




Study Shows Groundwater Gains in Arizona Yet Climate Risks Still Threaten Water Supply

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(<https://www.jsg.utexas.edu/news/files/superstitions-recharge-aerial-1.jpg>)

The Superstition Mountains Recharge Project is part of the Phoenix active management area in Arizona. Surface water from the Colorado River is brought to the project basins to recharge groundwater. Credit: Central Arizona Project. Photo by Philip A. Fortnam

A combination of water management practices has contributed to notable groundwater gains in Central Arizona despite the region dealing with long-term water stress, according to a study led by researchers at The University of Texas at Austin and collaborators in Arizona and Colorado.

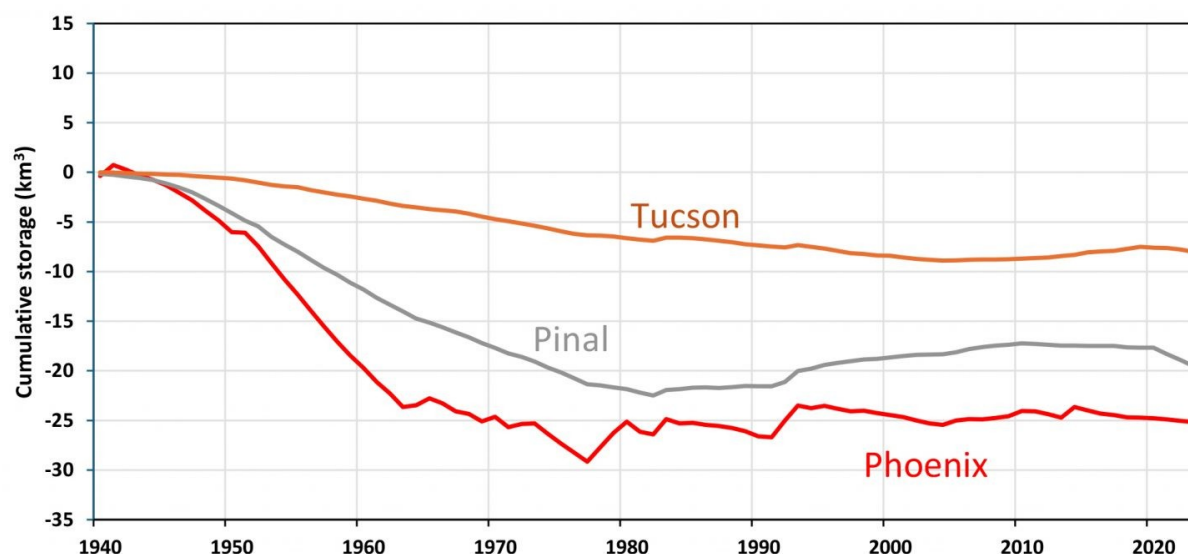
Since 1980, Central Arizona has been working to recharge its depleted aquifers. Much of that recharge depends on water from the Colorado River of the southwestern United States. That water, which accounts for 36% of Arizona's water supply, is brought to the state from over 300 miles away via the Central Arizona Project's system of aqueducts.

Some of the state's policies incentivize farmers to use surface water from the river rather than tap into groundwater. Other policies channel the river water directly to aquifer recharge zones, where it can seep down to the groundwater.

According to the study, which was published in *Communications Earth & Environment* (<https://www.nature.com/articles/s43247-025-02149-9>), these policies have helped bank a total of 10.5 cubic kilometers of groundwater water from 1989–2019 in the Phoenix, Tucson and Pinal active management areas, where these policies are in place. What's more, the researchers found that an additional 14.2 cubic kilometers in the aquifers can be attributed to water seeping in from surface-water irrigation that's not part of an active management program.

Together, the nearly 25 cubic kilometers of water is about five times the annual demand for water in the three active management areas, which are the largest of the state's seven. These are sizeable agricultural districts with a combined size larger than the state of Maryland.

“The research shows the value of conjunctive management of surface and groundwater,” said lead author Bridget Scanlon, a research professor at the UT Jackson School of Geosciences Bureau of Economic Geology.



(https://www.jsg.utexas.edu/news/files/groundwater-levels-over-time_scanlon.jpg)

After decades of depletion, groundwater levels are stabilizing in the three largest active management areas in Arizona. These groundwater gains are due in part to policies that encourage groundwater banking, according to research. Credit: Scanlon et al.

The researchers note that these gains demonstrate that Arizona’s groundwater recharge policies are working – and that these policies could provide a roadmap for other water strapped regions. However, the water provided by the Colorado River faces an uncertain future. Two decades of extreme drought have led to big water declines: the country’s two largest reservoirs, Lake Powell and Lake Mead, have gone from 90% capacity in 2000 to about 30% capacity in 2025 due to the river’s declining flow, and the river is expected to face further declines due to climate change.

That means that even with these groundwater gains, sound aquifer management in Central Arizona will face new challenges, said co-author Kathryn Sorensen, the director of research at Arizona State University’s Kyl Center for Water Policy and the former director of Phoenix Water Services.

“It’s a lot of water, and that’s great. We should celebrate that. But shortage on the Colorado River means we’ll have less water to boost our aquifers, and more pressure to pull groundwater out as a replacement supply,” Sorensen said.

The research findings on the Arizona aquifers are just one aspect of the study, which tracked surface water and groundwater gains and losses across the entire Colorado River Basin over decades. The researchers drew on GRACE satellite data, regional models and groundwater level monitoring data to show how water levels have changed in response to wet and dry periods and human interventions.

In addition to showing the importance of intentional groundwater banking policies, the study showed how incidental seepage from irrigation has also helped recharge the aquifers, which were initially depleted by intensive groundwater pumping from the 1940s–1970s, and how a wet period from the 1980s–1990s provided an additional boost.

“I don’t know if we’ll ever see a wet period like the 70s through the early 90s again, but we need to take advantage of those wet periods and get the water into the ground whenever and wherever we can,” said study co-author Don Pool, a retired former hydrologist for the U.S. Geological Survey’s Arizona Water Science Center.

Water allocations from the Colorado River are governed by a 1922 compact and reservoir operating rules that are set to expire in 2026. Policy makers from different states, indigenous communities and Mexico are convening to renegotiate water draws. Scanlon said that the broad scope and span of the research can help with planning sustainable water use from the river.

“You can see how things have been changing over time,” Scanlon said. “And that’s important if you’re trying to understand climate variability, variations in irrigation pumpage, conjunctive management, and put it into context.”

The study’s additional co-authors are Ashraf Rateb and Robert Reedy of the Bureau of Economic Geology, Brain Conway of the Arizona Department of Water Resources, and Bradley Udall of Colorado State University.

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