

For a class: Science Story

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Headline: Unpacking Snowpack

Deck: Low-to-no-snow winters are projected in the near future

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The beloved crunching of ice chunks under hiking boots and skiers carving past Douglas fir trees seem to be winter relics that may not carry over to future generations. The snowy winters that define much of the Pacific Northwest's cultural environment face challenges in the summing effects of a climate in crisis. As global temperatures rise, snowpack dwindles and soon leaves behind white winters and late summer resource scarcity. Ski resort trips aren't all that's at stake when thinking about a future with low to no snow.

Snowpack serves as a natural reservoir; like water towers, storing generations of compacted ice layers in mountain ranges. For wildfire hubs like Oregon and California, declining snowpack devastates the summer seasons when water resources are needed most. Water scarcity impacts river ecosystems and organisms within them: from fish and other marine species, including Chinook salmon and beavers, to plant life like sword ferns and other wildfire fuels. Less snowpack, resulting in low streams, stresses communities reliant on rivers for drinking water and agriculture.

Scientists measure snowpack to look at snow water equivalent (SWE), which determines the actual amount of water that will be present once the ice melts. When SWE is low, downstream flows are intrinsically low, furthering the dehydration of plant matter that will be a greater threat in fueling wildfires. The revegetation process is crucial to post-fire recoveries, which is heavily reliant on snowpack by providing water resources so plants stabilize the soil, sequester carbon and provide habitats for vulnerable animal species. According to a study, summer rainfall is a key factor in revegetation in most post-fire regions, especially the Oregon and Washington Cascades, while both snowpack and rain patterns are shifting due to climate change.¹

Researchers at Lawrence Berkeley National Laboratory estimate California's Sierra Nevada to have no snowpack as soon as 25 years.² On April 1, 2015, snowpack measurements were taken when snow is typically at its deepest, depending on the mountain range, and they quickly reached dry rock, showing a 21% decline since the 1950s. Researchers are also finding the Sierras will have snowless periods of five to 10 years as soon as the late 2040s and early 2050s.

The Sierra Nevada snowpack provides 30% of the state's water supply. Having rainfall during seasons that used to see snow "challenges some of our traditional water management practices," said Berkeley Lab's research scientist, Erica Siirila-Woodburn, to KQED.³ "The snowpack provides water in a time of

¹ Wilson, A. C., Nolin, A. W., & Bladon, K. D. (2021). Assessing the role of snow cover for post-wildfire revegetation across the Pacific Northwest. *Journal of Geophysical Research: Biogeosciences*, 126, e2021JG006465. <https://doi.org/10.1029/2021JG006465>

² Siirila-Woodburn, E.R., Rhoades, A.M., Hatchett, B.J. et al. A low-to-no snow future and its impacts on water resources in the western United States. *Nat Rev Earth Environ* 2, 800–819 (2021). <https://doi.org/10.1038/s43017-021-00219-y>

³ <https://open.spotify.com/episode/5wLHI5dCxNemaUIPoXbj8P?si=ce3dc055acf44f61>

year when precipitation is scarce. We're facing a situation where the release of this snowmelt and the arrival of our water is going to come further in time when our demands are highest."

"There's still time to mitigate our carbon emissions, such that these future warming scenarios might not arise," said Berkeley Lab's hydroclimate research scientist, Alan Rhoades. "My hope is that we collectively mitigate our emissions so that these projections are proven wrong."