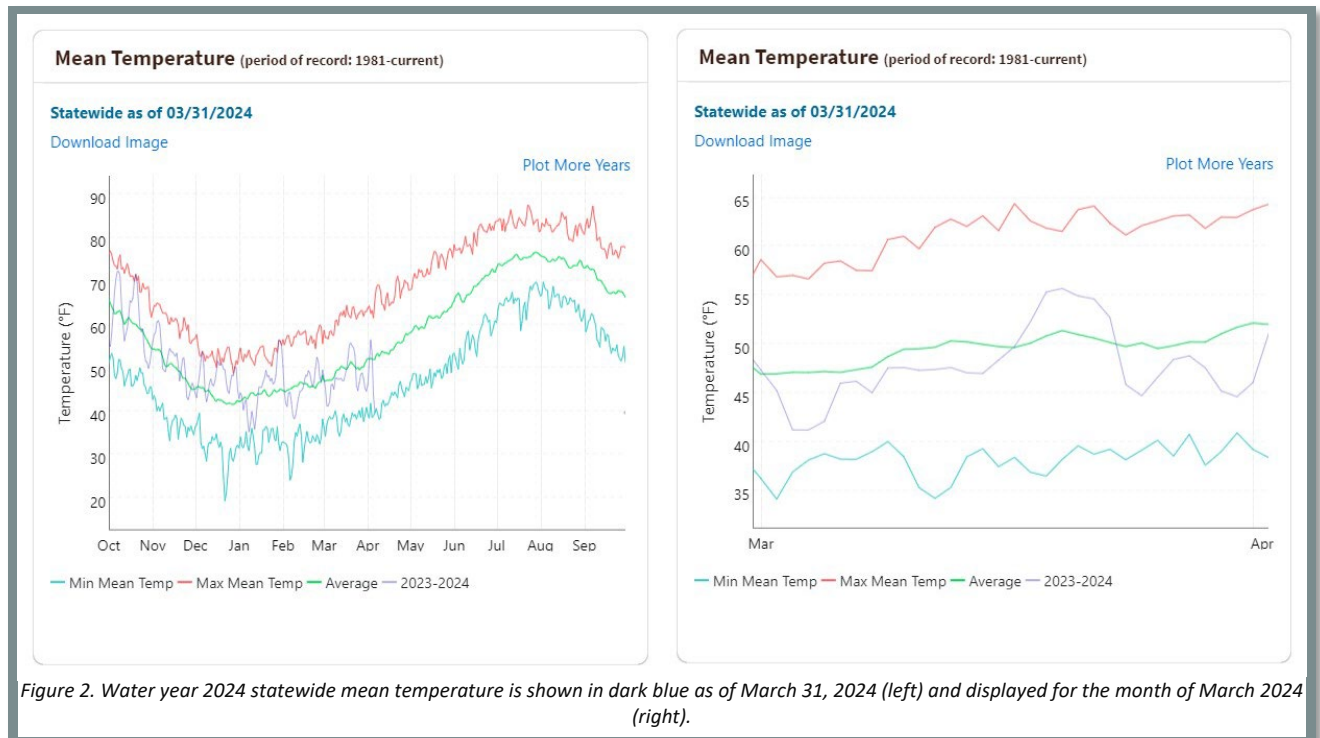


Based on the Climate Prediction Center (CPC) monthly outlook issued on March 31, 2024, for the month of April 2024 indicates up to 40% chance of above normal precipitation for Southern California and parts of Central California, up to 40% chance of below normal precipitation for Northern California, and equal chances of below, near, or above normal precipitation for the rest of the state. The CPC seasonal outlook covering the period of April 2024 through end of June 2024 indicates equal chances of below, near, or above normal precipitation across California.

Sources: [Statewide Hydroclimate and Water Supply Conditions, Forecast Information, Center for Western Weather Water Extremes \(CW3E\) Event Summaries](#)

TEMPERATURE

The statewide average temperature for the end of March was 44.6°F, which is about 7 degrees below the historical average for this time of year. The statewide average temperature for California was below average for the majority of the month of March, excluding about a week between March 17 to 24 where the statewide average temperature was above average (as shown in Figure 2). El Niño conditions are still observed but have weakened in the past month and are forecast to continue. CPC predicts, with an 83% chance, the transition from El Niño to neutral conditions between April to June 2024. CPC also is forecasting, with a 62% chance, La Niña conditions by June to August 2024.



Based on the CPC temperature outlook issued on March 31, 2024, for the month of April 2024 indicates above normal temperatures with 30-50% chance for Northern California and equal chances of below, near, or above normal temperatures for Central and Southern California. The CPC seasonal outlook covering the period of April 2024 through end of June 2024 indicates 50-60% chance above normal temperatures for along California-Oregon border, 40-50% chance of above normal temperatures for Northern California, 33-40% chance of above normal temperatures for Central California, and equal chances of below, near, or above normal temperatures for Southern California.

Sources: [Statewide Hydroclimate and Water Supply Conditions](#), [CPC 30-Day Forecasts](#)

RESERVOIRS

Statewide reservoir storage at the end of March is 116% of average. Most reservoirs are near or above average storage due to the higher inflow that resulted from the AR and storms in the past month. Flood

control reservoirs were able to maintain their storage to be near their respective top of conservation levels by making minor flood control releases and due to the majority of the precipitation falling as snow. The snowpack along the Sierra Nevada acts as a natural reservoir, where snow accumulates typically to a peak amount around April 1 and then begins to melt thereafter. A reservoir's top of conservation level gradually increases during spring and is higher by summer as it captures the snowmelt runoff which will be used for water supply during the dry months when water demand increases across the state.

Reservoirs in the Central Coast and Tulare Lake are well above average for the end of March with 138% and 143%, respectively. The flood control reservoirs that are slightly encroached at the end of March

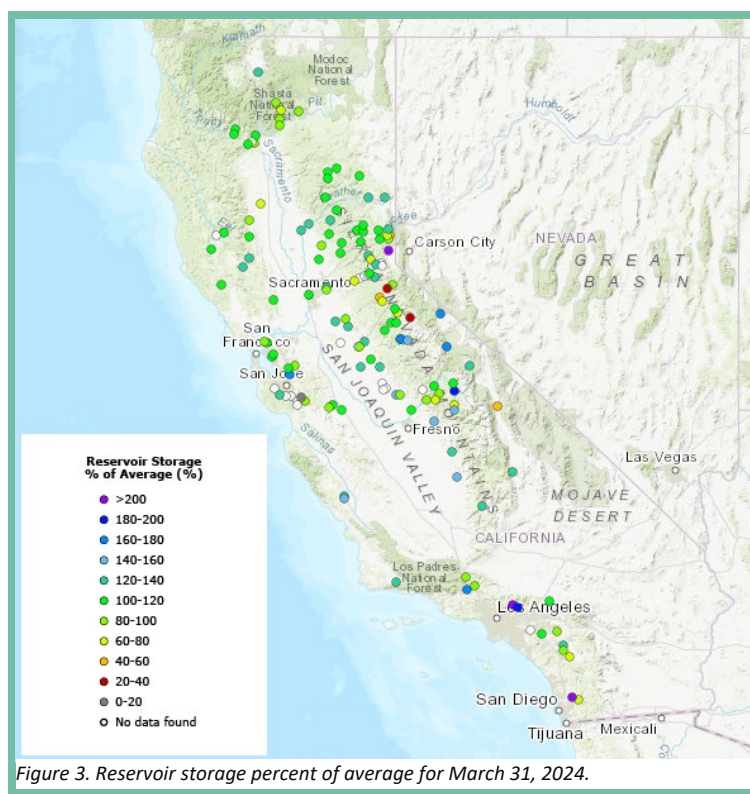


Figure 3. Reservoir storage percent of average for March 31, 2024.

include: Lake Shasta, Black Butte Lake, Lake Oroville, New Bullards Bar Reservoir, Camanche Reservoir, Lake Don Pedro, Millerton Lake, Terminus Reservoir, Success Lake, Lake Mendocino, and Lake Sonoma.

Sources: [California Water Watch](#), [California Data Exchange Center Reservoirs Flood Control](#)

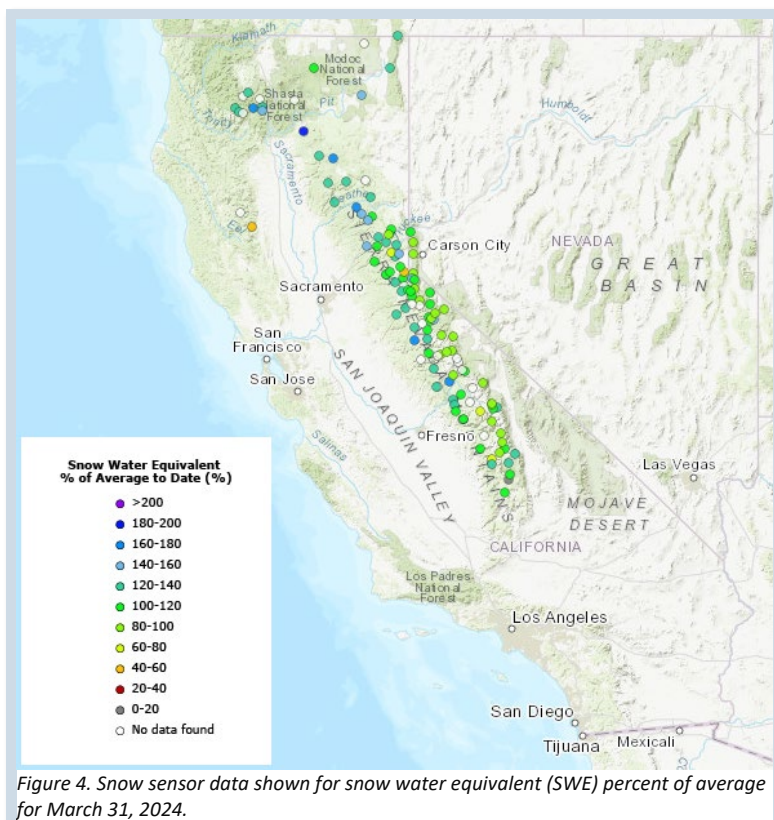


Figure 4. Snow sensor data shown for snow water equivalent (SWE) percent of average for March 31, 2024.

SNOWPACK

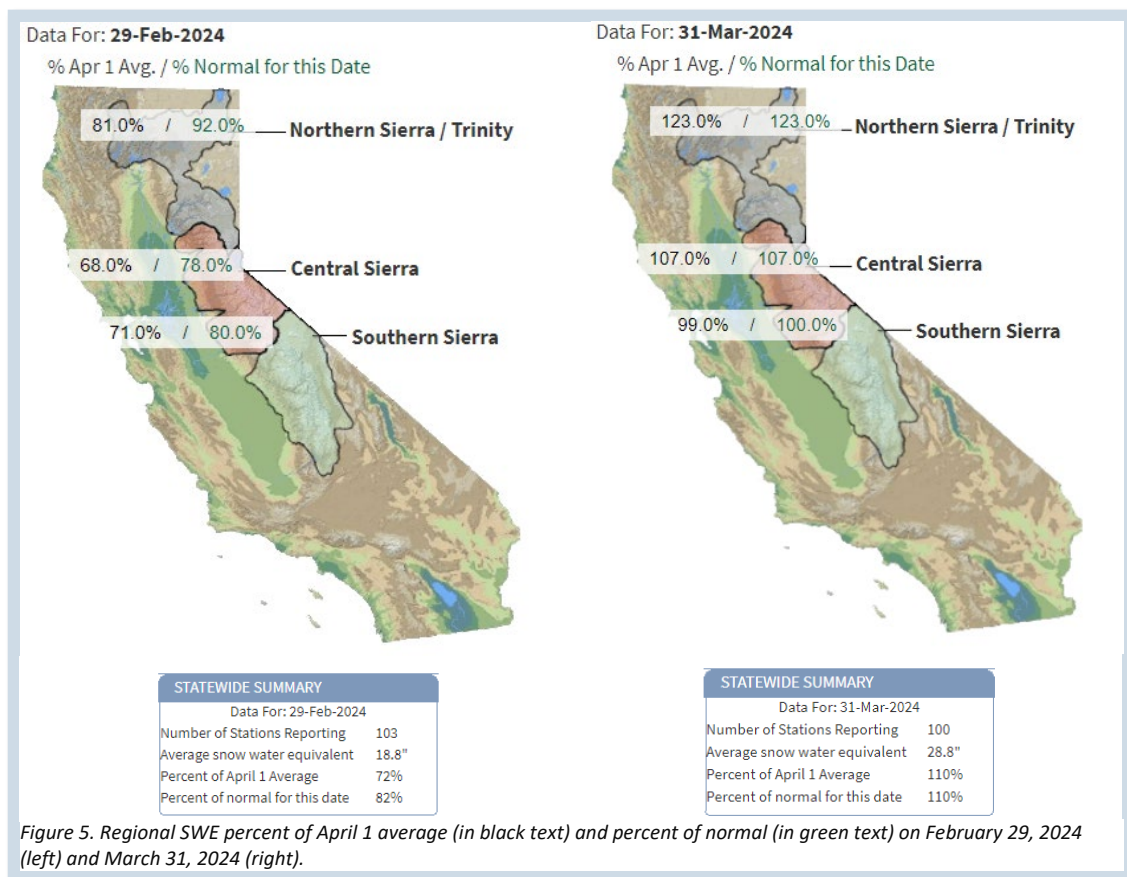
At the end of March, the statewide average snow water equivalent (SWE) was 28.8 inches, which is 110% of average for March 31. As shown in Figure 4, snow sensor readings for SWE percent of average for March 31 was average for the Southern Sierra Nevada (100% of average) and above average for the Central Sierra Nevada (107% of average) and the Northern Sierra and Trinity (123% of average).



The AR and moisture pulse from the February 28 to March 3 period coincided with below normal temperatures leading to accumulation of snow at lower elevations. During the February 28 to March 3 period, snow levels dropped to around 5,000 to 6,000 ft and then down to 2,500 ft as the cold front passed through the state. There were substantial snowpack contributions at the beginning of March which included about 4 to 10 ft in the Northern and Central Sierra Nevada, 2 to 4 ft in the Cascades, Klamath Mountains, and Southern Sierra Nevada, and up to 3 ft in the Northern California Coast Ranges. Figure 5 shows regional SWE conditions at the end of February 2024 (left) and end of March 2024 (right) to further show the snow accumulation during the month of March that helped to get snowpack conditions to exceed or be near the statewide April 1 average.

In general, for the Sierra Nevada, snowpack accumulation peaks around April 1 each year, and thereafter begins to melt with longer days and longer exposure to solar radiation. Several factors involving the timing, pace, and scale of storms and their temperature characteristics through the end of March can influence the total amount of snowpack and when it will begin to melt. The snowmelt period typically is from April through July, where the runoff is collected by major reservoirs for water supply during the dry months of summer and beginning of fall.

Source: [California Water Watch](#), [CDEC Snow Water Equivalent Plot](#)



STREAMFLOW

Streamflow for about 25% of locations across California was at a normal flow rate for the end of March according to United States Geologic Survey (USGS) stream gage locations. About 65% of streamflow locations were flowing greater than average for this time of year, while 10% of streamflow locations were flowing below normal for this time of the year. The colder conditions and the precipitation mainly falling as snow during the month of March, helped to provide relief to major river systems and reservoir operations to effectively manage the runoff from rain. During March, a few California-Nevada River Forecast Center (CNRFC) forecast locations exceeded their respective monitor stages and one location, Santa Margarita River at Ysidora, exceeded its flood stage briefly on March 31.

The rain and higher river flow at the beginning of March resulted in flow over the weirs along Sacramento River specifically at Colusa Weir (March 1), Tisdale Weir (March 1-18), and Fremont Weir (March 1-9). Colusa Weir allows overflow to go into the Butte Basin. Tisdale Weir (through the Tisdale Bypass) allows overflow to go into the Sutter Bypass and Fremont Weir allows overflow into the Yolo Bypass.

Source: [USGS Water Watch](#), [California Nevada River Forecast Center \(CNRFC\)](#)

GROUNDWATER

While the State's surface water reservoirs were replenished from the storms and runoff in water year 2023, groundwater basins are much slower to respond and are still recovering from past decades of drought and significant pumping. Groundwater levels, especially in shallow aquifers, continue to show some improvement this year, however, monitoring wells measured in the last 60 days show groundwater levels in 32% of monitoring wells across California are below normal, 33% are normal, and 35% are above normal. There were 19 dry domestic wells reported in the last 30 days, as of April 11, 2024.

Source: [DWR California's Groundwater Live](#)

