

# Glen Canyon Dam Faces Its Existential Moment

Iconic structure becomes Colorado River's biggest water chokepoint.

by [Brett Walton](#) April 29, 2026



## KEY POINTS

Glen Canyon Dam, completed in 1963, was not designed to be operated at extremely low water levels in Lake Powell.

The decline of Lake Powell is putting hydropower generation

and downstream water deliveries at risk.

The Bureau of Reclamation, the federal water manager, is studying options for retrofitting Glen Canyon Dam.



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PAGE, Ariz. – In the span of U.S. history certain years are turning points, milestones in the nation's story. 1776. 1865. 1929. 1968. Circumstance and consequence conspire to make it so.

For the Colorado River and those who rely on it, 2026 is on the verge of similar prominence. Circumstances in the basin today are that urgent.

A slow-developing water supply calamity, decades in the making, has boiled over, like a cold war turning hot. Extreme heat in March – triple-digit temperatures never witnessed that early in the year – obliterated a meager snowpack. The basin's big reservoirs, the supposed buffers against short-term drought, were already uncomfortably low after a quarter-century of declining river flows. They will drop even lower. The amount of water flowing this summer into Lake Powell, the nation's second-largest reservoir, will be one of the smallest ever measured, barely a trickle.

"This is unprecedented, but it's not unpredicted," said Eric Balken, executive director of the Glen Canyon Institute. "I like to say that this is the most predicted disaster of all time."

Lake Powell is formed by Glen Canyon Dam, a striking 710-ft tall concrete arch braced against ruddy sandstone walls. It plugs the Colorado just after the river enters Arizona. Meant to ensure water deliveries to the lower basin states of Arizona, California, and Nevada, Glen Canyon Dam was finished in 1963 to complement the Colorado River's audacious engineering that distributes water through mountains and uphill to the largest cities in the Southwest and to the region's most productive farmland. When full,

Lake Powell holds enough water to flood the entire state of Virginia to the depth of one foot.

Climate change and water demand that still exceeds supply have flipped the engineering script. Lake Powell is less than 25 percent full today. Glen Canyon Dam, instead of being a guarantor of water, is now the most significant water chokepoint in the basin. The hard-won asset has become a glaring liability.

The reversal of fortune is because of how Glen Canyon Dam was designed. The dam was never meant to be operated at the extremely low water levels that Lake Powell is rapidly approaching. Doing so for extended periods of time could damage the pipes that move water through the dam, according to the Bureau of Reclamation, the federal agency that manages the structure.

Reclamation is now studying its options for retrofitting Glen Canyon Dam to accommodate a lower Lake Powell. It expects to release those findings later this year or in early 2027. As any home remodeler knows, renovating an aging structure is neither quick nor cheap, especially when failure could have disastrous consequences.

In the short term, Reclamation is relying on operational band-aids for Glen Canyon Dam and Lake Powell. With the consent of the seven states in the basin – Arizona, California,

Colorado, Nevada, New Mexico, Utah, and Wyoming – the agency took [unprecedented action](#) this month to prop up the reservoir. Releasing more water from upstream reservoirs and holding back more in Powell will delay Glen Canyon's infrastructure reckoning. But that day will soon come, and Reclamation's answer to the dam's engineering problems will have far-reaching implications – not only for the reliability of the basin's water supply, but also for its power customers, ecology, and recreation economy.

## **An Assessment Deferred**

Dams are difficult to manage under any circumstance. Management is even more troublesome when operators must balance multiple, conflicting objectives. In Glen Canyon's case those objectives are water supply, flood control, hydropower generation, and releasing water to protect the ecology downstream in the Grand Canyon – namely, beach-building and threatened native fish like the humpback chub. This is in addition to ensuring the safe operation of the dam itself.



As of late April 2026, Lake Powell was just 25 percent full and projected to drop to a record low in the next 12 months. Photo © Brett Walton/Circle of Blue

How to operate Glen Canyon Dam and Hoover Dam, its larger downstream sibling, is what the seven basin states and Reclamation are attempting to figure out right now. The current agreement covers operations through 2026. Reclamation published a [draft environmental impact statement](#), or EIS, in January that would impose severe cuts on water users in the lower basin, particularly Arizona, in part to protect Glen Canyon Dam's fragile infrastructure.

For that reason, water users in the lower basin and elsewhere support an engineering fix for Glen Canyon Dam. Many were incredulous that Reclamation did not include an

assessment of dam modifications in its draft environmental analysis.

“This EIS could have been a great avenue to look at real changes at Glen Canyon Dam that could solve the water delivery problem and some of the ecological problems, too,” Balken said.

Patrick Dent is the assistant general manager for water policy at the Central Arizona Project (CAP), which delivers Colorado River water to the densely populated center of the state. He said that CAP does not favor any particular fix – only one that provides dam managers with more flexibility.

“Our primary interest is that they could release water at a lower lake level,” Dent said.

The Gila River Indian Community, which receives Colorado River water through CAP, told Reclamation that the agency has a duty to safeguard the tribe’s water rights, which are at risk if the dam cannot release enough water. “The United States must take action to fix Glen Canyon Dam,” Gov. Stephen Roe Lewis wrote in a March 2026 [letter](#).

The Colorado Water Conservation Board, which represents that state’s water interests, said it supports a reevaluation of Glen Canyon Dam, but “in a separate action” from the EIS.

Becki Bryant, a Reclamation spokesperson, said the agency

will release an appraisal study assessing three dam modification alternatives at the end of this year or in early 2027. Any action beyond the study, she said, requires congressional authorization and funding.

### **'Antiquated Plumbing'**

The tool for managing the dam's multiple objectives, which are a legislative requirement as well as a practical necessity, is the water held in Lake Powell, said David Wegner, a scientist who has worked on Glen Canyon policy for more than four decades. But even water has limits when the engineering is inadequate. "Sadly, these dams were not built for multiple objectives," Wegner said. And Glen Canyon was certainly not built for extremely low water, he added.

Glen Canyon Dam, completed in 1963, was not designed to be operated at extremely low water levels that Lake Powell is now approaching. Photo © Brett Walton/Circle of Blue

The problem with Glen Canyon is what a coalition of environmental groups calls the dam's "antiquated plumbing." The groups – Glen Canyon Institute, Great Basin Water Network, and Utah Rivers Council – published [a report](#) in August 2022 that outlined these engineering deficiencies.

Water can exit Glen Canyon in only three ways. One is the spillways, a pressure-release valve for flooding, which are located at elevation 3,648 feet, near the top of the dam. They are irrelevant today. Lake Powell rests 122 feet below them.

The main exit point is through the eight penstocks, the 15-

foot diameter tubes that move water through the turbines to generate hydroelectricity. The penstocks are incapacitated when Powell drops below 3,490 feet. (The lake today is 36 feet higher than that level.) If the lake falls below what is known as minimum power pool, hydropower generation also ceases.

If that happens, water must be released through four 8-foot diameter pipes called the river outlet works. Smaller than the penstocks, the river outlet works are located at elevation 3,370. Below that elevation water cannot be released from Powell, a status known ominously as "dead pool." (Functionally, the river outlet works may be useless at elevation 3,394, Reclamation says.)

The environmental groups identified two limitations with the river outlet works. One is that they were not designed to be operated full-time. They are a role player, not the star. The other is that their smaller size means less water can pass through them. That's a problem because the upper basin states of Colorado, New Mexico, Utah, and Wyoming are required to send a set amount of water downstream to the lower basin, according to the 1922 Colorado River Compact that divided the river.

The flow restrictions imposed by the river outlet works, if they had to be used full time, means that the upper basin could violate the compact, which could mean water

cutbacks imposed by the lower basin.

“It’s just so counterintuitive that the tool that was designed to meet this delivery obligation” – the construction of Glen Canyon Dam – “is now going to be the roadblock that may prevent the delivery obligation from being met,” said Balken of the Glen Canyon Institute.

The engineering problems are not a new discovery. Wegner, who was with the Bureau of Reclamation at the time as its Grand Canyon environmental studies manager, helped lead a 1987 National Academies [report](#) on Glen Canyon. The report recommended that the Interior Department consider the “installation and operation of multiple outlet structures” at Glen Canyon, which would give dam managers more flexibility with water releases.

Glen Canyon Dam's powerhouse sits at the base of the 710-foot-tall structure. Hydroelectric generation has dropped in tandem with the falling water levels in Lake Powell. Photo © Brett Walton/Circle of Blue

Glen Canyon's structural problems were substantiated in 2023, when Reclamation used the river outlet works during an experimental "high-flow" release of water to flush sediment downstream and rebuild eroding Grand Canyon beaches.

The high-volume release caused pitting, or cavitation, within the river outlet works, a risk that was heightened due to the physics of water when Lake Powell is low. Reclamation coated the pipes with epoxy as a temporary fix to prevent more damage, a process that took several months. The agency has since used two small-scale physical models at

its Technical Service Center in Denver to test dam operations at low water levels and the effect on infrastructure.

Reclamation acknowledged the limitations of the river outlet works in a [technical memo](#) published in March 2024 by Richard Lafond, director of the agency's Technical Service Center. The memo's conclusions were endorsed by the top decision-makers in Reclamation's Upper Colorado River Office.

"Long term operation of the river outlet works will result in accelerating regular operation and maintenance tasks," LaFond wrote. Reclamation should "not rely on the river outlet works as the sole means for releasing water from Glen Canyon Dam."

Wegner put it in starker terms. If the river outlet works had to be relied upon and the pipes began to erode again, then Reclamation could potentially lose control of water flows.

"Potentially that could fail," Wegner said, meaning an inability to control water releases through the dam if the pipes are structurally compromised. "And if that fails, now you have a catastrophe on your hand and you have limited options to manage that catastrophe."

In other words, there would be no way to release water

downstream into the Grand Canyon and into the lower basin.

## **Neither Quick Nor Easy**

What fixes are possible? Reclamation received \$2 million from Congress in the fiscal year 2022 budget for an appraisal study.

Reclamation outlined three engineering possibilities in a [2023 presentation](#), most of which centered on preserving hydropower generation as Lake Powell declines.

One possibility is a new, lower intake that uses the existing power generation turbines. An intake located deeper in the reservoir would allow Glen Canyon to pass water in what is currently dead pool. But it would entail "increased risk from penetration through the dam."

The second would connect new power generation equipment to the river outlet works.

The third option is tunneling through the canyon wall and installing a new underground power station. This would also provide more flexibility for water releases.

Reclamation also included three operational or policy changes for power production, including [investing in wind and solar](#) to offset hydropower declines.

Other ideas that seemed kooky and fringe just a few years ago – draining Lake Powell and filling Lake Mead first; changing the basin’s water accounting system – are now being discussed throughout the basin with more seriousness and candor.

Beyond that presentation, Reclamation has not said much publicly about dam modification. The agency declined an interview request to discuss Glen Canyon Dam’s engineering problems.

Whatever direction Reclamation chooses – an option outlined above or something new – the process will not be quick or easy. Any change to Glen Canyon must go through an environmental analysis and public comment period. Congress will have to authorize actions and appropriate the funds. Construction alone will take years.

Wegner, who was the staff director for the House Natural Resources Water and Power Subcommittee from 2008 to 2014, knows the difficulty and sees a lack of leadership. “There’s nobody in Washington who has been willing to lead the charge trying to get Congress to provide authorized funding to do this sort of work.”

### **‘Reservoir Triage’**

Because Reclamation is not confident it can operate the river

outlet works for an extended run, the agency is focused on keeping Powell above elevation 3,500 feet.

Protecting 3,500 feet comes with all sorts of baggage. It preserves hydropower generation, which power customers appreciate. But in effect the redline at that elevation strands some 4.4 million acre-feet in Lake Powell. (Only 3.7 million acre-feet is technically accessible with the current plumbing.) Some have called this elevation a ["de facto" dead pool](#). Thus, the agitation in the lower basin for a plumbing system within the dam that provides access to this water.

The mineral "bath tub ring" above Lake Powell shows where its water level has been. Photo  
© Brett Walton/Circle of Blue

Balken said that downstream water deliveries, not preserving

hydropower, should be Reclamation's biggest concern.

"When these decision makers are talking about Glen Canyon Dam from only a hydropower perspective, I think it's missing the larger point, which is the dam is about to become the biggest roadblock of water deliveries that the basin has ever seen," Balken said.

To avoid the infrastructure risks of dropping below 3,500 feet, Reclamation has started to take extraordinary action. The agency has two emergency levers it is pulling. One is to hold more water back in Lake Powell. Reclamation cut water releases to the legal minimum this year, something it has never done. The other is releasing more water from Flaming Gorge, a reservoir upstream that is in better shape.

As Balken describes it, "This is reservoir triage."

These emergency actions have serious side-effects. Upstream, Flaming Gorge is expected to lose 35 feet of elevation by next spring, once the extra water has been released. That will hurt the recreation economy of northeastern Utah and southwestern Wyoming – fewer boat ramps in the water, less fishing access.

These upstream releases have limited utility, Wegner said. "You can do that once or twice. But you got to then depend upon Mother Nature refilling those reservoirs upstream."

Downstream, Lake Mead will drop quickly and it too will approach a level in which hydropower generation at Hoover Dam [severely drops](#). Algal blooms in a warmer, shallower lake could be a problem. "They're going to be robbing Mead to pay Powell," Balken said.

## **Trying Not to Hit Bottom**

The idea of dead pool – when Lake Powell can no longer release water – was almost inconceivable when the reservoir was designed and filled. The official device for measuring Lake Powell's elevation ends at the top of the penstocks, at elevation 3,477.5 feet. According to Reclamation's 2024 technical memo, "This is an indication that reservoir elevations below minimum power pool" – 3,490 feet – "were not anticipated."

Reclamation finished filling the reservoir in 1980. Three years later, after an intense El Niño winter, the dam's upper limits were tested. Floodwaters in the summer of 1983 nearly broke the dam. Such volumes are almost inconceivable now.

In a typical year, Lake Powell would be rising in late April, flush with the deposits of snowmelt from headwater basins in the Rocky Mountains. Not this year. The snowpack peaked in many basins in late February or early March. What little snow there was has already melted. As of April 28, Lake Powell inflows are projected to be just 16 percent of average.

Lake level forecasts from mid-April showed a long downward slope for the next 12 months. Those projections were what triggered the emergency release of water from Flaming Gorge and the reduction in Lake Powell releases.

Scientists have been warning about circumstances like this for years. In a defining period for the basin, all the predictions of water supply shocks in the Colorado River from the past two decades are coming to pass.

"We should have been prepared for this," Balken said.

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