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Climate Change, Water Rights, and the American West



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Without the Department of Interior's intervention, large swaths of the American West could run out of water and the ability to produce energy by 2025. More than 40 million people in seven western states rely on the Colorado River's Lake Powell and Lake Mead for their electrical power, municipal and industrial water, and irrigation water for nearly 5.5 million acres of agricultural land. Both reservoirs are drying up. Climate scientists and federal water [managers predict](#) that because of human-induced **climate change and using more water than the Colorado River can produce**, the reservoirs might reach "dead pool" status by 2025, meaning that water levels would become too low to flow downstream and spin the hydroelectric turbines below.

"We are in a crisis. Both lakes could be two years away from either dead pool or so close to dead pool that the flow out of those dams is going to be a horribly small number. And it just keeps getting worse ... it might be too late to save the lakes."

[Tom Buschatzke](#), Director, Arizona Department of Water Resources, December 16, 2022

In August 2022, the Department of Interior (DOI) asked the seven states — California, Arizona, Nevada, Utah, New Mexico, Wyoming, and Colorado — to work collaboratively and submit a plan on how to restrict 30 percent of their water usage by February 1, 2023, or DOI will step in and do it for them. Six states [submitted a proposal](#) on January 31, 2023, on how they will work together and with the DOI to achieve DOI's goal.



California [refused to negotiate](#) with others. Instead, the state submitted its own plan that protects what they consider their legal “senior” rights over all the other states — and even Dol interference. The state says it will reduce by [9 percent](#) and threaten legal action if the federal government interferes with their rights. “California is not wavering from our legal position,” [said JB Hamby](#), Chairman of the Colorado River Board of California. Absent a seven-state consensus, Hamby said, then any reduction plan “defaults to the law of the river” — the entire body of treaties and statutes on the Colorado River’s water distribution. And clearly, Hamby believes that California’s senior rights supersede Dol’s authority.

Yet, under [federal law](#), the [Secretary of the Interior is responsible](#) for the Glen Canyon and Hoover Dams’ operation and managing the Colorado River’s mainstream waters “consistent with the Law of the River.” Therefore, on August 16, 2023, the [Dol announced](#) it would reduce 2023 downstream releases from Glen Canyon and Hoover dams “due to declining reservoir levels.”

In this case, when a small minority fights to preserve their interests of a dwindling shared resource, then only a government-led, top-down solution can protect the many, 40 million people, from the few, 500 landowners.

Lakes Powell and Mead

The Colorado River supplies water to power the two largest American dams: Arizona’s Glen Canyon Dam below Lake Powell and Nevada’s Hoover Dam below Lake Mead. Groundwater and precipitation also supplies 10 percent of Lake Powell’s water. Lake Powell provides the “Upper Basin” states of Utah, Wyoming, Colorado, and New Mexico with water and electricity and delivers water to the “Lower Basin” states of California, Arizona, and Nevada. Lake Mead provides water to Arizo-

na, California, and Nevada. Yet Lake Powell has not seen full capacity since 1983 and Lake Mead since 1999. As of January 29, 2023, Lake Powell was at [23 percent](#) capacity and Lake Mead at 29 percent, with numbers steadily dropping each year.

Slow melting snowpacks from Wyoming, Colorado, and Utah replenish the Colorado River. Thanks to a wet winter this year, January 2023 snowpack

in the Upper Basin [stands at 144 percent](#). Nonetheless, the snowpack remains insufficient to fill the lakes back to capacity. Brad Udall, a water and climate scientist at Colorado State University, told National Public Radio on January 22, 2023, that while this year's increased snowpack in the West was great to see, **"We would need 5 or 6 years at 150 percent snowpack to refill these reservoirs. And that is extremely unlikely."*** While it has helped eliminate extreme drought conditions in the short term, even the recent California extreme rainfall event cannot replenish Lake Powell's water supply that Southern California residents and Imperial Valley farmers rely on. California's cities and towns have reduced their water use by [30 percent](#) in the past 15 years, but **agricultural use dropped only 15 percent between 1980 and 2015**

and consumes 80 percent of California's water.

Camille C. Touton, Commissioner of the Bureau of Reclamation, told the Senate Energy and Natural Resources Committee on June 16, 2022, that protecting the "critical levels" of Lake Powell and Lake Mead's water supply will require a 2 million to 4 million acre-foot cut in usage in 2023. In the Los Angeles Times, Touton said, "The challenges we are seeing today are unlike anything we have seen in our history." By law, California is entitled to [4.4 million acre-feet](#) of Colorado River water annually. (An acre-foot is a measure of static water volume: one acre of water, one foot deep. It equals about 326,000 gallons of water, enough to provide water for two average households for a year.) By comparison, Arizona receives [2.8 million acre-feet](#).

Reservoir	Water level on Feb. 3, 2023	Minimum power pool elevation	Dead pool elevation
Lake	3,523 feet	3,490 feet	3,370feet
Powell	1,047 feet	1,000 feet	895 feet

Megadrought

The current 23-year-long "megadrought" in the Southwest has not occurred since the 12th century. Scientists discovered that California experienced an even worse naturally occurring megadrought [1,800 years ago](#). Today, rising temperatures due to human-induced **climate change worsen drought cycles** and cause **"a whiplash"** of extreme weather events. When air temperature increases, the atmosphere can hold [more moisture resulting in extreme rainfall and flooding](#). At the same time, hot temperatures [enhance evaporation, causing drought and decreased snowpack and snowmelt](#). Hotter temperatures also cause more

rain to fall on snowpacks, hastening melt that seeps into the parched ground (another result of drought) before it can reach the Colorado and the other great rivers of the West.

As the drought in the Southwest continues, water levels in both reservoirs will inexorably fall. Eric Balken, Executive Director of Glen Canyon Institute, recently told the [local news](#) in Page, Arizona, that, "Based on the best climate data that's available, **it's really unlikely that this reservoir [Lake Powell] is going to be around in the decades to come.**" Climate scientists echo his prediction. In a

* The [Udall family](#) is well connected to Southwest water politics and champions of environmental causes. Brad Udall's uncle, Stewart Udall, was the Secretary of the Interior when Glen Canyon Dam opened in 1966. His father, Arizona Congressman Mo Udall, in 1968 ensured that Glen Canyon Dam channeled water to Arizona.

recent study in *Science Advances*, the authors predict that, “...regional temperature increases push megadrought risk above 70, 90, or 99 percent by the end of the century, **even if precipitation increases moderately, does not change, or decreases, respectively.**”

Mullin Bernhardt, an ecosystems expert from the United Nations Environment Programme, said the drought conditions in the Colorado Basin are so bad that it no longer can be called a drought. [She said](#), “We refer to it as “aridification” — a new, very dry normal.”

“What has been a slow-motion train wreck for 20 years is accelerating, and the moment of reckoning is near.”

John Entsminger, General Manager, Southern Nevada Water Authority, *Los Angeles Times*, June 14, 2022.

Imperial Valley

On Southern California’s eastern border with Mexico, in California Desert, lies the Imperial Valley. Eighty miles east of the valley runs the Colorado River. Surrounded by barren mountains and sand dunes, the hot desert climate, which averages around 100° F in the summer, made the valley uninhabitable until 1901. That year, the Imperial Valley District (IID) formed and channeled water from the Colorado River. With a population of 180,000, California’s Imperial Valley uses more than half of the water shared among the Lower Basin states, consuming more than [Arizona and Nevada combined](#) in 2022. Elected by the local water users, the [five directors](#) representing the IID claims the valley has the most “senior rights” over the other states. In short, five people control 20 percent of the Colorado River’s supply.

The IID argues that [Arizona cities](#) must cut water usage in its cities before the Imperial Valley takes any cuts because they hold “junior rights.” The Imperial Valley farmers use a little more than half of California’s entire Colorado River’s water allotment, with [half of the crops](#) producing alfalfa

and other water-intensive grasses to feed cattle. Farmers can grow alfalfa year-round with dirt cheap water at \$20 per acre-foot. [Twenty percent](#) of that cattle feed is shipped overseas to Asia and the Middle East to meet their demand for beef. A 2020 study in [Nature Sustainability](#) found cattle-feed crops are “the greatest consumer of river water” in the American West.

During the California Gold Rush in the mid-19th century, miners established a water rights policy based on “[first in time, first in right](#),” meaning whoever claimed a water source first had the right to transport and control that water. This concept is legally referred to as prior appropriation rights rather than riparian rights, meaning whoever owns the land has exclusive rights to the water, provided that water is put to some “useful” purpose. Later, the [1922 Colorado River Compact](#) established the Colorado River System and allocated more water than existed — 7.5 million acre-feet per year of the river and its tributaries to the Upper and Lower Basin each, “which shall include all water necessary for the **supply of any rights which may now exist.**”

In addition, the Lower Basin was given the right to increase its use by 1 million acre-feet per year.

River than cities in Southern California, Las Vegas, Phoenix, and Salt Lake City.

In an agreement between the Bureau of Reclamation and the IID, in the 1930s, the Bureau built the gravity-fed, 80-mile [All-American Canal](#) to directly connect the Colorado River to the Imperial Valley to “reclaim the desert” for crop production. The canal is the valley’s only source of water. Today, the IID controls 1,675 miles of irrigation canals and upholds the farmer’s claim to their legal “senior water rights” over any other state that also receives the river’s water. Under current law, Imperial Valley farmers have more rights to the Colorado

As early as 1985, Don Worster, the eminent scholar of environmental history, pointed out that the government-subsidized endeavor to irrigate the arid American West — primarily to benefit corporate landowners while disposing of small farmers and the laboring class — was doomed to fail. The belief that the Colorado River could deliver more water and cheap electricity than it could ever produce to sustain a rapidly growing population was, in short, based on magical thinking and greed. He wrote in *Rivers of Empire: Water, Aridity, and the Growth of the American West* that:

“The American West can best be described as a modern hydraulic society, which is to say, a social order based on the intensive, large-scale manipulation of water and its products in an arid setting. ... The hydraulic society of the West is increasingly a coercive, monolithic, and hierarchical system ruled by a power elite based on the ownership of capital and expertise. Its face is reflected in every mile of the canal.”

Don Worster

It takes a lot of water to grow alfalfa in the Imperial Valley – nearly twice as much as one other region

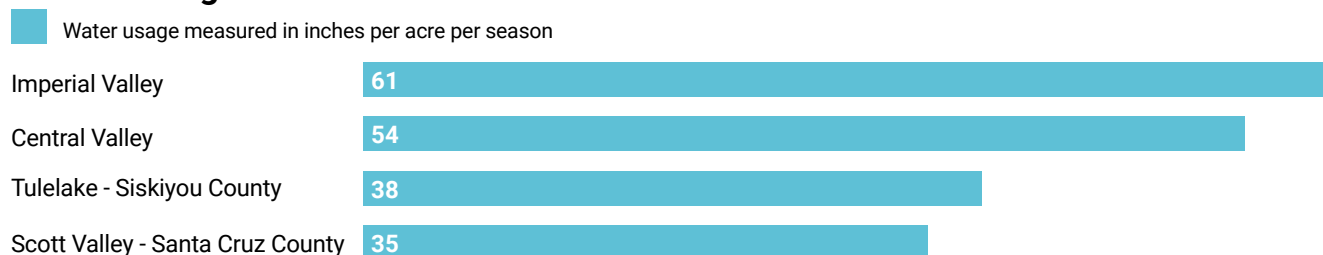
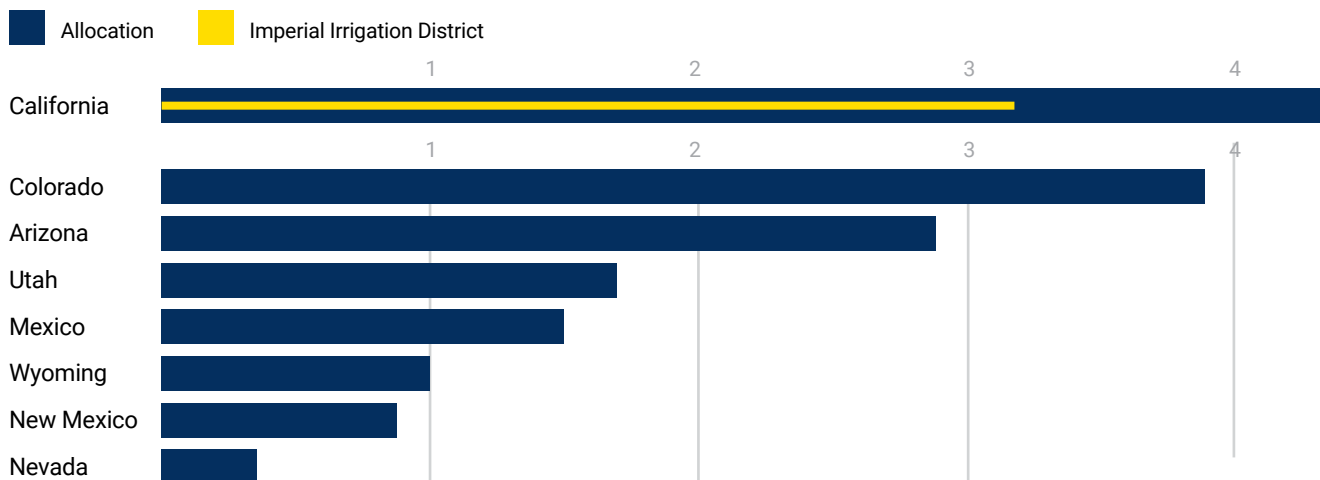


Chart: Jeremia Kimelman • Source: [UC Davis](#) • [Get the data](#) • Created with [Datawrapper](#)

Imperial Valley farms are allocated nearly 80% of California's water from the Colorado River



The Imperial Irrigation District no longer uses all of its legally allocated 3.1 million acre-feet per year. Thanks to a series of long-term water transfers they agreed to in recent decades they are down to about 2.6 million acre-feet per year

Source: Congressional Research Service, Imperial Irrigation District • [Get the data](#) • Created with [Datawrapper](#)

Department of Interior's Dilemma

In June 2022, the Secretary of the Department of Interior, which oversees the Bureau of Reclamation, gave water managers in the seven states an opportunity to collectively [devise a plan](#) to reduce their water use by 2 million to 4 million acre-feet per year, roughly a 15 to 30 percent decrease, to prevent Lakes Powell and Mead from reaching dead pool status. In October 2022, the [Department of Interior offered](#) to pay farmers \$400 per acre-foot to conserve water through the Inflation Reduction Act (IRA) funding. Currently, the Imperial Valley farmers pay 20 dollars [an acre-foot](#) and reaped \$2.3 billion in sales in 2021. One Imperial Valley farmer, appointed by the IID to chair California's Agricultural Water Advisory Committee, called the Department of Interior's offer a "[nothin' burger](#)," claiming farmers in the valley make \$2,000 in revenue for each acre-foot of water.

In response to the Department of Interior's February 1, 2023, deadline for a collective plan to reduce water usage by 30 percent, the Colorado River Board of California [offered to cut 9 percent](#) of its water in 2023–2026. The chair of the Colorado River Board is also one of the five IID boards of directors. The Board argues that [Arizona cities](#) must cut water usage in its cities before California takes any cuts because Arizona only holds "junior rights." Now the February 1 deadline has arrived without a seven-state agreement. Will the Department of Interior make good on its ultimatum to decide for the states their water reduction plans and sharing rights, or will the state of California and the DoI settle the matter in the courts?

And if Lake Powell and Lake Mead become dead pools, what good are California's "rights?"



Recommendations: A WBD Analysis

Climate change and drought will ultimately determine agriculture's fate in the Southwest. Meanwhile, several opportunities exist for Imperial Valley and other California and Lower Basin agriculture landowners to prepare for a drier future while reducing water consumption. Two of these are:

1 Diversify land use. Solar companies are eager to buy or rent land from Imperial Valley farmers. Solar farms solve two problems at once: they reduce pressure on the Colorado River and provide much-needed and discounted renewable energy to Southern Californian cities increasingly at risk for rolling blackouts.

2 Use water efficiently. In the short term, instead of growing the highest water-intensive crops such as alfalfa, rice, and lettuce, farmers in the arid Southwest should plant

low-water-intensive fruits and vegetables such as melons, figs, plums, pomegranates, tomatoes, squash, beans, beets, turnips, carrots, kale, Swiss chard, arugula, and onions. Other regions in the U.S. are better suited to growing water-intensive crops than the desert.

Other solutions include:

- **Solar-powered desalination.** Desalinization projects, filtering seawater into fresh, are energy-intensive, costing around \$2,000 an acre-foot. The \$1 billion, privately financed Carlsbad Desalinization plant, in partnership with nine San Diego municipal water agencies, provides about 10 percent of San Diego County's drinking water, producing \$50 million gallons of fresh — and very expensive — drinking water a day for 400,000 residents. The Department of Energy has invested in numerous universities and private companies to develop solar-powered desalinization plants. And the Massachusetts Institute of Technology

recently developed a solar-powered desalinization system that is more energy-efficient and less expensive than previous solar systems.

- **Systems loss accounting.** The six-state proposal submitted to the DoI asks the Lower Basin to adopt “systems loss accounting” as performed by the Upper Basin since 1948. That means considering evaporation and other losses as river water flows downstream through reservoirs and canals in their yearly allotment. Nevada and Arizona have agreed. Because they apply systems loss accounting to their annual allocation, the Upper Basin states use only about half of their allotments in most years.

- **Water Markets.** The Giannini Foundation of the University of California has proposed how water trading could mitigate the economic costs of drought and climate change. Researchers from the foundation demonstrate that different counties in California have different values on the water they consume. They propose that counties willing to pay a higher price for additional acre-feet of water could buy water from counties with a lower willingness to pay for water. Water trading would result in an economic benefit for both counties, reducing the financial costs of climate change.

Overall, agricultural landowners in the arid American West must adapt to survive the changing climate. What the DoI is asking now is only a short-term solution to address an acute — and potentially catastrophic — problem. In 2026, the seven states, Native American Tribes, and representatives from Mexico will meet again to stake out a long-term plan. Meanwhile, states can take advantage of federally funded opportunities to plan for the hydrologic realities of the Colorado Basin.

The Bureau of Reclamation has used the best science available to make [immediate and long-](#)

[term decisions](#) to “withstand water resource scarcity” in the West. Since 2021, Reclamation has:

- Invested more than \$300 million in drought relief projects
- Selected 227 new WaterSMART projects to support water conservation projects that increase water delivery efficiency and reliability during drought.
- Awarded 56 drought resiliency projects with \$55.3 million WaterSMART funding across the West

With nearly \$12.4 billion in funding through the 2022 IRA, DoI will further invest in water resource projects. Reclamation will allocate \$ 8.3 billion of IRA funding to build drought resilience in the West, including water recycling and reuse projects, desalinization projects, WaterSMART projects, and more.

DoI is also investing in renewable energy across the West, which will reduce energy reliance on Lakes Powell and Mead. On January 20, 2023, The [Biden-Harris Administration announced](#) the groundbreaking of Ten West Link — a new 125-mile, 500kV, high-voltage transmission line that will connect Southern California and Central Arizona and deliver clean, reliable, affordable electricity. The Ten West Link will transmit 3,200 megawatts of electricity and provide connection capability for new energy projects in the region.

Yet even vast federal funding cannot prevent the inevitable. Bureau of Reclamation Commissioner [Touton, stated](#) to the Senate Committee on Energy and Natural Resources on June 14, 2022, that, “no amount of funding can completely offset the severe shortfalls in precipitation being experienced this year across the American West. We will experience unavoidable reductions in farm water supplies and hydropower generation, ecosystem degradation, and urban areas. We all need to do more together to conserve more water.”



How WBD is Helping

At WBD, our strategic advisors and climate change professionals can help communities develop and implement various climate mitigation and adaptation measures. Our [WBD Guide to Building Community Climate Resilience](#) helps municipal governments identify assets vulnerable to climate hazards, determine which adaptive measures will reduce climate-related impacts, and decide how to implement them. We can help small and medium-sized municipal governments create climate plans that their residents will support. We understand the difficulties city officials face when undertaking this endeavor — where to begin, what tools are needed, and how to fund it. We recommend actions that do more than reduce the concentration of greenhouse gasses and climate change mitigation; **we also emphasize measures that reduce the impact of climate change — climate change adaptation** — such as decreased traffic and congestion, improved air quality, reduced property and infrastructure damage from climate change events, improved health, better

access to parks and green spaces, job creation, and cost savings through energy efficiency projects and risk management.

For our U.S federal government clients, we help implement elements of President Biden's Executive Order on [Tackling the Climate Crisis at Home and Abroad](#) in our current domestic and international projects. We are poised to support clients as they apply GHG mitigation and climate change adaptation measures through the Administration's [Inflation Reduction Act of 2022](#).

In addition, WBD follows our rigorous standard for environmental responsibility through our [Greenhouse Gas Management Statement and Methodology](#).

Whatever your climate resilience needs, WBD can help your community make better decisions in creating and implementing a sustainable, affordable, and achievable climate resilience plan.

About the author: Mary Jane Maxwell, Ph.D., Senior Expert at WBD, supports the National Institutes of Health as a science writer. She is a Certified Climate Change Professional and a member of the Association of Climate Change Officers. She is also an active member of the Citizens' Climate Lobby, a non-profit, nonpartisan, grassroots advocacy organization focused on national policies to address climate change.