

# California Snowpack Measure Could Reveal Future of Drought

*Surveyors will ski into the Sierra Nevada on Tuesday to gauge prospects for water runoff this spring.*



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Scientists flew over parts of California's Sierra Nevada mountain range to measure March's lower-than-normal snowpack.

PHOTOGRAPH BY NASA JET PROPULSION LABORATORY, AP

**Surveyors will ski into the Sierra Nevada mountains Tuesday to perform what has become an anxiously watched rite of spring in drought-stricken California: measuring snow to determine how much water will flow to the state this year.**

A critical measure of a precious resource, April's survey will influence whether the state's water officials declare that the drought is

easing or that it persists. At stake is the fate of summer water deliveries to farms and cities. (Related: "Could California's Drought Last 200 Years?")

Trailed by news media, surveyors will traverse a granite ridge on Lake Tahoe's 6,800-foot-high (2,073-meter-high) Echo Summit—dense with fragrant pine, fir, and cedar—then drive about ten aluminum tubes into the snow to measure depth. They weigh the samples to gauge water content.

Dozens of other surveyors will be visiting more remote sites in the Sierra. Some may ski 10 to 15 miles (16 to 24 kilometers) and climb more than 5,000 feet (1,524 meters) in a single day.

The skiers, who travel in teams for the sake of safety, take turns breaking trail to conserve their strength, sometimes enlisting help from snowmobiles or helicopters.

Throughout every winter, these spots are revisited monthly to record changing conditions—but findings from the April trip are the most closely watched because that's when snow is deepest.

April's test is considered the most accurate snapshot of how much water is hidden within snowflakes for future use.

"April is when, historically, our snow is at its peak," said Doug Carlson of the state Department of Water Resources. "Then it starts to peter out."

This year's results will be watched even more closely, as the state faces its third year of a drought that is forcing communities to drill emergency wells and farmers to fallow fields, and is threatening fish populations. (Related: "In California, Demand for Groundwater Causing Huge Swaths of Land to Sink.")

The state counts on winter snowfall to get through the rest of spring, summer, and fall. Indeed, the West's mountain snowpack has been dubbed a "frozen reservoir," melting into runoff that feeds the state's rivers and nourishes farms and cities.



California's chief of snow surveys, Frank Gehrke, conducts a survey at Echo Summit in February.

PHOTOGRAPH BY RICH PEDRONCELLI, AP

## Water for Farms and Cities

California's drought is the worst in the state's recorded history.

In January, the State Water Resources Control Board issued an emergency drought order, restricting exports from the Sacramento-San Joaquin River Delta to those necessary to meet drinking water and sanitation needs.

February storms eased some restrictions, but the big water projects—which supply a third of Californians—are predicting little or no water deliveries to most farms and cities this year.

Farmers who are fallowing fields fear there will be no water this summer to support a harvest. In a few communities, wells are running dry. In others, reservoirs are nearly empty.

An accurate snow survey, which allows the state to forecast runoff, leads to better water planning and management, guides the release of water from the state's reservoirs, helps farmers decide what to plant, and tells city dwellers how aggressively to conserve.

A third of California's water supply comes from this blanket of snow.

Improving technology is providing some alternatives to the laborious snowpack-measuring trek. The state has 99 new electronic snow stations that offer real-time results, using collection plates that can be monitored from a distance.

There's ominous news from their most recent recordings: 7.1 inches (18.03 centimeters) of water, only one-quarter of what's normal. While that's an uptick from the season's first measures, it's not enough to reverse the drought.



Don Pedro Lake, a reservoir east of Modesto, is fed by snowmelt from the Sierra Nevada.

PHOTOGRAPH BY PETER ESSICK, NATIONAL GEOGRAPHIC

These electronic findings were echoed by rain gauges, which showed that the average March rainfall at eight stations was only half of the usual average for the season.

### **A Battery of Tests**

But the foundation of the snow surveys program is still the human part of the equation: the snow surveyor.

The test was devised in the early 1900s, when Sierra scientists first discovered a mathematical correlation between winter's snow and the springtime rise of Lake Tahoe. It has since been expanded, with more than 50 state, national, and private agencies pooling their efforts to collect snow data for the state's Department of Water Resources.

Tuesday's public test takes place near Highway 50, near a log cabin belonging to the descendants of Joseph Phillips, who first settled the region in 1859. The area was a favorite route of early Gold Rush explorers seeking easier paths into California.

State Department of Water Resources officials feed results from these three different tests—manual snowpack measurement, electronic sensors and rain gauges, and stream flow data—into a computer to produce a forecast of predicted runoff. The forecast determines how much water will be released from state reservoirs to flow to farms and cities.

Farmers use the information to choose crops and schedule irrigation. Cities use it to determine water rationing. It helps public utilities decide whether to opt for oil, coal, and nuclear fuel instead of hydroelectric power.

Operators of flood control projects determine how much water can be safely stored in reservoirs. Fish releases are also dependent on water forecasts. Even businesses, such as banks and insurance companies, follow the forecasts.



Gehrke checks the weight of the snowpack survey tube earlier this year.

PHOTOGRAPH BY RICH PEDRONCELLI, AP

## Too Little Snow, Too Late

February snow blanketed the steep granite cliffs of the scenic Sierra Nevada, bringing California the first month of near-normal precipitation in over a year and boosting the spirits of state water-watchers. More flurries are expected this week.

But March precipitation has tracked well below average. And the recent snowfall is likely to be too little too late to have much impact on this year's severe drought, says Department of Water Resources director Mark Cowin.

While the storms are providing some short-term gains, the drought is far from being broken, he said. (Related: "Does California Rain Mean the Drought Is Over?")

"We welcome the late storms, but they are not enough to end the drought," said Cowin. "This drought is a wake-up call that we all have to take water conservation seriously and make it a way of life."

California is not alone in its plight.

Snowpack measures in southern Oregon's Cascade Range are low as well, threatening water that is vital for fisheries, hydroelectric power, agriculture, and recreation, with the Rogue and Klamath Basins reporting about 35 percent of average snowpack.

The problem is a high ridge of atmospheric pressure over the Pacific Ocean, which has blocked the so-called Pineapple Express—the traditional route of Pacific storms that target California and southern Oregon—for the past 15 months, according to Stanford University's Daniel Swain, whose California Weather Blog has a following among water-watchers.

Instead, storms have been diverted north into northern Oregon and Washington State. As the southern part of the state suffers, northern Oregon has seen a string of record-breaking storms.

Heavy rains are thought to be responsible for the deadly mix of mud, trees, and boulders that buried the Washington town of Oso in a mudslide last week, killing 17 people, with 90 more still missing.

The same storm systems then descended into Colorado's mountains, creating a snowpack that is 161 percent of last year's level in March. Water managers are already making plans to accommodate extra spring runoff.

Mother Nature may still surprise California, but time's running out.

Without more precipitation, the state's snow surveyors will be forced pack up their skis for the season and skip May's measurement, which is usually the last of the season.

"California's rainy season is already winding down: 90 percent or more of California's 'water year' precipitation normally falls by late March," according to Stanford's Swain.

"Barring a truly exceptional barrage of extreme precipitation events between now and May," he said, "it appears that California's ongoing extreme drought is unlikely to be substantially alleviated before next winter."