

California's shrinking snowpack may spur building more water storage

By Los Angeles Times, adapted by Newsela staff on 02.05.15

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Patchy snow is all that remains on the ground at Glacier Point as Darrell Carlis, 55, of Fresno, California, hikes near the Panorama Trail in Yosemite National Park, Jan. 23, 2015. Brian van der Brug/Los Angeles Times/TNS

LOS ANGELES — On Thursday, California workers poked hollow aluminum tubes into meadows of the Sierra Nevada mountain range to measure the snowpack. In what scientists see as a sign of things to come, they didn't find much.

"We will conceivably see more years like this in the future," said geologist Jeffrey Mount of the Public Policy Institute of California.

As the climate warms in coming decades, scientists say, the state's mountain snowpack — the layers of snow built up over time — could shrink by a third. By the end of the century, more than half of the state's snowpack, and a huge source of fresh water, could disappear.

But that doesn't mean nature will provide less water to the Golden State. The latest climate models suggest the overall amount of precipitation won't change much and may even increase across much of California. Rather, more of it will fall as rain and less as snow, forcing the state to change the way it manages one of the world's most complicated water systems.

Skimpy Snowpack

On Thursday, the snowpack was just 25 percent of average for this time of year. A dry January is partly to blame. But the snowpack is also skimpy because warm storms that hit the state in December dumped heavy amounts of rain, not snow.

On average, the peak California snowpack is equal to about 15 million acre-feet of water. That is enough to fill Shasta Lake, the state's largest reservoir, more than three times. The snow melts gradually over several months, trickling down mountainsides into rivers and swelling reservoirs in the spring and early summer. The reservoirs fill just when demand for irrigation for farmland and drinking water goes up.

Rain, on the other hand, "has to be dealt with immediately. You can't wait," said Kelly Redmond, deputy director of the Western Regional Climate Center in Reno.

Dealing with the rain was not a problem in December, when storms drenched California with 180 percent of average precipitation for the month. Three years of severe drought meant that big reservoirs had plenty of room to absorb the surge of rainwater. Lake Shasta rose by nearly 60 feet.

With climate change, "there could be more water coming off in the winter period than the present system is equipped to handle," said Dan Cayan, a climate scientist at Scripps Institution of Oceanography. Cayan added that the 1-degree Fahrenheit temperature rise since the 1950s already has reduced 5 percent to 10 percent of the spring snowpack in California and the West.

A Delicate Balance

Adapting to more winter runoff could literally require an act of Congress. Dams are operated according to a set of rules developed for each reservoir by the U.S. Army Corps of Engineers and written into federal law. They are designed to maintain the delicate balance between water supply and flood control. Congress has to approve any changes.

The operating manuals for reservoirs are called rule curves. They consist of pen-and-ink drawings that show the exact reservoir level that managers are supposed to maintain on a given date. "The trick is, they've all been custom-done based on historical" water levels, state climatologist Mike Anderson said. In other words, they are not up-to-date.

The state Department of Water Resources and the U.S. Bureau of Reclamation are the two agencies that operate most of California's large dams. They are in the early stages of studying whether rules should be changed because of the warming climate.

As meteorologists get better at predicting big storms, Anderson said, the state also is considering incorporating forecasts into dam operations. If heavy rains were headed for the Sierra, for instance, reservoir levels could be adjusted to catch the increased runoff.

None of that will be done casually. If it doesn't rain, letting the water out of reservoirs means lost water supplies. Filling up reservoirs in the winter may lead to flooding downstream during spring storms.

"Who wants to be the responsible person for not having that flood space in the reservoir?" asked Iris Stewart-Frey, a professor of environmental studies at Santa Clara University, who has studied shifts in the timing of the snowmelt.

"Going To Be A Problem"

Many experts say an obvious solution is to build more water storage. "I think if you want to replace 5 million acre-feet of lost snowpack, I don't see any other way than more storage," state hydrologist Maury Roos said.

But should California build new surface reservoirs or increase groundwater storage, or both? Who will pay for it?

"I see groundwater becoming incredibly important in the ability to store water from those years that are wet and warm," Mount said. "When you've got it, put it in the ground."

Arlan Nickel is coordinating regional climate change studies for the federal Reclamation Bureau. He said another possibility would be to increase the network of smaller, high-elevation reservoirs, such as Mammoth Pool in the Sierra National Forest.

Others argue for more off-stream surface storage, which would divert water from rivers to distant reservoirs.

The loss of snowpack is "definitely going to be a problem," said Jay Lund, director of the Center for Watershed Sciences at University of California, Davis. "But if it's managed well, it should not be a catastrophe."

Quiz

- 1 Which statement BEST explains the effect of the shrinking snowpack for California?
 - (A) The state will have to change the way it manages its water if more precipitation comes in the form of rain.
 - (B) The state may need to consider harnessing the ocean's water to address the water needs of its residents.
 - (C) To change the way reservoirs operate, Congress will need to be involved with the state.
 - (D) The state will store more water for citizens based on the improved predictions of meteorologists.

- 2 Read the sentence from the article.

But the snowpack is also skimpy because warm storms that hit the state in December dumped heavy amounts of rain, not snow.

Which word could replace "skimpy" WITHOUT changing the meaning of the sentence?

- (A) abundant
 - (B) short
 - (C) revealing
 - (D) limited
- 3 Which answer choice does NOT describe how the operations of a dam could be affected by climate change?
 - (A) Dams are operated by the U.S. Army Corps of Engineers and they may continue operating with manuals called rule curves.
 - (B) Dams may have to adjust for increased runoff from rainfall. This could have an effect on dam operations.
 - (C) Adjusting reservoir levels may depend on potential rainfall. As such, weather forecasts may play a larger role in the operation of the dams.
 - (D) Dams currently operate with rules about water levels based on past years. If the climate changes, dams may have to alter their water levels.

- 4 Which phrase from the article helps convey a sense of optimism despite the shrinking snowpack?
- (A) has to be dealt with immediately
 - (B) it should not be a catastrophe
 - (C) three years of severe drought
 - (D) 1-degree Fahrenheit temperature rise since the 1950s already has reduced 5 percent to 10 percent of the spring snowpack

Answer Key

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