

Crescenta Valley Water District

Weekly News Articles

February 5, 2023



Washington Post

February 5, 2023

The Colorado River drought crisis: How did this happen? Can it be fixed?

The Colorado River is in crisis. The problem has been building for decades but has come to a head in recent years because the major reservoirs on the river have fallen to dangerously low levels, prompting the Biden administration to call for unprecedented cuts in water usage among the 40 million people who rely on the river.

That is forcing tough decisions out West. How do you balance securing water for some of the fastest growing cities in the country with preserving water for farming regions that supply most of the country's winter vegetables? Do you recognize that some users have a longer established right to the water than others, such as farming regions that laid legal claim to the water before urban areas?

Six of the seven states along the Colorado River have agreed to an approach for cuts that would get them close to what the Biden administration is calling for — but California, the biggest water user along the river, remains the lone holdout, leaving officials in the West worried about conflicting plans.

Story continues below advertisement

As the country starts to pay more attention to the plight of the Colorado River, we addressed some questions about the river and how its highly coveted water is distributed.

Why is the Colorado River drying up?

The Colorado River is drying up due to a combination of chronic overuse of water resources and a historic drought. The dry period has lasted more than two decades, spurred by a warming climate primarily due to

humans burning fossil fuels. These hotter and drier conditions in the western United States have drained the major constructed reservoirs on the river — Lake Powell on the Arizona-Utah border and Lake Mead on the Arizona-Nevada border — to levels not seen since these reservoirs were first filled decades ago.

Story continues below advertisement

In 1999, the year before the drought started, those two lakes together held 47.6 million acre-feet of water — that's about 92 percent full. This week, they held a combined 12.9 million acre-feet of water, or about one-quarter full. An acre-foot is equal to 326,000 gallons of water, about as much as two to three typical households would use in a year.

The amount of water being used by the seven western states and Mexico far exceeds how much water is running through the river, James Prairie, the Colorado River's research and modeling group chief at the Bureau of Reclamation, explained in a presentation in Las Vegas in December. Between 2000 and 2020, the natural flow of the Colorado River averaged 13.4 million acre-feet. In that same period, water consumption averaged 15 million acre-feet. Since the drought started, water use has outstripped supply by 33.6 million acre-feet.

"These reservoirs have served us for 23 years but we're now pushing them to their limits," Prairie said.

One of the most frightening dynamics playing out in the last few years is the changing relationship between snowpack in the mountains and runoff into the reservoirs. Last year was a decent snow year, about 90 percent of the normal amount of snow fell, but only about 60 percent of normal runoff reached the reservoirs. In 2021, things were even worse: another 90 percent snow year resulted in 29 percent of average runoff.

Story continues below advertisement

Scientists attribute this breakdown to climate change — the hotter and drier conditions now permeating the West. Drier soils absorb more water before it can reach the lakes. Hotter temperatures evaporate more water and lengthen the growing season for plants, sucking up more water.

How many states does the Colorado River run through?

The Colorado River runs through seven states. It starts as little streams in Colorado's Rocky Mountains (and is also fed by tributaries originating in Wyoming) and wends its way south and west for 1,450 miles until it ends in Mexico's Gulf of California. The water is divided among what are known as the "Upper Basin" states: Colorado, Wyoming, Utah and New Mexico; and the "Lower Basin" states: California, Arizona and Nevada.

Story continues below advertisement

The Upper Basin states have fewer reservoirs, and water gets diverted from the river in thousands of places to serve farms and other users. The Upper Basin has to adapt its usage more to wet and dry years.

The Lower Basin states regulate their water deliveries every year from massive reservoirs, in particular Lake Powell and Lake Mead. If water levels fall too low in these reservoirs, [they could reach "dead pool."](#) That's the point when water would be effectively blocked from passing Glen Canyon Dam (on Lake Powell) and Hoover Dam (on Lake Mead) — cutting off the lifeline to some 25 million people who get water from Lake Mead.

In October 2022, Lake Powell was a quarter full due to a historic drought, which threatened power supplied to millions by the Glen Canyon Dam in Page, Ariz. (Video: John Farrell/The Washington Post)

What are water rights?

Water rights on the Colorado River refer to who has permission to take water out. They are based on seniority and governed through a complicated network of laws, court decisions, contracts and regulations known as the Law of the River.

Story continues below advertisement

There have been some important milestones for these rights over the past century.

Access to the river's water was divided among these seven states in 1922, in an agreement known as the Colorado River Compact. Two decades later, in 1944, Mexico was guaranteed a portion of the river by treaty. These agreements grant a total of 17.5 million acre-feet of water to be shared between the states and Mexico. But the river's natural flow has been far less than that in recent years.

In 1963, a Supreme Court case, *Arizona v. California*, ruled that of the first 7.5 million acre-feet that heads to the Lower Basin states, 4.4 million goes to California, while Arizona gets 2.8 million and Nevada gets 300,000.

Story continues below advertisement

Five years later, in 1968, the federal government agreed to build the Central Arizona Project, a network of canals that transport Colorado River water through Arizona. In exchange, Arizona agreed to junior water rights, so California would get its share of water before Arizona in times of shortage.

Times like right now.

What does California want to do about the Colorado River crisis?

California is the elephant in the room in the Colorado River talks. It uses more water than any state. It is also the remaining holdout among the seven states in current negotiations over how to meet the Biden administration's push to cut 2 to 4 million acre-feet in usage and keep the reservoirs from hitting dead pool.

Story continues below advertisement

California [did not sign on](#) this week to a plan by the other six states (Utah, Colorado, Nevada, Arizona, New Mexico, Wyoming) and instead offered its own plan.

The dueling plans ultimately get to a similar place: When reservoir levels at Lake Mead drop close to dead pool, both plans would propose a similar

scale of cuts of some 3.3 million acre-feet. But on the way down, the timing of those cuts, and which state makes them, are very different.

The six-state plan attributes 1.5 million acre-feet of lost water to evaporation and other “system losses.” Cuts in supply to account for this amount of water would be divided among the Lower Basin states once Lake Mead’s elevation is below 1,145 feet, which it is now. That translates into at least 766,000 acre-feet of cuts for California.

Story continues below advertisement

California’s plan offers to cut far less, at least initially: 400,000 acre-feet per year until 2026, a reduction of about 9 percent, with increasing cuts as reservoir levels drop.

California authorities argue their plan follows the Law of the River — giving priority to agricultural regions in the Imperial and Coachella Valleys that established water rights before other urban areas. The state’s natural resources secretary, Wade Crowfoot, [wrote](#) on Twitter this week that the six-state plan “upends long existing rights, compacts & agreements that CA urban & rural water users depend on.”

But California’s plan also puts a massive burden on Arizona. At the lowest levels, it would mean a cut of nearly 1 million additional acre-feet larger for Arizona, leaving the state with only 600,000 acre-feet of water from the river. Arizona’s allotment from the river is 2.8 million acre-feet.

“I’m going to have nightmares tonight,” Pat Jacobs, a Central Arizona Project board member, said at a meeting of the board Thursday.

“I think we’ll all have sleepless nights as the result of that figure,” board president Terry Goddard said.

Does the heavy snow this winter help the Colorado River?

It definitely doesn’t hurt. The main source of runoff for the Colorado River is the snow that piles up in the Rocky Mountains. This year snowpack in the area that feeds the Colorado River is running at 143 percent of normal for this time of year, Vineetha Kartha, Colorado River

programs manager with the Central Arizona Project, told the organization's board meeting.

The snows have helped push back the timeline for some of the most dire scenarios facing the river.

Projections by the Bureau of Reclamation in recent months showed Lake Powell could fall below the level where Glen Canyon Dam could no longer produce electricity as soon as July. But the latest projection in January does not have the lake dipping below that level this year. The shift is also partly due to the fact that the bureau changed the timing of how it releases water from Glen Canyon Dam — reducing its monthly water releases through April and then increasing them in later months — to help protect reservoir levels.

But the larger fears remain that without major reductions in how much water the states consume from the river, these reservoirs will continue to dry up.

“We are doing really good. We are doing way better than last year,” Kartha told the Central Arizona Project board meeting. “But I would like to serve this with a large side of caution. It's very early in the season. And if there is any high temperatures or drying this could easily go south.”

Drought and the Colorado River

What is the Colorado River? Running southwest from the Rocky Mountains to Mexico's Gulf of California, the river runs through seven states in the American West. It powers agricultural land and urban areas, [serving roughly 1 in 10 Americans](#).

[Why is the river drying up?](#) A combination of chronic water overuse and historic drought conditions are creating chaos. The dry period has lasted more than two decades, draining the major reservoirs along the river. The amount of water being used [far exceeds what's actually available](#).

What's being done? The Biden administration is pushing to cut 2 to 4 million acre-feet in water usage, and is [in negotiations with the seven](#)

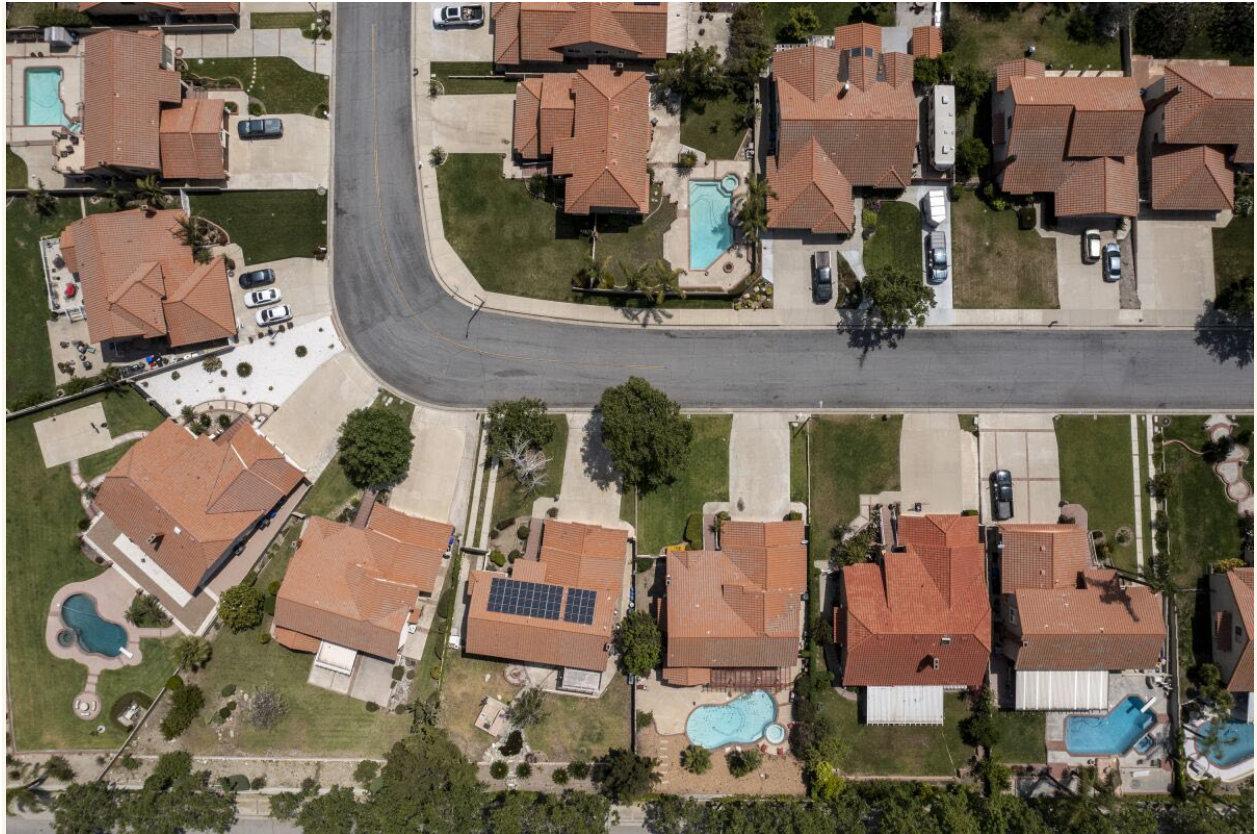
[states affected](#). California, despite using more water than any state, is the remaining holdout. [It has offered its own plan to conserve water.](#)

<https://www.washingtonpost.com/climate-environment/2023/02/05/colorado-river-drought-explained>

LA Times

February 6, 2023

Why Southern California water restrictions remain despite so much rain



A housing tract last year in Rancho Cucamonga, where outdoor watering has been reduced to one day a week.

(Robert Gauthier / Los Angeles Times)

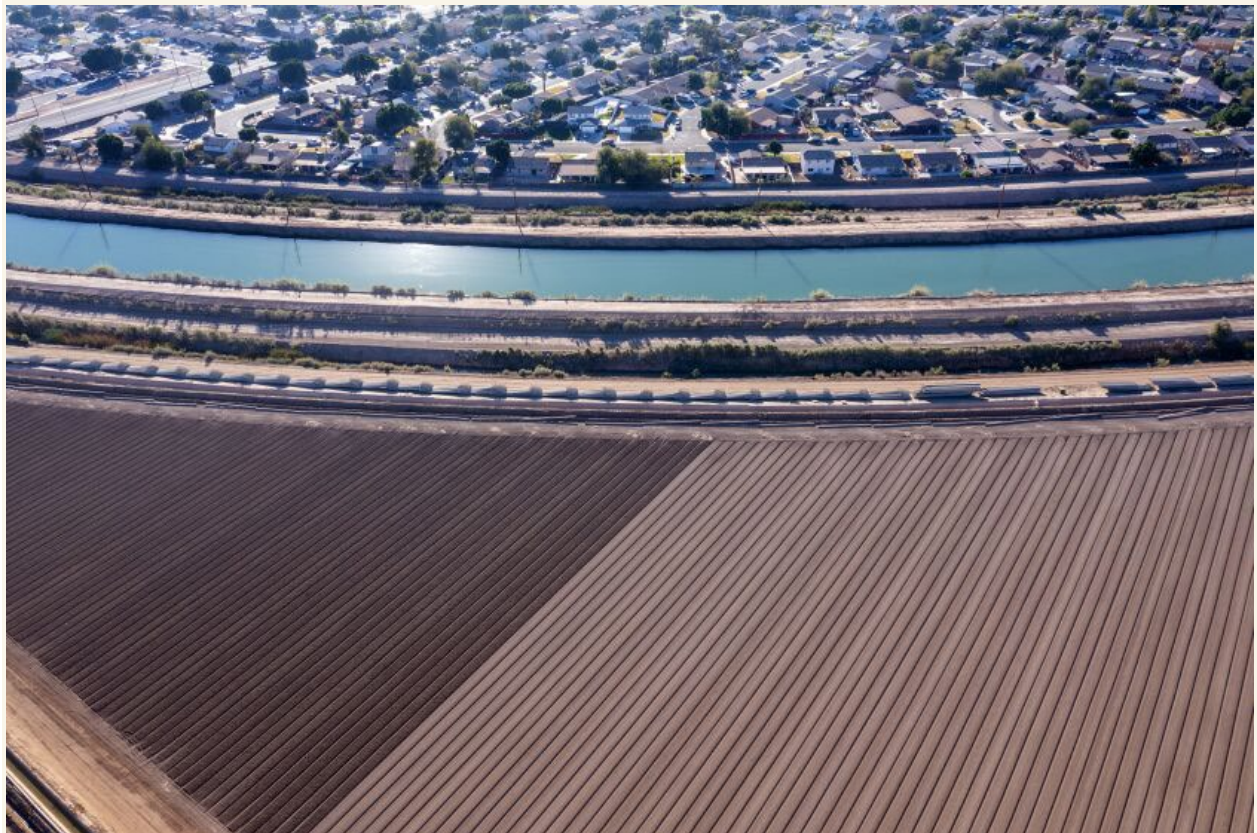
Call it water whiplash: As California recovers from one of its wettest months in recent history, the Colorado River is still dwindling toward dangerous lows.

As a result, Southern Californians aren't sure whether to expect shortage or surplus in the year ahead. Though the state is snow-capped and soggy from a series of atmospheric river storms, the region remains under

a [drought emergency declaration](#) from the Metropolitan Water District of Southern California. That includes mandatory water restrictions for about 6 million people in and around Los Angeles.

The early-season storms provided some drought relief, but most officials say it would be premature to loosen water restrictions. In fact, the severity of the crisis on the Colorado — and the federal mandate that California and six other states [significantly reduce their use of water from that river](#) — means more calls for conservation are likely in the months ahead, according to MWD General Manager Adel Hagekhalil.

The wet start to the year “shouldn’t take the momentum away from us continuing to work on building resiliency, recycling water and storing water when we have it,” Hagekhalil said. “We should conserve as much as we can so we can save water to have it available when we need it.”



[Climate & Environment](#)

[California is alone in battle over Colorado River water cuts](#)

As the region wrangles over Colorado River water cuts, California hopes its senior water rights will trump the united front shown by six other states

Feb. 2, 2023

Hagekhalil said [January's burst of moisture](#) was characteristic of climate change, which is driving huge swings between bouts of extreme wetness and extreme dryness. In 2022, a similarly strong start to the wet season ended with the driest January, February and March on record — meaning there's no guarantee that the state will still be wet come spring.

“I don't want to deal with the water supply in Southern California on a month-to-month, day-to-day basis,” he said. “I want to look at the long term, at how we can create a resilient water future for everyone, with no one left behind.”

The storms did provide enough of a boost for the Department of Water Resources to tentatively increase this year's State Water Project allocation [from 5% to 30%](#) for its 29 agencies, including the MWD. The State Water Project is a system of reservoirs, canals and dams that is a major component of California's water system.

For the record:

9:40 a.m. Feb. 6, 2023An earlier version of this article said incorrectly that Southern California gets about half its water from the Colorado River. Southern California gets about one-quarter of its water from the Colorado River.

But Southern California still gets about one-quarter of its water from the Colorado River, which didn't really benefit from the storms and remains remarkably strained, Hagekhalil said.

He said MWD's board will be evaluating the water supply between now and June to determine whether to upgrade Colorado River-dependent areas from their current voluntary 20% reduction to a mandated allocation — a move the agency made last year [for State Water Project-dependent areas](#).

Though plans may change, MWD will likely aim for “uniformity across the whole region to ensure that we are all continuing to save, especially with what we’re seeing on the Colorado River,” Hagekhalil said.



At the heart of Colorado River crisis, the mighty ‘Law of the River’ holds sway

At the heart of tensions over water allotments from the Colorado River is a complex set of agreements and decrees known as the ‘Law of the River.’

Feb. 3, 2023

Some decisions also fall to individual agencies, which are often reliant on local conditions when it comes to their supplies. The Los Angeles Department of Water and Power serves about 4 million people and receives some of its water from the MWD. Officials there never distinguished between Colorado River and State Water Project-dependent customers and instead last June placed their entire service area under [two-day-a-week watering restrictions](#). DWP spokeswoman Ellen

Cheng said Friday that while the recent storms were welcome, “the region’s water challenges are not over.”

“Reservoirs and storage within the state are still recovering, and impacts of Colorado River use reductions have yet to be resolved,” she said. “For now, L.A. is maintaining course with the current outdoor irrigation restrictions, and we are closely monitoring supply conditions as they continue to develop over the next couple of months.”

She added that DWP encourages customers to “keep their foot on the pedal” and continue to use water efficiently, including [taking advantage of turf replacement programs](#) to reduce water use.

Other areas plan to relax restrictions, however. The Las Virgenes Municipal Water District, which serves about 75,000 residents in Agoura Hills, Calabasas, Hidden Hills and Westlake, plans in the coming week to recommend to its board of directors a scaling back from Stage 3 of its water-shortage contingency plan to the less-restrictive Stage 2, spokesman Mike McNutt said.

Las Virgenes receives almost all of its supplies from the State Water Project and was among the areas hit hardest by reduced allocations last year.

If the move is approved, Stage 2 would loosen mandatory water restrictions and create a new districtwide target for a voluntary 20% reduction in water use, McNutt said. The district would also increase water budgets to what they were prior to the drought emergency and cease [installing flow-restriction devices](#), save for potential cases of excessive and repeated overuse.

“In the past six months, our customers have averaged a 40% reduction in water usage compared to 2020 figures, which is remarkable,” McNutt said.

The agency is also moving forward with [plans to construct a wastewater purification facility](#) to reduce its dependence on imported supplies.



Low on water, but high on celebrity, Las Virgenes seeks wastewater purification facility

A water-strapped celebrity enclave that has long relied on imported supplies has taken a significant step toward water recycling.

Dec. 15, 2022

At the Inland Empire Utilities Agency in San Bernardino, officials are more cautious about the months ahead. The wholesaler, which serves about 935,000 people, has since December been in Level 6 of its water-shortage contingency plan — the most severe level, reflecting a shortage of 50% or more.

“While the winter storms have provided us with some much-needed relief, our state is still facing considerable water supply challenges in the future,” General Manager Shivaji Deshmukh said in a statement Friday.

Deshmukh said the IEUA is working closely with the MWD to assess how the recent changes in imported supplies will affect the region.

“Although long-term impacts are still unknown, we believe that the increase in the State Water Project allocation will provide our customer agencies with supplies to better meet regional consumptive demands for the first six months of 2023,” he said. “Nevertheless, it is critical that we continue to work with and support our customer agencies on the implementation of their water use efficiency programs and assist in educating the community on the importance of conservation and the use of precious local supplies.”



Epic California snowpack is now the deepest it's been in decades

Drought-weary California enters February with significant snowpack. But it could still disappear quickly if dry conditions return.

Feb. 1, 2023

Such uncertainty is not unique to Southern California. Residents in all of the state's 58 counties remain under [Gov. Gavin Newsom's drought emergency declaration](#), and state officials said it's too early in the wet season to even consider lifting that order.

"We have a 30% State Water Project allocation, the Los Angeles Aqueduct system has great snowpack right now ... and then we have the Colorado River system, which is a question mark at this point," Jeanine Jones, DWR's drought manager, said during a news briefing this week.

Newsom first placed Sonoma and Mendocino counties under a drought emergency in April 2021, then added more counties in May and July before [expanding the order to the entire state in October](#). Jones said that if and when the time comes, California will probably exit the drought emergency the way it came in — county by county, or region by region.

"We can talk about things like statewide snowpack, statewide runoff, statewide precipitation, but water supply is a local function, and it really comes down to what are the circumstances affecting a particular community or area," Jones said. "Some areas will likely come out of drought conditions because of the very wet conditions that we've had, but it really depends on the circumstances of a water supplier's individual sources of supply."

Jones said groundwater, the state's system of aquifers, [remains severely depleted](#) and could take years to recharge. Lake Mead and Lake Powell will similarly need more than one wet season to refill, she said, noting that the drought in the Colorado River basin began in 2000.

MWD's Hagekhalil said the fragility of the system means that every drop is valuable, and the likelihood of an eventual return to dryness in California is all the more reason to conserve while water and snow are here.

"We cannot be just adapting to the rain and waiting for the rain," he said. "This is bigger than all of us. The climate has changed, and we need to change."

<https://www.latimes.com/california/story/2023-02-06/what-the-colorado-river-crisis-means-for-southern-california>

Washington Post

February 7, 2023

California storms left behind a ‘generational snowpack.’ What that means.

The snow is a boon for the state’s water supply but could pose a flood risk as the season progresses

California’s mountain snowpack is the largest it’s been in decades, thanks to a barrage of atmospheric rivers in late December into January. The snow is a boon for the state’s water supply but could also pose a flood risk as the season progresses.

Measurements completed last week show that Sierra Nevada snow water content is rivaling or outpacing the [1982-83 season](#), the biggest snow year in the past 40 years. Up to two feet of additional snow fell on the region this weekend.

“[It’s] fair to say this is a ‘generational snowpack,’ as many of the younger folks haven’t seen snow like this before, or if so, not in a long time,” Benjamin Hatchett wrote in an email. He is an assistant professor of atmospheric science at the Desert Research Institute in Reno.

Statewide snowpack is double the norm for the time of year. Some locations with longer records are ranking in the top 3 for early February snow since the 1940s and ’50s, according to Hatchett.

Story continues below advertisement

Most important, at least a full season’s worth of snow has fallen so far across the Sierra, and more storms could arrive in February and March.

“This is good news, but we now hope we’ll continue building, or at least maintain, that snowpack such that we don’t lose it to earlier-than-normal

melt, as this implies that we can't store it as effectively in our reservoirs,” Hatchett wrote.

A ‘big boost’ for reservoirs

The recent extreme wet period put a sizable dent in the state’s drought.

Major reservoirs, many of which were severely depleted before winter started, are now near their historical average for the date. Those gains have prompted officials to [increase](#) planned water allocations to farms and cities served by the State Water Project, a storage and delivery system that stretches from the Sierra Nevada to Southern California. [Lake Oroville](#), the backbone of the project, has added more than 1.2 million acre-feet of water since late December.

Story continues below advertisement

“Our reservoirs have gotten a really big boost from the nine atmospheric rivers that we had,” said Ellen Hanak, vice president and director of the Public Policy Institute of California’s Water Policy Center.

California was lucky, she said, that last month’s strong atmospheric rivers were colder storms, with much of the moisture falling as snow, which will further fill reservoirs as it melts.

Mountain snow is crucial for capturing water from large storms because reservoirs can’t be completely full in winter — there must be space for flood protection from any incoming storms.

“It is basically free supplemental storage of water that you don’t have any place to put in the winter,” Hanak said.

Story continues below advertisement

However, the largest reservoirs still have a fair amount of empty space to fill, particularly those in far Northern California, which saw less rain and snow compared to areas farther south. Shasta Lake and Trinity Lake, for example, are only 57 percent and 32 percent full, respectively. And it will take more than one good year to replenish depleted groundwater and for drought-stressed forests and ecosystems to recover, she said.

Flood and drought concerns ahead

While this year's huge snowpack is on balance very good news, there are some potential concerns as the season unfolds, including ongoing flood risk.

"A risk in having a large snowpack is that melt may occur faster than we'd ideally like," said Erica Siirila-Woodburn, a hydrology research scientist at Lawrence Berkeley National Laboratory, in an email. "In some ways, big snowpacks could be a 'ticking time bomb' if warmer temperatures, higher rain-snow elevations, and rain-on-snow events cause accelerated snowmelt."

A recent [study](#) by Hatchett, Siirila-Woodburn and others found that California's wildfire-scorched mountainous areas are more susceptible to rapid snowmelt during winter dry spells.

Despite the current snow bounty, the region continues on a path toward a warmer, [low-to-no-snow future](#) with climate change, meaning that "more precipitation will fall in the form of rain and not snow and in more punctuated events like atmospheric rivers, creating less seasonal water storage and magnifying water stresses," Siirila-Woodburn wrote.

Officials are warily eyeing recent dry weather with fears that the storm cycle could shut off again, as it did in January 2022. And any heat waves this spring could evaporate some of that snow water.

"There is a lot more that needs to play out over the course of the next several months to really capture our full water supply picture here in California," Karla Nemeth, director of the Department of Water Resources, said last week during a monthly snow survey.

While there is no clear signal for wet or dry conditions for the coming months, a recent [drought outlook](#) suggests that a swath of the state could be drought-free by the end of April.

"The ideal season spreads storms out over the whole rainy season," said Hanak of the Public Policy Institute of California. "It would be good to get

more precipitation and it would be good if it stays cool — that’s what water managers are hoping for.”

<https://www.washingtonpost.com/weather/2023/02/07/california-snowpack-floods-drought-storms>

Cal Matters

February 7, 2023

Ground zero: Rain brings little relief to California's depleted groundwater



The Savory Basin outside of Fresno was built two years ago to refill the aquifer with captured stormwater. The Fresno district spent millions to buy farmland and create basins for percolating water underground to help meet the requirements of state groundwater management regulations. Photo by Larry Valenzuela, CalMatters/CatchLight Local

In summary

Communities, largely home to low-income Latino residents, still have dry wells. Restoring groundwater takes decades, with costly, long-term replenishment projects — and ultimately, much less pumping.

The powerful storms that clobbered California for weeks in December and January dropped trillions of gallons of water, flooding many communities and farms. But throughout the state, the rains have done little to nourish the underground supplies that are critical sources of California's drinking water.

Thousands of people in the San Joaquin Valley have seen their wells go dry after years of prolonged drought and overpumping of aquifers. And a two-week deluge — or even a wet winter — will not bring them relief.

Even in January, as California's rivers flooded thousands of acres, state officials received reports of [more than 30 well outages](#), adding to more than 5,000 dry residential wells reported statewide in the past decade.

"Just one wet year is nowhere near large enough to refill the amount of groundwater storage that we've lost, say, over the last 10 years or more," said Jeanine Jones, a drought manager with the state Department of Water Resources.

Water from heavy rains can reach shallow groundwater basins in a matter of days, but in places where wells must pump from deep underground aquifers — like those in the San Joaquin Valley — this can take months. And even a season's worth of storms is not usually enough to restore wells left high and dry by years of overdraft.

"Just one wet year is nowhere near large enough to refill the amount of groundwater storage that we've lost, say, over the last 10 years or more."

Jeanine Jones, state Department of Water Resources

Restoring California's groundwater is not as simple as waiting for rain and letting it seep into the ground. It requires detailed planning and scientific analysis of project sites, and uses tens of millions of dollars in state funds. Land has to be purchased or growers must be compensated for flooding their fields. And it also means that growers — and to a lesser extent, communities — must reduce the water they pump.

[Graham Fogg](#), a UC Davis professor of hydrogeology, said the recent rainfall could substantially help minimally impacted areas, like much of

the Sacramento basin, where groundwater tables are only 25 to 30 feet down. But it's a far different story in the San Joaquin Valley, where the [water table](#) is 100 to 300 feet down, even 700 feet in some places.

"That's where most of the dried-up wells have occurred," Fogg said, "and that's where it will take years, maybe decades, of not only managed aquifer recharge, but also reduced pumping from wells, to raise groundwater levels back to more appropriate elevations."

According to state officials and other groundwater experts, most wells in the San Joaquin Valley have virtually no chance of recovering unless groundwater pumping is drastically curbed.

"I've seen about 2,000 wells go dry, and we don't see wells recover on their own," said Tami McVay, director of emergency services for [Self-Help Enterprises](#), a San Joaquin Valley nonprofit that provides funding to residents who need new wells. "They sometimes recover for a couple of days, but then they go dry again."

Groundwater is liquid gold

Groundwater is among California's most precious natural resources, providing about [40%](#) of the water consumed in most years. It is an inexpensive, local source in a state where many cities rely on imported water and rural towns have no other sources. And its importance is magnified in dry years, when reservoirs fed by rivers are depleted.

The San Joaquin Valley's groundwater reserves have been relentlessly pumped by farmers for decades. Tens of millions of acre-feet have been pumped from the ground, causing the water table to steadily drop and [thousands](#) of wells to go dry.

A handful of communities, largely home to low-income Latino residents, have run out of water, forcing people to use bottled water for everything. The true scope of the problem, in fact, may be underestimated, since many dewatered wells are unreported.

East Porterville, Tooleville, Tombstone Territory, Fairmead, Lanare and Riverdale are just a few of the San Joaquin Valley communities that have been hit hard with dry wells.

“There’s so much political pressure to maintain the status quo, and to continue pumping, because it’s tied up with economic profits. And the end result is community members who can’t rely on their wells for safe water,” said Tien Tran, a policy advocate with the group [Community Water Center](#), which advocates for water equity.

Almost a decade ago, California enacted a law that is supposed to protect groundwater reserves from overpumping. The [Sustainable Groundwater Management Act](#) requires local groundwater agencies to halt long-term depletion and achieve sustainability, defined by [specific criteria](#). But the deadlines are almost 20 years away, and basins are still being overdrafted.

The San Joaquin Valley’s major groundwater basins are designated [critically overdrafted](#) by the California Department of Water Resources. A year ago, the agency [rejected the region’s groundwater sustainability plans](#) on the grounds that they inadequately considered the needs of residential wells, among other impacts.

Gov. Gavin Newsom’s water strategy released last August called for [increasing groundwater recharge](#) by an average of half a million acre-feet each year. On Jan. 13, state water agencies announced a program to expedite approval of recharge projects.

Department of Water Resources Director Karla Nemeth said the voluminous mountain snowpack dumped in January offers a prime opportunity, and a time-sensitive one, to recharge aquifers.

“We’ve got a heck of a lot of snow in the Central Sierra,” she said. “That snow is going to melt, and we want the local water districts to be positioned to capture some of that excess snowmelt and get it underground.”

The quest to store rainwater underground

Compelled in part by state law, and often supported by millions in state funds, some farmers and other land managers have dug large recharge basins to capture stormwater and allow it to sink. Cities design similar projects, and in recent months alone, they've put tens of thousands of acre-feet of water into underground storage.

While not enough on their own to reverse overdraft, these programs could serve as models for scaling up recharge efforts statewide.

In the Tulare Irrigation District, for instance, stormwater during high flows is diverted into 1,300 acres of ponds used to recharge groundwater. In addition, in a new program launched last year, farmers who sink water into their fields during storms can get it back later, during dry periods. General Manager Aaron Fukuda said it has motivated dozens of landowners to take part this winter. As of Feb. 3, the district was bringing in water at a rate of 1,500 acre-feet daily, mostly to be deposited in the ground.

"The actions our district took last year are paying dividends this year," Fukuda said.



Tulare Irrigation District General Manager Aaron Fukuda stands near the Cordeniz basin, a pond outside of Tulare used to recharge groundwater. Photo by Larry Valenzuela, CalMatters/CatchLight Local

About 40 miles to the north, the Fresno Irrigation District has captured at least 9,000 acre-feet of water since December, according to Kassy Chauhan, executive director of the North Kings Groundwater Sustainability Agency, which manages the district's groundwater.

Much of this water was diverted into some 900 acres of basins, including 180 acres that were recently constructed. The Fresno district spent millions buying former farmland and forming these basins, which are basically bulldozed depressions ringed by earthen berms made for the express purpose of depositing water underground.

"We were able to capture that water in those basins," Chauhan said. "It was clear progress."

Another example of a recharge project is the Pajaro River Valley, on the Central Coast. The local water agency has collaborated with researchers

to identify potential recharge hotspots and carve out infiltration basins. One has been in operation for 20 years, and more are coming. The goal, said Brian Lockwood, general manager of the Pajaro Valley Water Management Agency, is to enroll farmers in a rebate program that pays them for flooding their land.

But these types of efforts, even applied broadly, will only have a limited impact. Managed aquifer recharge using local water could potentially recover just 3% to 8% of the San Joaquin Valley's groundwater overdraft, according to 2020 research.

UC Davis Professor of civil and environmental engineering [Jay Lund](#) said, while he endorses groundwater recharge projects, there is a better way to lessen the Central Valley's water woes.

"We have to reduce demand," he said.

The problem is that farmers are still pumping water out of the ground faster than it's going back in.

Experts have predicted that the state groundwater law could eventually force as many as [750,000 acres of farmland](#) out of production, permanently easing demands on the state's water supply.

Groundwater agencies tend to "emphasize solutions on the supply side, and relatively little on the demand side ... and the supply numbers do not add up," according to a 2020 PPIC analysis.

In much of the Tulare Irrigation District, the groundwater table sits at a record low elevation of 180 feet underground, and Fukuda said the district's sustainability plan — required by the state's groundwater law and developed by the [Mid-Kaweah Groundwater Sustainability Agency](#) — allows for the water table to dip a bit farther before leveling off. The North Kings agency, according to Chauhan, is also allowing some continued decline.

According to data from more than 1,200 San Joaquin Valley [monitoring wells](#), the water table has been dropping for at least two decades, in many places more than 2.5 feet per year on average.



The Cordeniz basin outside of Tulare is a pond that the water agency uses to help recharge the aquifer. Photo by Larry Valenzuela, CalMatters/CatchLight Local

The groundwater plans that the state rejected last year were revised and resubmitted in July, and the state is expected to announce their next round of San Joaquin Valley assessments within two months.

Water equity activists who have studied the revised plans say they're not impressed by the changes made.

"We still found that these plans are not taking adequate steps to protect drinking water users in the basins," said [Nataly Escobeda Garcia](#), policy coordinator for Water Programs with the NGO Leadership Counsel for Justice and Accountability. "We anticipate that numerous domestic wells and public water systems will still be at risk of dewatering."

The Community Water Center has predicted that almost 500 domestic wells that draw from the Kaweah Subbasin, in the southeast San Joaquin Valley, could go dry under the new plans.

“Domestic wells are disproportionately impacted,” Tran said. Tulare County alone has seen 1,810 wells go dry since 2014, according to the state reporting system. All but two were labeled “household.”

Replenishing groundwater has limits

With or without human intervention, water sinks into the Earth. Natural, or passive, recharge is the process by which [hundreds of millions of acre-feet](#) of water have accumulated in California’s shallow basins and deep aquifers. [Recent research](#) from NASA found that as much as 4 million acre-feet yearly may seep beneath the Central Valley.

But this doesn’t necessarily make a big difference. While the water can generate quick spurts of rebound of the water table, these post-rain gains — at least in the San Joaquin Valley — tend to be erased, plus some, by subsequent dry spells and continued pumping.

The result is a one-step-up-two-steps-down [trajectory](#) of groundwater decline.

“Overall water levels have been dropping and until it’s reversed, we’re going to keep getting dry wells,” Fogg said.

Even extremely wet periods have had only temporary benefits in the San Joaquin Valley. After the record wet 2017 winter, the [water table jumped](#) — in some places dramatically — but quickly dropped again, continuing the decline. Today more than half of the [monitoring wells](#) in Tulare County are at all-time low water levels.

Active recharge programs generated about 6.5 million acre-feet in the San Joaquin Valley alone in 2017, according to a report by the Public Policy Institute of California.

“We have lots of active recharge already,” said [Ellen Hanak](#), vice-president and director of the institute’s Water Policy Center. “The question is, with (the groundwater law), can we up our game?”

“Overall water levels have been dropping and until it’s reversed, we’re going to keep getting dry wells.”

Graham Fogg, UC Davis professor of hydrogeology

Paul Gosselin, the Department of Water Resources' deputy director of sustainable groundwater management, said 42 recharge projects underway with \$68 million in state support could add 117,000 acre-feet of water storage to the state's aquifers — a big step toward meeting the governor's half-million acre-foot goal. He said the department has \$250 million available to support more recharge work.

Changing climate makes this work all the more urgent. The state's system of capturing and storing water in reservoirs was designed in part around snowpack in the Sierra Nevada. But as the climate warms, mountain snowpack is becoming scarcer. It is melting faster and earlier, and more precipitation is falling as rain in the first place.

California's existing reservoirs don't have the capacity to store so much liquid water at once, but its aquifers do.

"Groundwater recharge will be a good way to compensate for that change," Hanak said. But, she said, "there is a major time constraint — you've got to be able to get that water out there fast, because it's coming down fast."

Randy Fiorini, a Merced County farmer and former chair of the Delta Stewardship Council, thinks the slow pace of aquifer percolation is an obstacle that can only be addressed by building small holding reservoirs to capture stormwater.

"From there, you would meter it into a groundwater basin," he said.

Urban success stories

In urban areas, maintaining groundwater is easier than in farm communities. But it takes active management.

The Orange County Water District provides water for the 2.5 million people who live in the northern half of the county. Despite minimal rainfall, it has relatively little reliance on imported supplies and uses a unique groundwater storage system.

A third of its water comes from the Santa Ana River, which originates in the San Bernardino Mountains and flows through San Bernardino and Riverside counties. The Inland Empire discharges voluminous amounts of treated wastewater into the river as it flows into Orange County, where it is deposited into ponds that recharge the aquifer, according to Roy Herndon, the district's chief hydrogeologist.

Another third comes from natural rainfall plus imported Colorado River water. The rest is wastewater that is used to refill the aquifer after [undergoing treatment so advanced](#) that it meets or exceeds all drinking water standards, making it “essentially potable,” Herndon said. Built 15 years ago, the plant can produce 130 million gallons per day, [enough water](#) for about 400,000 households.

All told, the Orange County Water District has 1,100 acres of recharge basins which collectively absorb an average of 250,000 acre-feet of stormwater and runoff annually.



Right: Roy Herndon, chief hydrogeologist at the Orange County Water

District, at the La Palma Recharge Basin in Anaheim on Jan. 26, 2023. The basin was built on 14 acres of former Boeing property. Photos by Bing Guan for CalMatters

In Sonoma County, the local water agency is using a \$6.9 million state grant to inject surplus water from the Russian River hundreds of feet underground. The project could enter its initial pilot phase next winter and eventually produce 500 acre-feet of water each year. If successful, other similar projects could follow, he said.

In 2018, Los Angeles County voters passed Measure W, which created a new tax on the owners of impermeable surfaces that direct water into storm drains leading to the ocean. Each year since its introduction, the tax has generated [about \\$280 million](#) in funds for use in supporting stormwater projects.

Since October, the county has captured more than 143,000 acre feet of stormwater in reservoirs and groundwater basins, according to Lisette Guzman, a public information officer with Los Angeles County Public Works. That's enough water, she said, to support more than a million residents for a year.

Lund says the physical limitations of moving and handling surface water mean groundwater recharge projects cannot fix most of the state's well problems.

"No matter how much (recharge) you do, you aren't going to get more than 15% of the groundwater overdraft in the San Joaquin Valley," Lund said. "That's good, and you should do as much as you can economically, but you still have 80, 90% of the problem left."

Gosselin, at the state water agency, is more optimistic, citing the new research, laws, funding and priorities in managing groundwater.

In the novel "East of Eden," John Steinbeck described Californians' tendency to forget about wet times when it's dry and drought when it rained. But Gosselin said growers and water agencies are now planning ahead, rain or shine, to capture and store water in the ground.

“We need resiliency from climate change,” he said, “...and I don’t think people are going to forget about either right now,” he said.

<https://calmatters.org/environment/water/2023/02/california-depleted-groundwater-storms>

LA Times

February

Why California is so far apart from other states in Colorado River water cuts plan



Lake Mead, held back by Hoover Dam, has declined to its lowest levels since it was filled.

(Allen J. Schaben / Los Angeles Times)

The ongoing dispute over Colorado River water comes down largely to math: How much water should each state and region lose as reservoir levels continue to decline?

California has one interpretation of how to divvy up the cuts, and six other states that depend on the river have a different formula.

A breakdown of the numbers in these two competing proposals shows the points of tension.

The proposal by six of the seven states in the Colorado River Basin would require California to shoulder a substantial part of the burden, despite its relatively [higher-priority water rights](#). Southern California water agencies would be required to cut as much as 32% of their full water allocation if Lake Mead, the country's largest reservoir, continues dropping toward dangerously low levels.

California's proposal, in contrast, would hit Arizona harder as reservoir levels decline.

Exactly how much harder hasn't been spelled out, because the proposal from California water agencies doesn't divide the cuts between the states for the largest potential reductions.

But what's clear in California's [proposal](#) is that it calls for the other states, particularly Arizona, to give up more water. California's recommendations suggest that Arizona could face some of the largest reductions at critically low reservoir levels, a major blow for a state that gets [more than a third](#) of its water from the Colorado.

The figures in the two alternatives submitted to the federal government also show significant differences in how quickly cuts would take effect in the river's three Lower Basin states — Arizona, California and Nevada — as the reservoir's levels continue to decline.

The [proposal](#) submitted by Arizona, Colorado, Nevada, New Mexico, Utah and Wyoming calls for requiring larger cuts sooner. Those states urged the federal government to start to account for evaporation and other water losses along the lower portion of the river — something that hasn't been done before and that California officials argue shouldn't be considered among the immediate options for emergency measures.

California's proposal relies on applying cuts in a series of tiers based on Lake Mead's levels. The first set of additional reductions, amounting to 1 million acre-feet, includes previous pledges by California water districts

to reduce their take from the river by 9% starting this year. It also calls for reducing Arizona's usage by nearly 20% and Nevada's share by 13%.

The next set of tiered cuts, which haven't been apportioned among the states, would begin when Lake Mead's level reaches 1,025 feet elevation — about 27 feet below its current level. Those cuts would gradually become larger if the water level at Hoover Dam continues dropping toward 1,000 feet, a level that both proposals aim to protect.

The Colorado River supplies water to cities and farmlands from the Rocky Mountains to northern Mexico. Chronic overuse combined with 23 years of severe drought and the [effects of climate change](#) have pushed the river's two largest reservoirs, Lakes Mead and Powell, to their lowest levels since they were filled.

If Mead continues to fall further, the dam could still release water down to a level of 895 feet. Below that point, called "[dead pool](#)," no water would pass through Hoover Dam. Supplies would be cut off to California, Arizona and Mexico.

The growing risks of that worst-case scenario have prompted federal officials to demand the states come up with ways of preventing a catastrophic crash.

Neither proposal represents any formal agreement at this stage. The states submitted their proposals to the federal government as alternatives for officials to model as they analyze options.

The federal Bureau of Reclamation plans to consider the proposals as officials carry out a review to revise the current rules for dealing with shortages. In this process, federal officials will consider several alternatives for making cuts and managing reservoirs. They plan to release a decision this summer.

Under California's proposal, the largest potential cuts (if Lake Mead declines below 1,025 feet elevation) could include mandatory cuts as well as voluntary reductions based on agreements among the states, said Chris Harris, executive director of California's Colorado River Board. He

said these proposed reductions are intended to protect the reservoir's level if "we had a sequence of years of extremely dry hydrology."

"There is uncertainty associated with how those reductions, if necessary, would be applied and to whom," Harris said in an email. Because maintaining the viability of the water supply is vital for California, the state "would very likely do more as well" in that scenario.

California's proposal also calls for prioritizing water for "health and safety requirements" if low reservoir levels trigger large reductions.

Arizona's water officials disagree on this approach.

"I think it's a proposal that probably works really well for California," said Tom Buschatzke, director of the Arizona Department of Water Resources. "I don't think it is robust enough, creates enough protection for the lake."

Buschatzke and others argue that a better and more equitable approach would be to start accounting for evaporation and other water losses from the reservoirs and along the river in the Lower Basin. The proposal from Arizona and other states calls this water "infrastructure protection volumes," or IPV, saying that immediately counting these losses, estimated at more than 1.5 million acre-feet per year among the three Lower Basin states and Mexico, would help stabilize the reservoirs.

Because California uses the single largest share of the river, that change would substantially affect the state. According to the figures outlined in the six states' proposal, California would immediately see a cut of 18.5% in its Colorado River supplies, and could face a total reduction of 32% at critically low reservoir levels.

Accounting for these losses would mean a smaller cut of about 13% for Arizona, according to the proposal, and a roughly 6% reduction for southern Nevada.

One key difference is that under the California proposal, the largest cuts [wouldn't kick in until later](#). That's "essentially a gamble on good hydrology once again helping us avoid conflict," said John Fleck, a water

researcher and writer in residence at the Utton Center at University of New Mexico's School of Law.

"It sort of says, if we continue to have good snow, if we have a good snowpack this year, and maybe for another year or two, we can put off the reckoning of this conflict and avoid litigation," Fleck said.

But Fleck said he disagrees with that approach.

"I just think we need to rip the Band-Aid off. We need to deal with this conflict now," Fleck said. And what's needed, he said, are "deep cuts now to rescue the system."



Colorado River crisis is so bad, lakes Mead and Powell are unlikely to refill in our lifetimes

One California water manager says Colorado River reservoirs aren't likely to refill. Scientists agree that the region needs to plan for a drier future.

Feb. 6, 2023

Along with the clashing points, there are commonalities in the proposals.

Both incorporate commitments for reductions under previous agreements, including cuts that are occurring this year under a 2019 deal called the Drought Contingency Plan, and reductions under a previous U.S.-Mexico agreement. The six states' proposal also includes some potential reductions by Mexico, which would need to be negotiated.

Both sides agree on roughly how big the cuts should be to prevent a "dead pool" situation. The two proposals call for similar cuts totaling more than 3.3 million acre-feet per year as Lake Mead declines close to the critical threshold of 1,000 feet.

Reductions at that level could satisfy the Bureau of Reclamation's goal of reducing water use throughout the seven states by [2-4 million acre-feet](#) per year. But any decision by the federal government could also face legal challenges from the states.

Some of the region's top water managers say they're still hoping that a seven-state consensus might be possible.

Already in the proposals, the states have signaled they are willing to deal with substantial cuts between now and 2026 to help reservoir levels. Arizona, for example, signed on to a proposal listing potential reductions of up to nearly 44% in the state's supply from the river.

Even as the federal government considers the competing proposals, representatives of the states and water agencies plan to hold more negotiations in private in the coming weeks.

"We still want to continue to try to work with all seven states," Buschatzke said. "I still think the parties have a chance to find common ground."

John Entsminger, general manager of the Southern Nevada Water Authority, said he thinks there is still "a strong commitment by all seven states to continue to work in good faith towards a solution."

Wade Crowfoot, California's natural resources secretary, said he expects that the gap between the water reduction numbers in the two proposals will be a starting point in the negotiations.

"When you look at the differences in volume, they're not insurmountable," Crowfoot said. "Everybody's focused on trying to bridge that difference, because continued disagreement is in no one's best interest."



Colorado River in Crisis: A Times series on the Southwest's shrinking water lifeline

Colorado River in Crisis is a series of stories, videos and podcasts in which Los Angeles Times journalists travel throughout the river's watershed, from the headwaters in the Rocky Mountains to the river's dry delta in Mexico.

<https://www.latimes.com/california/story/2023-02-07/comparing-two-competing-proposals-for-colorado-river-cuts>

& The West

February 8, 2023

In times of scarcity, California's best new source of water? Reuse.

While expensive solutions like new reservoirs and seawater desalination grab attention, California communities are quietly building up their capacity to clean stormwater and wastewater for reuse for irrigation, industry and, yes, drinking water too.

Not a drop wasted? The Hyperion sewage treatment plant in Los Angeles is the world's largest. A [\\$3 billion proposal](#) would have it capture 100% of storm and sewer water for drinking water supply by 2035. This would help LA catch up with Orange County, a leader in the practice. *Doc Searls via Flickr*

By **Caroline M. Reinhart**

As California has struggled with drought, Governor Gavin Newsom's fundamental solution: find more water by diversifying the state's public water supply. Because of the proximity of the Pacific Ocean, one of the most frequently mentioned sources is seawater desalination. A few communities are trying it, despite environmental concerns.

But another potential source gets less public attention, even though water providers are showing increasing interest thanks to its early successes: reuse.

"...when you want more supply, you have to think about alternatives. The best, most reliable alternative is treated wastewater."

Peter Gleick, The Pacific Institute

"In many regions we're running up against limits on natural water availability of the traditional sources of supply," said Peter Gleick, the co-founder of the Pacific Institute, an environmental research organization.

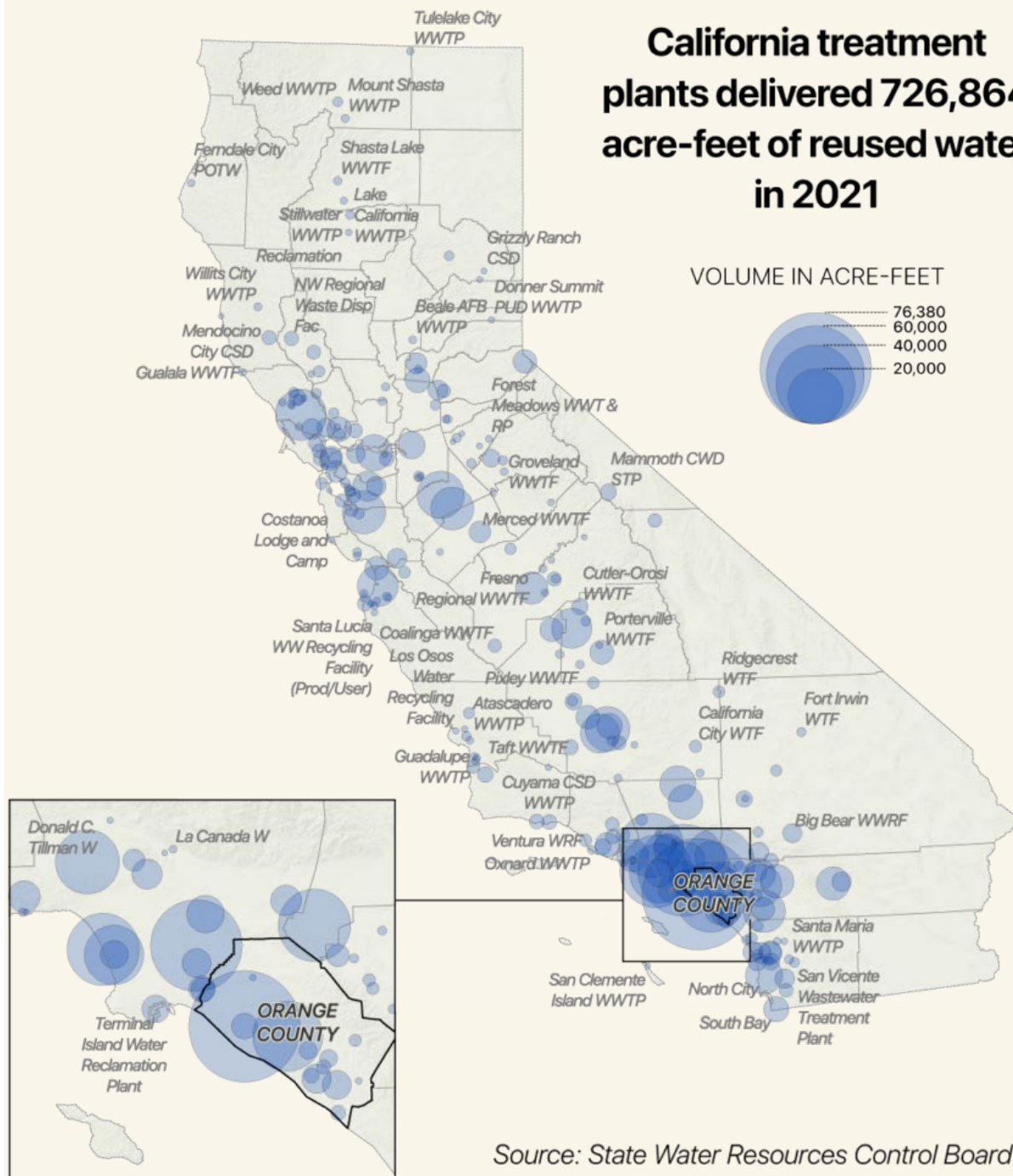
“And when that’s the case, and when you want more supply, you have to think about alternatives. The best, most reliable alternative is treated wastewater.” Californians [use approximately 6.6 million acre-feet of water per year](#) in urban areas. To meet this demand, the state’s water utilities identified a range of options including recycled water, desalination, and conservation.

Using less water is the quickest, cheapest and easiest alternative. “Conservation is still one of the biggest things we can do,” said Mehul Patel, the executive director of operations for Orange County Water District’s Groundwater Replenishment System. “Use less, be smarter, think about why we’re using the water we’re using and the volumes we are using it. That would go a long way.” But reused water may be the next best option.

The new goal: doubling the volume of reclaimed water

Reclaimed water is largely used in two ways: first, for industrial machines, irrigation, and agriculture and second, for eventual human consumption after treatment and a period of retention time in an aquifer. These types of reuse, non-potable and indirect potable reuse, already supply approximately [728,000 acre-feet](#) of reused municipal wastewater in California per year. This constitutes 11 percent of total public water system use, and uses less than a quarter of the state’s wastewater leaving room for considerable growth.

California treatment plants delivered 726,864 acre-feet of reused water in 2021



& the West

Current reuse efforts use less than a quarter of the state's wastewater leaving room for considerable growth. Gov. Newsom's goal, 1.8 million

acre-feet by 2040, would double the amount of recycled water used in 2021.

According to the Pacific Institute, California has the potential to increase their water supply by an additional 1.8 to 2.1 million acre-feet per year if they expand water reuse. Newsom's reuse goal, 1.8 million acre-feet by 2040, would double the amount of recycled water used in 2021.

To meet this goal, two Bay Area agencies, Pure Water Soquel in Santa Cruz and the Santa Clara Valley Water District are working to supplement their groundwater aquifers with recycled water that has already been through their system. A state mandate to maintain the sustainability of California groundwater basins by 2040 motivated Pure Water Soquel's project while Valley Water, which [serves the San Jose area](#), is seeking both to prevent seawater from contaminating aquifers and to augment dwindling supplies. Their advanced water treatment projects will come online in 2024 and 2028, respectively.

Representatives of Pure Water Soquel and Valley Water said they were emboldened by the success of reuse efforts in Orange County, in southern California. Oakland and San Francisco also say they are considering reuse projects, but they haven't gone as far as a cluster of smaller agencies around them. Pending groundwater augmentation projects would add about 356,500 acre-feet per year when completed.

Monterey One Water's project, Pure Water Monterey, is a regional pioneer of a more ambitious form of water recycling: indirect potable reuse. The process directs treated wastewater through groundwater aquifers, which are a key source of drinking water. Moreover, the process helps buffer freshwater aquifers from the contamination impact of seawater intrusion.

To combat seawater intrusion, Pure Water Monterey injects purified recycled water back into the groundwater aquifer to correct the water's chemical composition. It can then be used to augment the drinking water system's supply.



The central coast town of Cambria is one of the first communities in California to recycle sewage water into an eventual drinking-water source through indirect potable reuse. Treated water is added to groundwater supply for later use. *Florence Low/California Department of Water Resources*

Mike McCullough, the director of external affairs for Monterey One Water, reflected on how their advanced water treatment facility began with the help of the Orange County Water District, “using water once and discharging it is just not good stewardship.” Calling the Orange County Water District a “leader,” he added, “now we’re just trying to follow and do the same thing that they did just on a lot smaller scale.”

The secret of Orange County’s reuse success

Orange County Water District’s recycling system is the world’s largest water purification system, with the capability to produce up to about 307 acre-feet — or 100 million gallons — of wastewater per day. But their success required overcoming significant obstacles, involving both engineering and psychology.

Orange County Water District via Instagram

Orange County Water District's success required overcoming significant obstacles, involving both engineering and psychology.

San Diego's decades-long struggle to establish a system of reuse stood in sharp contrast to Orange County's achievement. In the early 2000s, San Diego residents balked at the thought of drinking wastewater. At the time, San Diego attempted to install a recycling system but opponents' objections — the “yuck factor” — won out. [Miller Brewery](#) led the opposition, expressing fears that the idea of wastewater in their products would scare away customers. Using the evocative slur “[toilet-to-tap](#),” their campaign halted the facility's plans.

Then ongoing droughts, along with greater understanding of and the treatment process, helped change attitudes. After about a decade of planning and engineering, San Diego's first operational water reuse facility, Pure Water Oceanside, was completed last March.

Gleick of the Pacific Institute, reflecting on San Diego's long journey, said that, as with Orange County, their educational campaign made the difference. “What it means is that [you] don't launch a water reuse program without a public education and communications program to tell the people what you are doing. Build support for it.”

“We wanted to, in our outreach, show that we have this new technology. It's very safe,” said Orange County's Patel. “It's used in other industries already like food processing, so it's not like we are trying to do something that has never been done, it just hasn't been done on a municipal scale.”

Monterey One Water's McCullough said several agencies including his own found Orange County's approach a template for how to gain public support. “They've handled a lot of obstacles and everybody's coming behind them. They broke the ground as far as public outreach and education.”

Emulating Orange County, Pure Water Monterey built a small demonstration facility for visitors to watch the equipment in real time

and taste the treated water from sinks if they desired. Now, Pure Water San Diego also provides facility tours.



Reclaimed water shown at various stages of treatment. *Department of Ecology, State of Washington via Wikimedia Commons*

According to a 2016 [survey](#) conducted by Xylem Inc. a water technology company, 89 percent of California residents are [more willing to consume recycled water after understanding the treatment process](#). The support for reclaimed water is only increasing with the attention to California's intensifying-drought. However, a [Bill Lane Center for the American West study](#) published in the same year concluded that while education does lower concerns about reclaimed water, participants were [still reluctant to use it for drinking, bathing, and cooking](#).

Treatment that goes above and beyond standard methods

Any water agency planning to use recycled water for drinking must put wastewater through an intense series of treatments, typically with a three-step process after the basic treatment, filtering out most contaminants, is finished.

The water then goes to an advanced water treatment facility, which separates water from any remaining impurities by using an energy-intensive process called reverse osmosis. During this phase, a high-pressure pump pushes water through microscopic holes, trapping everything from dissolved solids like lead, to salt compounds, to tiny contaminants like PFAS, while letting water molecules through.

The water is then nearly as pure as the distilled water used to sterilize hospital equipment. The final disinfection step: treating the water with an advanced oxidation reaction, a process in which ultraviolet light works with hydrogen peroxide to prepare the water for distribution through the water system.

Indirect potable reuse uses reservoirs or aquifers to create an environmental buffer.

For years, recycled water, treated less intensively, has been used for irrigation and heating and cooling. Now, to reach drinking water's higher standards, groundwater augmentation projects use one more step: sending it into an aquifer to mingle with existing groundwater. Indirect potable reuse uses reservoirs or aquifers to create an environmental buffer. For example, this recycled water can replenish groundwater basins to mitigate the impacts of over pumping.

Direct potable recycling offers “water on demand”

California legislators want to promote direct potable reuse. Instead of adding water back into the groundwater supply, as Orange County does and the several Bay Area agencies plan to do, direct potable reuse provides water ready to go straight to the customer's tap. The State Water Board plans to adopt [regulations](#) on required treatment steps by the end of 2023.

Among those researching direct potable reuse are the East Bay Municipal Utility District, Valley Water, San Francisco Public Utility Company and Monterey One Water, but they cannot move forward and construct facilities until the state adopts final regulations.



Operators at the Pure Water Monterey water purification facility. *Monterey One Water via Twitter*

Even with indirect potable reuse infrastructure in place, adopting direct potable reuse will require the utilities to adjust the purification process, according to Jonathan Lear, the water resources division manager at Monterey Peninsula Water Management District.

To follow the new rules, Lear said, would mean reengineering the water processing they already use. Nonetheless, when regulations for direct potable reuse are established, these utilities will be keen to incorporate the new water source. As Lear says, “there are large benefits of being able to manufacture water and directly serve it without having to park it somewhere for a little while.”

Other options

State utilities have another, easier option for increasing water supply. Stormwater has long been used as a major source to supplement water supplies as runoff from heavy rain pools in man-made surface water

ponds. Urban stormwater capture has the potential to add 580,000 to 3 million acre feet per year depending on rainfall levels.

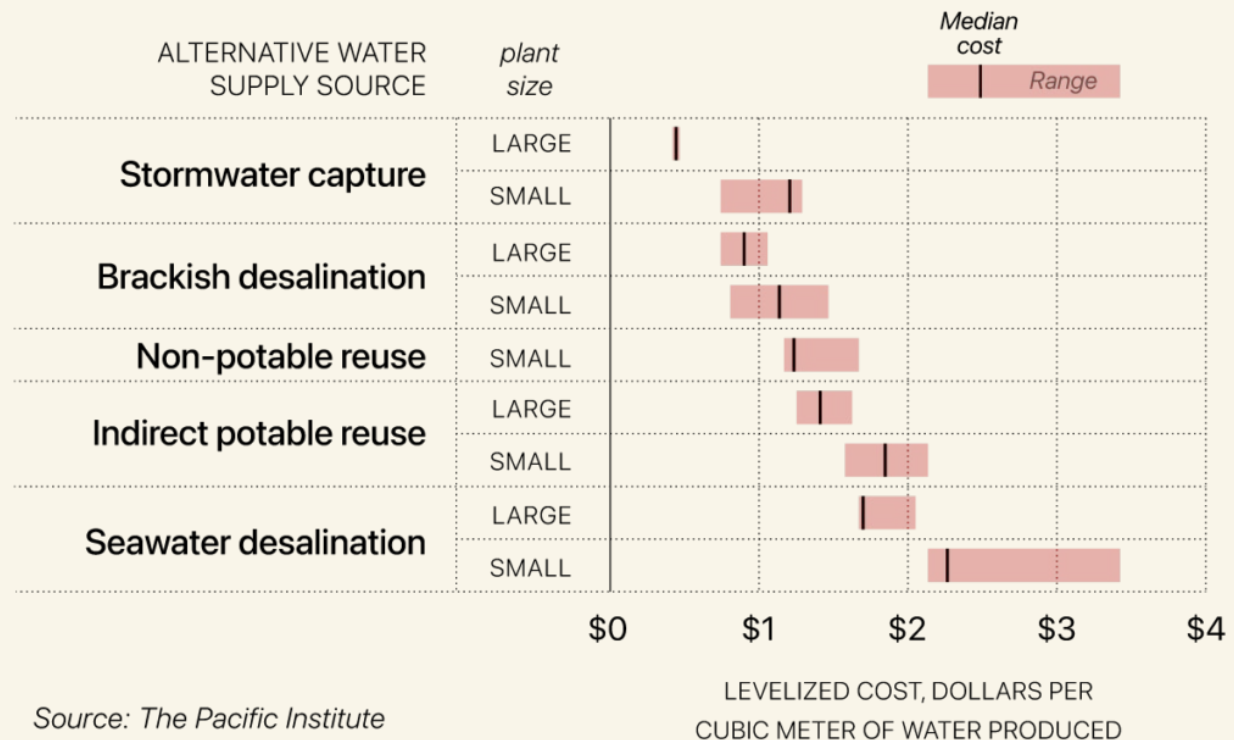
This source would be beneficial to utilities because it is produced with less energy and expense, though it must clear out such contaminants as pesticides and oil.

Urban stormwater capture has the potential to add 580,000 to 3 million acre feet per year depending on rainfall levels.

Desalination, the treatment of ocean or brackish water for human consumption, gets a lot of attention; the state's Coastal Commission has recently approved desalination plants in Monterey and Dana Point. But desalinated water requires three to ten times more energy than recycled water. Most of that energy is generated by fossil fuels. Not only does desalination require more costly inputs, but it produces a high-salt concentrate known as brine, which must be pumped into the ocean, threatening marine organisms.

In fact, reclaimed water uses a similar treatment process as desalination — for instance both, rely on reverse osmosis. But the concentrate left over from the recycling process has little of seawater's salt, so the leftover concentrate is less harmful. Purifying reclaimed water is also cheaper: [seawater desalination's median cost](#) is \$1.72 per cubic meter for large plants and \$2.29 per cubic meter for smaller ones. Non-potable recycled water costs 45 percent less for small projects. Indirect potable reuse costs 18 percent less for small projects and 38 percent less for large projects.

For water reuse technologies, a range of costs



& the West; Data: [The Pacific Institute](#)

Stormwater capture is the cheapest alternative water option but its water quality issues may justify choosing reused water, despite the extra cost. Because of the “yuck factor,” recycled water is treated more intensely than conventional drinking water sources.

Because of the “yuck factor,” recycled water is treated more intensely than conventional drinking water sources.

A [Stanford study](#) published in November of last year found that [recycled water for potable reuse is much cleaner than conventional tap water sources](#). Because the source is wastewater, regulators require a more intensive treatment process to clear the water of even the smallest of contaminants that can be found in standard drinking water treatment facilities.

McCullough of Monterey One Water agrees that this recycled water’s purity exceeds that of everyday tap water. “No drinking water system

goes through the treatment process that we go through so our water is definitely way cleaner.” He added that recycled water “has less particulate matter or viruses or compounds or anything in it than water that is traditionally serving customers now.”

<https://andthewest.stanford.edu/2023/in-times-of-scarcity-californias-best-new-source-of-water-reuse>