

California's Water Supply at Risk From Warmer Winters

Lauren Sommer, KQED Science, 2-8-16

Any sign of precipitation in the forecast is a welcome sight for Californians these days. But with temperatures expected to be above normal this winter, California's snowpack may not reach the heights it could.

Getting snow in the Sierra Nevada Mountains is crucial to the state's water supply. But scientists say as the climate continues to warm, more precipitation will fall as rain instead of snow.

All in the Timing

"Not all precipitation is created equal," said Kelly Redmond, who studies the snowpack at the Desert Research Institute in Reno.

Both snow and rainfall end up in the same place in California, feeding its network rivers and reservoirs. The key difference is timing.

"When it falls as snow, it stays there," said Redmond. "It's like a free reservoir. It doesn't run off, doesn't cause floods."

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The Sierra snowpack melts just as California's dry season begins.

"It releases slowly in the spring, and shows up in the rivers and in our faucets in the summer months," he said.

This timing is critical, Redmond says. The snowpack feeds about a third of the California's water supply. If it fell as rain instead, water managers would need to find a way to store it in reservoirs in the winter until the dry summer months.

Record Warm Winter

State officials, understandably, keep a very close eye on snow levels, doing monthly snow surveys in the Sierra.

Currently, the snowpack is its best in years – 110 percent of normal. But last year at this time, it was just 21 percent. Dry weather was the main culprit to blame, but so was record-breaking warmth.

Last year, for the first time ever recorded in the Sierra, the coldest winter temperatures were above freezing on average.

“It doesn’t take much warming to switch from rain to snow,” said Redmond.

California’s snow is already nicknamed “Sierra cement,” because it’s known for being wet and heavy.

“It’s almost ready to turn to rain,” Redmond said. “It’s not like the powder you get in Utah and Montana and Colorado, which are at higher altitudes.”

For every five degrees of warming, the freezing point of a storm, or the altitude of the “snow level” as it’s called, will rise by a thousand feet, driving the snowpack higher into the mountains.

If rain falls on top of snow, it diminishes the snowpack further by melting it and producing heaving runoff.

“Overall the freezing level in the Sierra Nevada has been going up,” said Redmond. “It’s been more in the spring. What this means is that melting is starting to occur earlier at higher altitudes and runoff is starting earlier.”

Future of Warming

“I think this has been kind of a wake up call,” said Dan Cayan, who studies climate change at the Scripps Institution of Oceanography and the US Geological Survey.

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“The last couple years were extraordinarily warm and I think to some extent those are models for what we might expect in the future,” he said.

Cayan says California’s snowpack has already shrunk by 10 percent on average since World War II, a trend that is likely to continue as the climate warms.

“By the end of the century, if we’re lucky, we’ll only lose half,” said Cayan. “And if we’re unlucky, we could lose more than that. We’re in an era of unprecedented changes.”

Whether California will get more or less precipitation overall with climate change is something that’s been debated, but a study released on Thursday indicates that periods of dryness could increase.

Researchers found that the low-pressure weather systems that typically bring rain to the Southwestern US have formed less often during the last three decades.

“Droughts in the Southwest, specifically in California, are getting more intense and can last longer than in the past,” said Andreas Prein of the National Center for Atmospheric Research, who led the study.

Preparing for More Runoff

“It’s a big deal,” said Mark Cowin, director of California’s Department of Water Resources. “It really does change the dynamic.”

To prepare for a future with more extreme winter runoff, some have called for expanding California’s system of reservoirs.

“Of course, there’s always been interest in dams,” said Cowin. “They’re big. You can see them. But the fact is we’re not going to appreciably change the amount of reservoir capacity we have in California.”

Aside from a handful of proposed projects, there are not many good locations left for dams, he says.

Instead, Cowin says the state will need to look at other options, like storing more water underground through groundwater banking, preparing for floods and using water more efficiently.

Those options will also take substantial financial investment.

“We could spend a hundred billion dollars over the next decade or two pretty easily,” Cowin said. “Even more than that.”

California’s recent water bond could help with that, but at just \$7 billion dollars, it’s really (and here comes the water metaphor) only a drop in the bucket.