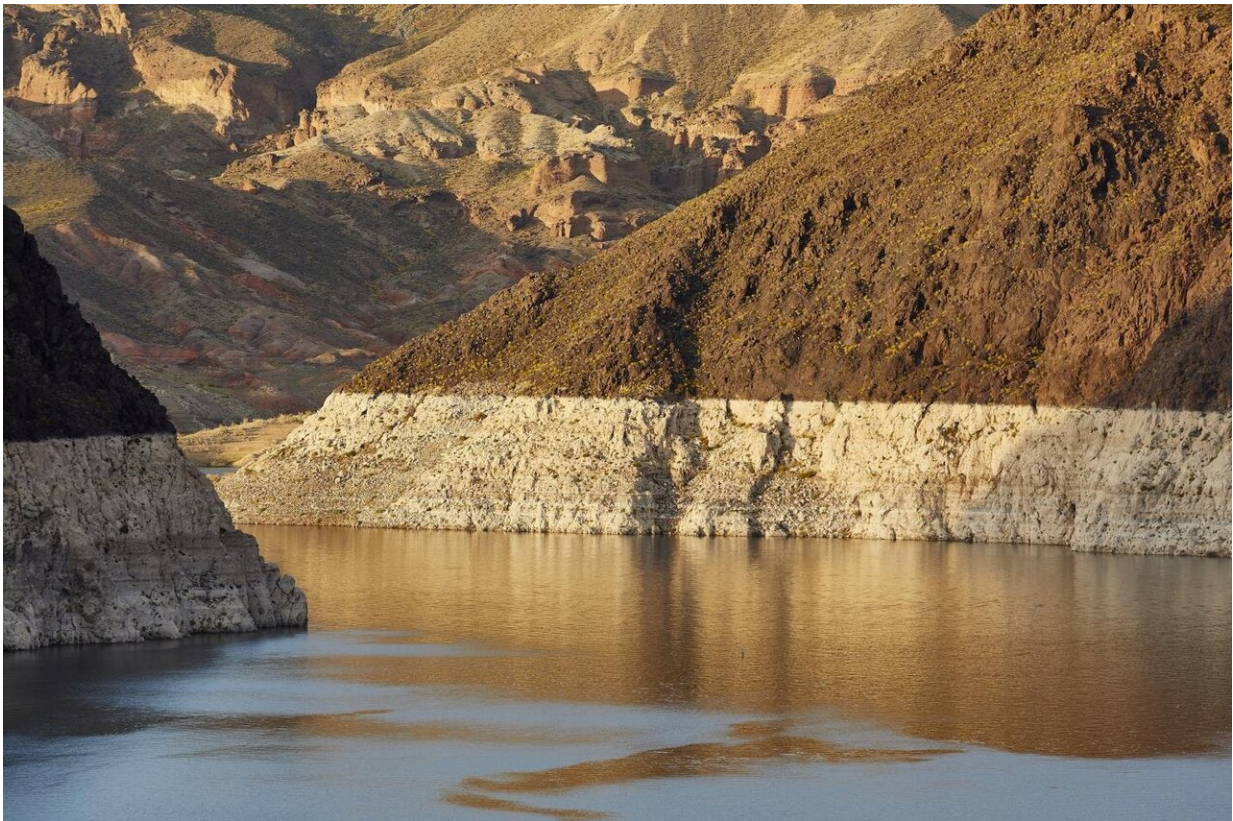


# What happens in Vegas, may come from the Arctic?

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Lake Mead and its infamous bathtub ring is pictured on April 11, 2019. Credit: Josh Hawkins/UNLV

A cave deep in the wilderness of central Nevada is a repository of evidence supporting the urgent need for the Southwestern U.S. to adopt

targets aimed at reducing greenhouse gas emissions, a new UNLV study finds.

UNLV climate scientist Matthew Lachniet and colleagues have compiled a detailed, 13,000-year climate history from stalagmite specimens in Leviathan Cave, located in the southern Great Basin, which provides clues for the mitigation of climate change today.

These ancient climate records show that Nevada was even hotter and drier in the past than it is today, and that one 4,000-year period in particular may represent a true, "worst-case" scenario picture for the Southwest and the Colorado River Basin—and the millions of people who rely on its water supply.

At that time, the long-term hot and dry climate of the region was linked to warm Arctic seas and a lack of sea ice, as well as warming in the western tropical Pacific Ocean, the cave record shows.

This parallels today and the near future, as the release of human carbon emissions into the atmosphere will warm the Arctic and possibly the western tropical Pacific, and is expected to result in long-term arid conditions for Nevada and the broader Colorado River Basin.

If the arid conditions become permanent, then the water supply in the Colorado River Basin is expected to decrease, which researchers say would imperil critical water resources for millions of people who live in the Southwest U.S.

"The last few decades have seen increasingly severe 'hot droughts' in the Colorado River Basin, when high temperatures coincide with less rainfall, and which have startled climate scientists and water policy managers," Lachniet said. "But these dry intervals don't usually last more than a few decades. In contrast, our new data show that Nevada climate

can experience an extended interval of aridity for thousands of years, not just a few decades."

The recent Southwestern U.S. drought that began in 2001, which has resulted in historic low reservoir levels in Lake Mead, is one indicator of the gravity of the problem. The Colorado River and Rio Grande basins are critical human support systems as their headwaters in the Rocky Mountains supply snow-fed water for myriad economic uses and support 56 million residents throughout the region.

"'Business as usual' scenarios for anthropogenic warming carry the risk of tipping the Southwest into an extended state of aridification," researchers wrote.

The paper, published in the journal *Paleoceanography and Paleoclimatology*, provides a clearer and more comprehensive picture of the Southwest's climate history compared to tree ring records which extend only 2,000 years into the past.

Stalagmites—like those located in Leviathan Cave—are common cave formations that act as ancient rain gauges to record historic climate data. Stalagmites grow upward at rates of inches every few hundred years as mineral-rich waters seep through the ground above and drop from the tips of stalactites on cave ceilings.

These deposits more accurately represent a long-term shift toward a more arid climate as they hold data that extends deeper into the past.

A former analysis of one tree ring record, for example, pointed to a 10-year drought in the Medieval era as being a "worst case" predictor of a future, comparable drought, as compared to the more persistent and sustained 4,000-year period of aridity presented in Lachniet's new study.

Regionally, paleoclimate records from other sources like lakes, landforms, pollen, and others, also support the conclusion of warmth and aridity during the same 4,000-year period.

Researchers also found that the Leviathan Cave region, where the stalagmite specimen was collected, is representative of climate conditions in most of the Mojave Desert and the southern Great Basin, and that the data has implications for the broader desert region.

Lachniet and colleagues say that their study can be a resource for policymakers today in adopting measures to reduce [greenhouse gas emissions](#) which will in turn "minimize oceanic and Arctic warming."

"There already is evidence that droughts in the Southwest are partly caused by humans because of the higher temperatures and more evaporation in surface waters like Lake Mead," Lachniet said. "The new fossil-fuel [climate](#) might end up making these droughts permanent."

**More information:** Matthew S. Lachniet et al, Great Basin Paleoclimate and Aridity Linked to Arctic Warming and Tropical Pacific Sea Surface Temperatures, *Paleoceanography and Paleoclimatology* (2020). [DOI: 10.1029/2019PA003785](https://doi.org/10.1029/2019PA003785)

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