

From a Raft in the Grand Canyon, the West's Shifting Water Woes Come Into View

The Colorado River through the national park holds lessons for managing an essential and diminishing resource in a rapidly warming climate.

Judy Fahys August 8, 2021



Ian McCammon, the writer's spouse, rows the Colorado River through the Grand Canyon National Park, here amidst ancient Vishnu schist in May. The trip offers a window into deep time and recent history. The needs of recreational boaters, wildlife, the canyon ecology and water users is part of an ongoing conversation that has been made more contentious because of drought, water shortages and global warming. Credit: Judy Fahys/Inside Climate News

Floating in the bottom of the Grand Canyon last spring, I was traveling back in time in more ways than one. In a narrow section, where the Colorado River runs deep and quiet, Vishnu schist offers a window onto the world as it was here 1.7 billion years ago, give or take a couple of hundred million years. Little about the redrock walls seems different from when I first marveled at the scenery as I rafted past many years ago.

But for the water that carries travelers through the national park, the changes have been dramatic even though they've occurred over just 31 years and barely amount to a tick in geologic time. It used to be that the big problem was managing so much water on the Colorado.

Now the problem is adjusting to so little water. Drought and climate change are proving a profound challenge in the Southwest, where more than 40 million people rely on the Colorado River Basin for the water that sustains their communities and irrigates more than 3 million acres of crops. And it's only expected to get tougher.

On my first excursion down the river I was part of what retired NPR reporter Howard Berkes described as a “floating press conference.” That was in 1990, when the primary purpose of the Glen Canyon Dam upstream was to provide cheap, convenient power to electric wholesalers serving about 1 million people in the West.

Twice daily blasts of extra water through the dam’s turbines raised and lowered the river by as much as 13 feet a day. The surges ripped apart the beaches that recreational boaters camped on each night and upset the river ecology. Policymakers, scientists, advocates and professional river guides told the 21 assembled journalists about their growing concern about balancing dam efficiency with preserving nature in the national park.

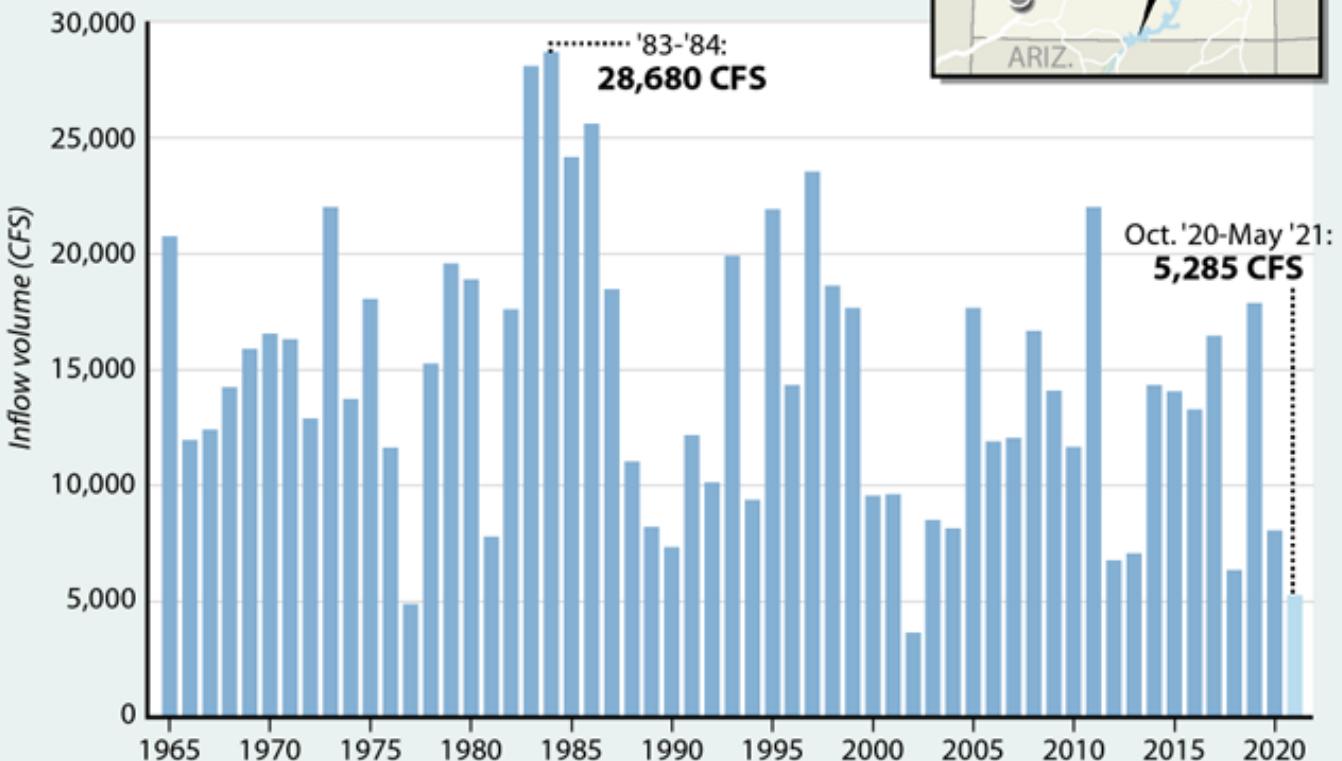
When I rafted through the canyon again this spring, it was clear their efforts, bolstered by decades of river research, led to some meaningful changes in dam operations. By tinkering with the knobs controlling hydropower flows, the river’s ecological health has improved in measurable ways.

Lake Powell's Low Flows

Declining inflows to Lake Powell from Colorado River Basin tributaries have been blamed, in part, on global warming. The impacts are evident in the Grand Canyon ecology, and they're affecting water and power supplies for millions of Americans in the West.

LAKE POWELL UNREGULATED INFLOW

In cubic feet per second, water years 1965–May 2021 averaged



NOTE: Water year is Oct. 1 – Sept. 30.

SOURCE: U.S. Bureau of Reclamation

PAUL HORN / Inside Climate News

Then, and Now, on the River

Dave Wegner, who led early studies of the dam's impacts for the U.S. Bureau of Reclamation, helped explain the problem caused by too much water on the 1990 river trip. One day at lunch he pointed out a stick jabbed into the soft, blond sand at the river's edge. During an ordinary lunch break, it disappeared in more than two feet of rising water, thus showing how the fluctuating river levels reflected the West's



thirst for electricity.

"We're releasing more water at Glen Canyon Dam in response to electrical demand in the power grid," he said.

The rush of water signaled that dam operators were responding to the region's demand for hydropower, a daily ebb and flow. As electricity users powered up their hair dryers and coffee pots each morning, and cranked their ovens and air conditioners each afternoon, dam operators released extra water through the turbines.

The water blasts didn't just erode the sandy beaches that rafters rely on for our campsites and picnics, they also ruined the insect hatches that provided nourishment for fish and birds and washed away plants and shrubs necessary for nesting and sustenance. The very existence of endangered species like the [humpback chub](#), a fish that likes warm water, was put at risk because of the torrential pulses from the chilly bottom of Lake Powell and the nonnative Rainbow trout that thrive in cold water.

"What we're trying to do is to figure out the dynamics of all this," Wegener said at the floating press conference. "Are there thresholds in dam operations where we tend to accelerate erosion of these various beaches, and are there thresholds where we might tend to start to rebuild some of these beaches?"



Water collected from the Upper Basin states on the Colorado River and stored in Lake Powell powers the hydroelectric turbines of the Glen Canyon Dam. The reservoir, the second largest in the nation, reached its lowest level this summer since it began filling in 1963 because of a megadrought that has lasted more than 20 years as climate change has warmed the region. Credit: Judy Fahys/Inside Climate News

In the years since, the Grand Canyon environment became a focus for dam operators, thanks in part to bipartisan legislation sponsored by Democratic Rep. George Miller of California and Republican Sen. John McCain of Arizona in 1992—the Grand Canyon Protection Act—and perfected over time. The law prompted an in-depth environmental assessment, ongoing scientific research, experimental water releases and, ultimately, changes in how Glen Canyon Dam

was operated.

Today the river still fluctuates, but not as dramatically as before. Steady, low flows on weekends have helped restore insects and humpback chub, an endangered species adapted to warmer water. Camping beaches are rebuilding. Birds find abundant shelter and food along the river's edge. But there was a lot more water flowing into Lake Powell above the dam back then—about four times, on average, the volume of inflow this year.

Scott VanderKooi, who oversees the Grand Canyon Research and Monitoring Center for the U.S. Geological Survey in Flagstaff, Arizona, said it's important to keep studying the river now in light of two decades of drought and climate change. "There's a sense of urgency in trying to understand what is happening and how quickly and how much things will change," he said.

Big Waves and Trickling Tributaries

Knowing what's happening with the water has always been a big deal in the Grand Canyon for river runners. They're always looking out for a crosscurrent that could wallop passengers off the boat or those Hawaii Five-O waves big enough to swallow a raft. Crystal Rapid gets more difficult in high flows, but avoiding the "Land of the Giants" holes in Hance Rapid is trickier in low water.

But water concerns took on a new meaning during my latest trip down the Colorado in May.

Sixteen of us were on a “private trip,” which we organized ourselves instead of using a commercial guide service. We rowed rubber rafts and kayaks 250 miles through the national park and some of North America’s most challenging rapids—all while rapt by some of the world’s most breathtaking redrock scenery and gobsmacking geology.

We’d strapped everything we needed for more than two weeks of camping onto the boats—sunscreen, oar repair kits, rain gear, food, helmets for the big rapids, goofy costumes for party nights and cases of bubbly beverages. Our loads included 10, five-gallon jugs that, during my previous trips, would have needed refilling two or maybe three times.

Last May we needed to fill them six times. It’s possible this thirstiness is tied to the 17 percent decline since 1990 in precipitation in the canyon from January to May, which is consistent with lower moisture levels across the Southwest that have been blamed on climate change.

On the river, we noticed water wasn’t shooting from the greenery on the cliff face at springs like Vassey’s Paradise, as it had been when the floating press conference drifted past 31 years earlier. Streams like Nankoweep Creek were running dry.

The short hike to the Book of Worms also held a surprise. We had no trouble finding the stone panel covered with fossilized tracks the invertebrates left in the muck about 550 million years ago. But the trail to it had many shriveled and collapsed cactus pads where lush yellow blooms were abundant when we visited two years ago.



Researcher Helen C. Fairley and her field team this spring compared changes in vegetation and the beach below Deer Creek Falls with historic photos of the same spot. Fairley has been studying changes in the Grand Canyon for decades. She's noticed shriveled cacti and Bighorn sheep gathering especially early on the riverbanks this year. Both indicate another dry year in the Colorado River Basin as climate change warms the Southwest. Credit: Judy Fahys/Inside Climate News

We ran into veteran archaeologist Helen Fairley across the

river from Deer Creek Falls, where she and her team were snapping before-and-after photos to document long-term changes in beaches and vegetation. The U.S. Geological Survey scientist had also spotted troubling trends like these.

"You know you're dealing with a drought when you're seeing desert plants falling over from lack of water," said Fairley, glancing at the desiccated cacti surrounding us.

Like me, Fairley, who's been studying the canyon for decades, had also noticed the odd abundance of Bighorn sheep chowing down along the river's edge. It's not unusual to see Bighorn at the river's edge, but this time the thrill of snapping their pictures wore off because there were so many. One night, a Bighorn even watched us from a rocky ridge above our camp. She seemed to glare, as if we'd elbowed her hungry family from the dinner buffet.

"Generally, they don't come down until late summer or fall, when the water sources up high dry out," Fairley said. "Well, this year, apparently, they don't have water up high."

Water became a preoccupation for us, too, even on the river.

We filled the jugs at the Phantom Ranch spigot, as usual. Then we refilled them with clean water from Tapeats Creek, chemically treating all 50 gallons to be safe. But our five-gallon jugs ran dry surprisingly fast, and four other times

volunteers from our group hauled buckets of water from the river and filtered every drop using a hand pump.



The drive to keep water jugs full for one Grand Canyon River trip this May meant refilling stops six times, here at Tapeats Creek, a relatively clean water source that only required chemical treatment. About 40 million people rely on Colorado River water in seven western states. Credit: Judy Fahys/Inside Climate News

The lack of runoff this year was also visible. Runoff normally fills the river with sediment that turns the river the color of a strong mocha. But this year it was so puny—the inflow into Lake Powell was about one-third of normal—that there was little sediment and the water remained unusually clear. VanderKooi said moss grew in the water as a result and kept

the river green along the length of our trip through the national park.

This spring, the U.S. Bureau of Reclamation expected the inflow into Lake Powell, the reservoir behind Glen Canyon Dam, to be a fourth to a half of what's been normal since it started filing in 1963. It's part of what appears to be a steep decline of inflows into the reservoir, a trend that's stepped up over the past two decades.

Pam Adams, a hydrologist for the bureau, which runs the dam, recently noted that reservoirs in the Colorado River Basin were nearly full before the current drought began. They dropped by about half in just a few years. Tree ring data showed the current drought, now christened a "megadrought" because it has lasted 20 years, represented the driest period in more than a century and one of the driest in the past 1,200 years, she added.

"Our challenges are not over," Adams said.



Looking upstream from Deer Creek Falls overlook in 2019, it's possible to see what the spring runoff normally looks like on the Colorado River—full of sediment from side streams.

Credit: Judy Fahys/Inside Climate News



Floating the Colorado River through Grand Canyon National Park offers a window into deep time and recent history. The needs of recreational boaters, wildlife, the canyon ecology and water users is part of an ongoing conversation that has been made more contentious because of drought, water shortages and global warming. Credit: Judy Fahys/Inside Climate News

Rafters and Researchers Study a Rapidly Changing River

A small army of citizen scientists are also watching the changes as they help gather data in the Grand Canyon that will ultimately be used in setting future policies on the Colorado River.

One is river guide Maggie Oliver, who was prepping a dory at

the Lees Ferry put-in, between the Glen Canyon Dam and the Grand Canyon. Oliver had already packed and stowed science kits that would travel downstream as part of a guided river trip for tourists. The kits would help gather information on bats and insects, but she was aware of bigger issues in play on the river, such as global warming.

"It's definitely on our minds," she said. "We've seen the river change; we've seen the flows change and the temperature change."

Oliver, who works for Arizona Raft Adventures, the company that supported the floating press conference 31 years ago, recalled how on a research expedition tracking insect populations, a kind of bellwether for the ecosystem, river temperatures rose surprisingly fast as their boats made their way downstream.

Indeed, heat is at the heart of many challenges facing the basin. In a 2018 paper published in the journal, Water Resources Research, a team including Colorado State University climate scientist Bradley Udall set out to understand why the Colorado River's stream flow had declined by 16.5 percent over the previous century when annual precipitation had *increased* by 1.4 percent during that time. The researchers determined that warming reduced snowpacks and increased evaporation, starting in the headwaters, and could be blamed for half of the

streamflow's decline.

The influential study cited five other papers that projected the trend would continue into the middle of the century, with runoff declining up to 30 percent by 2050, thanks to anthropogenic climate change. And the study, which compared the first 15 years of the current drought with the severe drought from 1953-1968, also determined that this century's warming was the big factor in a reduction of runoff, since actual precipitation wasn't that much lower than in the earlier drought.

In short, no matter what way scientists contemplate the Colorado River Basin water situation, human-caused global warming is having significant impacts throughout the 250,000 square miles of the basin.

A lack of forage on the range is forcing ranchers to sell off livestock. Tinder-dry vegetation has increased the risks, costs and extent of wildfires. Heat deaths are increasing. Less snow and snowmelt from the mountains means less water flowing through the dam to produce carbon-free hydroelectric power, which, in turn, might create a demand for more fossil fuel energy to make up the difference.

Longer droughts, more evaporation, precipitation changes, earlier runoffs, lower streamflows—they're all expected in the Colorado River Basin of the future, especially if projections

are correct that more greenhouse gases will result in temperatures that could be as much as 5-7 degrees higher throughout the Mountain West.

And these are unavoidable concerns for the participants of Grand Canyon Youth, says Emma Wharton, who leads the Flagstaff-based nonprofit. She also can imagine a time soon when water levels dip so low on Lake Powell that hydropower production falters at Glen Canyon Dam. It's a problem that the Bureau of Reclamation is trying to avert with plans announced last month to release water held in already low reservoirs upstream.



Executive Director Emma Wharton says participants in her nonprofit rafting program, Grand

Canyon Youth, grasp the importance of understanding environmental change. The program has participated in 40 citizen science programs. Credit: Judy Fahys/Inside Climate News

"There's a lot of trepidation about what is to come," said Wharton. "This generation is really going to have a lot of challenging decisions to make moving forward, but I also see the hope in the love and care that our alumni and our participants have for these places and that there is a lot of joy there at the same time."

People who rely on the Colorado River are coming to grips with the fact that too much water is an easier problem to solve than too little.

High Stakes for the River—and the People Who Depend on It

Considering how that floating press conference helped inspire changes to protect the Grand Canyon, there's reason to believe that scientific data gathered since then can help bring the kind of transformations that will be necessary to keep the Colorado River healthy for future rafters, fish, plants and sheep.

Yet, my reporting on the issue over the past three decades also gives me pause. That's because the common refrain is that everyone—the seven states in the Colorado River Basin, the 39 basin tribes and recreational users—must work together to address the uncertainties of Colorado River

water and the shortages we've started seeing. In a society so much bigger than a rubber raft, it's not clear that we're up to the challenge of collaboratively managing a shared resource in such challenging times.

On the Colorado River, cooperative agreements among water users, one hammered out in 2007 and another in 2019, offer some hope that it's still possible to stay the course and continue protecting the ecological resources in the Grand Canyon. But the stakes are getting higher too. A variety of strategies, including releases from upstream reservoirs to protect Lake Powell and water conservation, have already been implemented in California and Nevada. And, by the end of the month, the Bureau of Reclamation is expected to start reducing water to farmers in Arizona.

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But the states upstream—Utah, Wyoming, Colorado and New Mexico—also are planning new dams and pipelines for

the Colorado River water they let downstream states use for a century. It's water those Upper Basin states were granted under the 1922 Colorado Compact, when river flows were strong. All of the states, both in the Upper and Lower Basin, want more water to accommodate growth just as climate change promises a future that's drier and hotter.

There are hard realities foreshadowing brutal choices. The needs of growing cities and established farmers, the demands of power producers and tribes, the protection of endangered species and the environment seem destined to collide in the long-term. And, on the Colorado River, as with most of the water in the West, the most immediate human needs—water, food, electricity, recreation— have usually prevailed.

I recall something Fairley said deep in the canyon.

"We have to figure out how to keep people with enough water to drink and to sustain human life and society," she said. "At some level, it does become kind of a preeminent concern over every other issue."

Fairley hopes to see those decisions made intelligently and strategically—and with the help of science—so that the Colorado River can continue sustaining life *and* the Grand Canyon far into the future.

Perhaps that's a lesson that's easiest to comprehend in a raft floating between the steep walls of the quiet canyon, even in a flash of geological time.

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Judy Fahys has reported on the West for decades from Washington, D.C., and Salt Lake City. After covering the environment, politics and business at the Salt Lake Tribune, she fell in love with audio storytelling as the environment and public lands reporter for NPR Utah/KUER. Previously, she spent an academic year as a Knight Science Journalism fellow at the Massachusetts Institute of Technology. Her work has appeared in the New York Times, the Washington Post, High Country News and Outside magazine and aired on NPR. She serves on the board of the Society of Environmental Journalists.