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Southwest braces for water cutbacks as drought deepens along the Colorado River

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Unrelenting drought and years of rising temperatures due to climate change are pushing the long-overallocated Colorado River into new territory, setting the stage for the largest mandatory water cutbacks to date.

Lake Mead, the biggest reservoir on the river, has declined dramatically over the past two decades and now stands at just 40% of its full capacity. This summer, it's projected to fall to the lowest levels since it was filled in the 1930s following the construction of Hoover Dam.

The reservoir near Las Vegas is approaching a threshold that is expected to trigger a first-ever shortage declaration by the federal government for next year, leading to substantial cuts in water deliveries to Arizona, Nevada and Mexico.

Arizona is in line for the biggest reductions under a 2019 agreement that aims to reduce the risks of Lake Mead falling to critical lows.

The river has been slipping closer to a shortage for years, and the drought has deepened over the past year, shrinking the flow of streams that feed the river in its headwaters in the Rocky Mountains. The soils across the watershed remain parched and will soak up some of the melting snow this spring and summer. The amount of water that flows into Lake Powell at the Utah-Arizona state line over the next four months is projected to be only about 45% of the long-term average and among the lowest totals in years.

With the reservoirs continuing to drop, the expected cuts next year will reduce the Central Arizona Project's water supply by nearly a third and shrink the amount flowing to farmlands in Pinal County.

Managers of Arizona's water agencies say they have detailed plans in place to deal with the reductions in water supplies over the next five years, even if the drought continues to worsen. These initial steps to cope with shortages are playing out while the seven states that depend on the river prepare for difficult talks on post-2026 rules, negotiating a plan for adapting to a river that's yielding less as the watershed grows progressively warmer with climate change.

Officials who manage Arizona's 336-mile Central Arizona Project Canal, which runs from Lake Havasu to Tucson, have known since plans were first drawn up for the system that they hold the lowest priority and could face cuts in a shortage. Such a scenario wasn't on the horizon in the years after the canal was completed in the early 1990s, but the situation has changed as years of drought and higher temperatures have reduced the flow of the river.

"It's decreasing significantly over time," said Alexandra Arboleda, a CAP board member. "We've planned really well for it, so we don't have to panic, but it is going to mean some significant cutbacks."

Representatives of the seven states in the Colorado River Basin signed the set of agreements known as the Drought Contingency Plan nearly three years ago in a ceremony at Hoover Dam. Under one of the agreements, Arizona and Nevada agreed to take the first cuts to help prop up the level of Lake Mead, while California would participate at lower shortage levels if the reservoir continues to fall.

Under a separate deal, Mexico agreed to help by leaving some of its water in Lake Mead.



The deals lay out shortage tiers based on Mead's levels. The federal government's latest projections show the lake level will sit below the threshold elevation of 1,075 feet at the beginning of next year,

triggering what's called a Tier One shortage.

For Arizona, that means a cut of 512,000 acre-feet or about a third of the CAP's supply. If the level drops further into lower shortage tiers over the next few years, the agency that manages the CAP Canal would see its supply pared back further. The water supplies of Arizona's cities are protected for these next several years under the state's plan, but Arboleda said the situation points to growing challenges in the long term.

"That is something we really need to come to terms with and figure out how we're going to manage without that water," Arboleda said. "We could be experiencing this for a long period of time, and I think the more we can have an ethic of conservation in Arizona, the better off we will be."

The Colorado River's flow has shrunk during one of the driest 22-year periods in centuries. Scientists say the West is experiencing a megadrought and one that's worsened by humanity's heating of the planet.

The drought over the past year has hit especially hard in the Colorado River watershed. Last spring and summer, months of extreme heat combined with the lack of monsoon rains baked the soils dry and shrank the amount of runoff, sapping the river and its tributaries.

This winter, the storms that rolled across the Rockies brought some snow, but not nearly enough to brighten the picture. The snowpack in the Upper Colorado River Basin now stands at 75% of the median for this time of year.

And the dry soils are beginning to absorb some of the melting snow like a sponge.



The upshot, as climate researcher Jeff Lukas puts it, is that “the exceptionally low soil moisture will turn a blah snowpack into a terrible runoff year.”

The effects will ripple downstream to Lake Powell and Lake Mead, which hold supplies for cities, farming districts and tribes across the Southwest.

The country’s two largest reservoirs are both headed for record lows. The last time Lake Mead reached a record low level was in 2016. The latest projections from the federal Bureau of Reclamation show Mead could fall below that mark as soon as July. Lake Powell is now just 36% full, and estimates show it could decline to a record low around March 2022.

“This is going to be a really important year for understanding how the region responds to drought because we’ve seen such dry conditions throughout the West,” said Elizabeth Koebele, an assistant professor of political science at the University of Nevada, Reno, who is studying collaboration in the river basin.

“This situation will provide a really good test of the Drought Contingency Plan,” Koebele said. And working through this sort of test, she said, can help reveal “how radical the changes are that we need to make” to drought plans in the years to come.

‘We are prepared’

The Colorado River and its tributaries provide water for about 40 million people and more than 5 million acres of farmland from Wyoming to the U.S.-Mexico border. Demands for water have outstripped the available supply for many years. Most of the river’s vast delta in Mexico was transformed into a stretch of desert decades ago, leaving only a smattering of wetlands.

Arizona gets an estimated 36% of its water from the Colorado, and a large portion of the water is pumped through the CAP Canal to cities, tribes and farming areas.

The state’s plan for managing cutbacks and shortages through 2026 involves deliveries of “mitigation” water to help lessen the blow for some farmers and other entities, as well as payments for those that contribute water, including the Colorado River Indian Tribes and the Gila River Indian Community.

Under the drought agreement, Arizona’s supply was cut by 192,000 acre-feet each year in 2020 and 2021, representing about 11% of the Central Arizona Project’s total supply. The cutbacks will more than double under the expected shortage next year.

The Arizona Department of Water Resources and CAP said in a statement last week that the shortage will bring cuts that fall largely on agricultural water users in central Arizona.

“These reductions are painful, but we are prepared. We have long understood the risks to Arizona’s Colorado River supplies and have been planning for decades,” the water agencies said.

Ted Cooke, CAP’s general manager, said it helps that the cutbacks under the Drought Contingency Plan are incremental and clearly laid out ahead of time, making them predictable and manageable to plan for.

“It will be the largest mandatory Colorado River reduction in history. And guess what? Arizona is taking it,” Cooke said. “We’ve got this program in place that does a lot to offset, at least at the beginning, some of those immediate impacts, to buy us time to keep the river system sustainable and develop the next plan.”

Cooke said the plan is working the way it’s supposed to.

“We know with lots of warning in advance what is going to happen,” Cooke said. “Once we know what tier we’re in, we’re completely 100 percent certain exactly what is going to happen, who it’s going to impact, how the mitigation works.”

The first-tier shortage will likely continue in 2023, Cooke said. During the life of the agreement through 2026, he added, “we do not expect there to be any reduction in supply to municipal customers.”

But Pinal County farmers who now receive water from the CAP Canal expect to see their deliveries reduced by more than half next year, and then slashed to zero in 2023.

The state’s plan called for replacing a portion of that water by enabling irrigation districts in central Arizona to pump an additional 70,000 acre-feet of groundwater per year. The farmers and their water districts sought \$50 million to pay for drilling more wells, buying pumps and building pipelines to carry groundwater to canals and fields.

Portions of that funding from state and local entities have mostly come through, but federal funds have been “very slow developing,” so the infrastructure projects aren’t on track to be finished by 2023 as

was planned, said Paul Orme, a lawyer who represents four agricultural irrigation districts. That will mean less water available for farmlands that produce crops such as cotton, alfalfa, wheat and corn.

Over the next few years, probably 20-30% of the farmlands in the Pinal area will stop being irrigated, Orme said.

“I still believe Pinal agriculture will be a significant economic driver for Pinal County and the state for years to come even with a contraction in irrigated acres,” Orme said. As water supplies shrink, he said, new irrigation technologies should help allow for more crop production per acre.

A ‘shrinking system’

The drought has dramatically worsened over the past year, not only in the headwaters of the Colorado River but across the West. A year ago, about 4% of the West was in a severe drought. Now, about 58% of the West is classified as being in a severe, extreme or exceptional drought.

With grazing lands parched, some ranchers have had to sell off cattle to reduce their herds. And some Indigenous farmers who usually rely on rains have seen smaller harvests as some of their corn crops have withered.

In Arizona, where a state drought declaration has been in effect every year since 1999, officials have warned of the potential for especially severe wildfires this year.

In the watersheds of the Salt and Verde rivers, which supply the Phoenix area, the snowpack this winter was far below average. And the hot and dry conditions reduced runoff, shrinking the amount of water flowing into reservoirs.

But Salt River Project’s reservoirs began 2020 nearly full after a wet winter, and even after a year of extreme drought, the reservoirs are still at 76% of full capacity.

“It gives us plenty of cushion,” said James Walter, a meteorologist with SRP. “And the reservoirs will still be in a fairly good position following the high-demand season of the summer.”

The relatively well-off condition of these reservoirs stands in stark contrast to the overallocated Colorado River, where the agreements among the states are intended to reduce the risks of a damaging crash.

The Drought Contingency Plan was designed to reduce the chances of Lake Mead hitting the worst shortage tier (below 1,025 feet), and it has accomplished that, said Tom Buschatzke, director of the Arizona Department of Water Resources. He said water conserved both before and after the deal’s signing has helped boost Mead’s level significantly, delaying the onset of shortages.

“It’s definitely working as we had planned,” Buschatzke said. And in Arizona, he said, high-priority water users including cities and tribes “are very well protected, even if the lake continues to go down.”

While implementing cuts, the state’s water managers are also starting to develop proposals for managing shortages after 2026, when the existing deals are set to expire. Last year, the state convened a newly formed Arizona Reconsultation Committee to discuss proposals for the new shortage-sharing guidelines ahead of negotiations among the states.

A central aim, Buschatzke said, is to plan for the “expected drier future that we’re already seeing over the last 30 years from climate change.”

Scientists have found that the Colorado River is very sensitive to rising temperatures as the planet heats up with the burning of fossil fuels.

In one 2018 study, researchers found that about half the trend of decreasing runoff in the Upper

Colorado River Basin since 2000 was the result of unprecedented warming. In other research, scientists estimated the river could lose roughly one-fourth of its flow by 2050 as temperatures continue to rise.

In a report released in February by Utah State University's Center for Colorado River Studies, researchers warned that a "gradual and incremental approach to adaptation" is unlikely to meet the river's challenges in the future.

"The Colorado River can be sustainably managed only if consumptive water uses are matched to available supplies, which will require Upper Basin limitations and substantially larger Lower Basin reductions" than are currently planned, they wrote. "To sustainably manage the Colorado River, water managers will have to match demands to continuously changing supplies using new forms of demand management."

Drought in the headwaters: Climate change is hitting the Colorado River 'incredibly hard'

Buschatzke said the region will need to plan for a river that provides less.

"We might have to learn to live permanently with less than 2.8 million acre-feet of Colorado River water," Buschatzke said, referring to Arizona's allotment. "The challenge is going to be to find a path forward in which we continue to protect Lake Mead, continue to look at doing what we can do to make the Colorado River more sustainable for lots of different purposes, and to find a plan that is as simple as possible."

The low flows this year underline the importance of making sure the post-2026 rules adequately address the trend of decreasing runoff over the long term, said Anne Castle, a senior fellow at the University of Colorado Law School's Getches-Wilkinson Center for Natural Resources, Energy and the Environment.

"It's important for people to understand that we're dealing with not only a limited system but a shrinking system," Castle said, "and that that has real implications for water use throughout the Colorado River Basin."

A chronic water deficit

Across the watershed, states are taking different approaches in responding to the drought and making long-term plans for adapting.

In Colorado, officials convened task forces to coordinate drought responses in cities and agricultural areas, and cities in the Denver area are working together to warn residents about the shortages and the need to reduce water use.

In Utah, where Gov. Spencer Cox declared a drought emergency, officials are urging people in some areas to refrain from watering their lawns.

In the Las Vegas area, the Southern Nevada Water Authority's customers are already conserving enough each year that the agency will be able to contribute its portion of the shortage reductions from its unused allocation in Lake Mead. Because of those water savings over the past two decades, spokesperson Bronson Mack said, "we can absorb the shortages."

"We are confident that we can continue to meet our community's water demands, so long as we stay focused on conservation," Mack said. "We have to stay focused on conservation because the drought we've been experiencing, the implications of climate change going forward, it is serious. And it is going to be incumbent upon everybody to continue to use less."

'Megadrought' in the West: Supercharged by climate change, long drought points to drier future

The Nevada agency maintains year-round water restrictions and continues to provide financial incentives for removing thirsty grass from medians and other areas, Mack said.

Officials from Southern Nevada have also offered to invest in a water recycling project in Southern California, which could enable the agency to use some of the Metropolitan Water District's Colorado River water in exchange.

In Arizona, managers of water agencies have been talking about continuing to boost conservation and water reuse projects to stretch supplies. They've also been discussing the growing strains on groundwater in rapidly growing parts of Arizona, where the total population has more than doubled since 1990.

"We need to continue to do what we've been doing and do more of it," Cooke said. That includes saving water by using desert landscaping instead of grass, installing low-flow devices and promoting more wastewater recycling, he said.

And even though city water suppliers won't face cutbacks, Cooke said, they can choose to adopt additional conservation measures if they feel it's necessary.

"There's a lot more space for conservation and reuse. But those things by themselves," he said, "are not going to solve the whole problem."

Tapping the sea:In the Middle East, countries spend heavily to desalinate seawater

A committee convened by the state has been looking at long-term options for augmenting supplies through desalination, which could include treating salty groundwater in Arizona or working with Mexico to build a desalination plant on the shore of the Sea of Cortez.

High school returns to life after year of remote learning What's the history of the Beet Sugar Factory in Glendale? Phoenix restaurants re-prioritizing sustainability How 2020 was one of the deadliest in years in Maricopa County

As part of the latest U.S.-Mexico Colorado River agreement, a binational workgroup was formed to look into the possibility of desalinating seawater. Last year, a study commissioned by the group concluded that a desalination project on the Sea of Cortez would be "technically and economically feasible."

Arizona's water officials have expressed interest in helping build a desalination plant in an exchange that would enable the state to get some of Mexico's Colorado River water. That water would be expensive because the study showed the cost over 30 years could total \$2,000 or more per acre-foot of desalinated water.

But as scarcity worsens, Arizona may be willing to pay a high price.

Arboleda, the CAP board member, said she thinks desalination will be part of a solution down the road.

The underlying long-term problem, she and others say, is that the 1922 Colorado River Compact and the 1944 U.S.-Mexico treaty have allocated much more water than is available. In future years, the average annual water deficit in the river's Lower Basin has been estimated at 1.2 million acre-feet.

"If you just do the math and you add it all up, that's the problem the Colorado River is facing, is that we've allocated an amount of water that the river can't provide, except in a really good year," Arboleda said. "And so that's why we've been working really, really hard to leave water in the river and in Lake Mead."

Addressing that underlying deficit, Arboleda said, will be a big challenge.

"I'm hopeful because I think we have a good process in place to work with the other basin states. But

it's not going to be easy to work through all of that," she said.

As the seven states prepare for negotiations on the post-2026 rules, leaders of tribes have also said they want their voices to be heard in the talks. They've expressed hope that the Biden administration will listen as Interior Secretary Deb Haaland, the first Native American to hold a Cabinet post, oversees the talks.

Meanwhile, disagreements have emerged about plans in the Upper Basin to take more water from the river, including Utah's proposal to build a 140-mile pipeline that would transport water to support plans for growth. In September, representatives of the six other states pushed back against Utah's pipeline proposal, voicing concerns in a letter to the federal government and warning of a potential court battle.

Cooke said the proposed Lake Powell pipeline was one of the subjects he and Buschatzke discussed with Utah's representatives last week.

"The one thing that I told the Utah folks was, yes, they have the contractual right to develop further water supply usage in their state, but what are the consequences of doing that?" Cooke said. "Look what has happened in the Lower Basin."

He pointed out that in the 1960s Arizona had to accept junior-priority status to get the Central Arizona Project through Congress.

"And now that we have spent billions of dollars to develop this capability to take it, we're needing to cut back. We're not able to take everything that we're entitled to take," Cooke said, adding that he urged Utah's representatives to keep that in mind.

"Is that supply really going to be there?" Cooke said. "And how much are you going to spend to take water some of the time?"

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