

'Climate change is water change' — why the Colorado River system is headed for major trouble



A 2014 view of Lake Mead in the distance behind dry, cracked earth in an area that used to be underwater near where the Lake Mead Marina was once located in the Lake Mead National Recreation Area, Nevada. (Photo by Ethan Miller/Getty Images)

There's good news and bad news for the drought-stricken Colorado River system, according to projections just released in a [new federal report](#) from the Bureau of Reclamation, manager of dams, powerplants and canals.

The report predicts that Lake Mead — the river system's largest reservoir, supplying water to millions of people in Nevada, Arizona, California and Mexico — will narrowly escape a shortage declaration next year. But a shortage is looking imminent in 2018, and water experts are growing ever more worried about the river system's future.

The Colorado River basin has been plagued with drought for 15 years now, and the effects are starting to show. Earlier this spring, Lake Mead — which feeds 90 percent of the water supply in Las Vegas, alone — [dropped to its lowest levels](#) since the Hoover Dam was completed in 1936.

In fact, the last time the lake was at full capacity, with water levels 1,225 feet above sea level, was in 1983. Since then, and particularly since the year 2000, its surface levels have been steadily dropping, leaving behind a striking white “bathtub ring” around the shoreline showing how the water levels have decreased over the years. Currently, demand on Lake Mead has been removing more water than is being replenished, resulting in a deficit of about 1.2 million acre-feet, or about 400 billion gallons, each year.

According to federal guidelines, a shortage is to be declared at the start of any given year if Lake Mead’s water levels have sunk below 1,075 feet above sea level. The new federal projections, spanning the next 24 months, suggest that the elevation will be hovering just below 1,079 feet at the end of this December.

By the end of December 2017, however, the report predicts that water levels will have sunk to about 1,074 feet. If this occurs, the federal government will declare a shortage and affected states will be obligated to reduce their water consumption.

Avoiding a shortage in 2017 can be viewed as a temporary victory, said Jennifer Pitt, the National Audubon Society’s Colorado River project director.

“Were it not for some extraordinary efforts by lower basin water users in California, in Arizona, in Nevada and in Mexico to reduce their use of water already, we would in fact have seen a shortage in the lower basin,” she said.

In 2012, the U.S. and Mexico entered into an agreement known as [Minute 319](#), a cooperative water management plan under which Mexico has been storing water in Lake Mead to help bolster the reservoir’s falling water levels. Under the agreement, Mexico agreed to take part in both surpluses and shortages as they’re declared for the reservoir. The agreement is set to expire next year, but officials have already opened negotiations to potentially extend it.

And in 2014, the Bureau of Reclamation launched the [Pilot System Conservation Program](#) in cooperation with states in the lower Colorado River basin, which has involved a number of projects in California, Nevada and Arizona aimed at conserving water through storage initiatives and demand reduction. The agency estimates that the projects approved so far will have conserved more than 50,000 acre-feet of water — approximately 16 billion gallons — by the end of this year.

However, the projections for 2018 serve as a stark reminder that there’s still work to be done.

“I think it is a short-term success that we’ve avoided shortage this year, but it is a very clear reminder how close we are to the edge,” said Taylor Hawes, The Nature Conservancy’s [Colorado River program](#) director. “We are all in this together. It’s not just a lower basin problem, it’s a full basin problem, including Mexico and the upper basin. And we need to be developing solutions that work for all sectors and work toward long-term sustainability.”

Such solutions will likely be all the more important in the face of future climate change, according to [Brad Udall](#), senior water and climate research scientist at Colorado State University’s Colorado Water Institute.

For the past 15 years, a combination of precipitation declines and unusually high temperatures have helped fuel the region’s ongoing drought.

“Because you have these warmer temperatures, you then get a whole bunch of other processes at play,” Udall said. “You get a higher evaporative load from soil, you get plants that green up sooner and use more water, you get more evaporation out of reservoirs, you get a longer growing season on both the spring and the fall ends. All of that leads to declines in runoff.”



A riverboat glides through Lake Mead on the Colorado River at Hoover Dam near Boulder

City, Nev. last October. (AP Photo/Jae C. Hong)

Melting snowpack in the Rocky Mountains is the primary source of water replenishing Lake Mead and the other reservoirs each spring. But recent declines in precipitation mean there's less snowpack available to melt in the first place. And thanks to the high temperatures in the region, what snow there is has been melting earlier, which adds to the problem. Typically, it's best when the snow melts all at once as late in the season as possible, Udall said. When it melts sooner, it can trigger an early growing season for plants, which then suck up more water throughout the course of the spring than usual. This effect takes away from the water that runs off into the reservoir and can also contribute to longer fire seasons and increased evaporation of water from the soil, all of which also feed drought. And, more simply, an earlier melt can also result in lower water flow later in the summer, when water is needed the most.

These changes are "clearly climate change at work," he said, adding, "Climate change is water change. This is the primary way by which we tiny little humans are going to get to feel the impacts of climate change. The water cycles will change."

It's still unclear how the region's hydrology will continue to evolve as it continues to heat up. Climate models have presented a mixed bag of future scenarios, Udall noted. But so far, the warmer temperatures seem to be linked to long-term declines in flow. And Udall added that recent research has also suggested that future warming may increase the potential for "megadroughts" — droughts that last for decades, rather than just a few years.

"These warmer temperatures make it a lot easier to push the system into a dryness state that's hard to escape from," he said.

This year and last year, unusual weather events in the spring helped the river system avoid an otherwise impending shortage, Udall pointed out.

"In 2015, on April 1, the runoff forecast was for 74 percent of normal," he said. "It was a pretty grim forecast."

However, the country as a whole went on to experience an unusually wet May, which Udall said "bailed the system out from what would have been an earlier shortage declaration for sure." This year, he said, a similar situation occurred.

But it's not a phenomenon the western states should count on in the future, he added. There's still a very real possibility that a shortage will occur in 2018, and a continuation of

the water conservation initiatives undertaken so far — along with additional efforts — will be crucial to avoid a crisis.

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Some experts have suggested implementing a policy in which lower basin states — Arizona in particular — would accept steeper cuts to their annual Colorado River water allocation while the reservoir still remains at higher elevations. A [2009 paper](#), which Udall co-authored, suggested that such aggressive tactics could significantly reduce the probability of crisis through at least mid-century.

This “drought contingency plan” is still a matter of discussion among the lower basin states and the Bureau of Reclamation, but some experts feel that its adoption is crucial to avoiding future crises.

“It is imperative that the three lower basin states adopt the lower basin drought contingency plan to stabilize the Colorado River supply and to give water users certainty about what their supplies will be in the future,” said Pitt of the National Audubon Society.

Ultimately whatever solutions are adopted in the future, experts agree that they must be a collaborative effort among all the beneficiaries of the Colorado River system.

“The sort of geopolitical reality of the Colorado River is that we’re all in it together,” Pitt said. “And all water users and all jurisdictions are going to have to work together to ensure that our water supply is stabilized and our uses don’t exceed what this river has to give.”