

Restoring the Colorado: Bringing New Life to a Stressed River

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By [Jim Robbins](#) / [Photography by Ted Wood](#) • February 14, 2019



The Colorado River delta in Baja California is now a mosaic of largely dried-up river channels and tidal salt flats.
Ted Wood

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From the air, the last gasp of the Colorado River is sudden and dramatic. The pale green river flows smack into the Morelos Dam on the U.S.-Mexico border, and virtually all of it is immediately diverted into a large irrigation canal that waters a mosaic of hundreds of fields — alfalfa, asparagus, lettuce, and other vegetables, their vivid green color clashing against the sere desert. The slender thread of water that remains in the Colorado's channel continues to flow south, but is soon swallowed up by a sea of sand, far short of its delta, which lies 100 miles farther on.

The Colorado River once surged through the delta during high flows, carrying so much water at times that shallow draft steamboats chugged hundreds of miles up the river into the U.S. with loads of freight. The water in the delta nourished a vast fertile landscape, a fitting end to a river known as the Nile of North America.

“The river was everywhere and nowhere,” the naturalist Aldo Leopold wrote during a 1922 canoe trip to the delta, describing the waterway as it ebbed, flowed, braided, and stalled into pools, nourishing a rich and diverse ecosystem of “a hundred green lagoons,” a “milk and honey wilderness” with thick stands of cottonwoods and willows that provided habitat for hundreds of species of birds. The delta's marshes, mudflats, and white sand beaches were home to clapper rails, bitterns, mallards, teal, and clouds of egrets.

Bobcats, puma, deer, and wild boar wandered the delta's forests. Leopold was searching for the jaguar that roamed there, but didn't see any.



The Morelos Dam on the U.S.-Mexico border, where the Colorado's remaining water is diverted to cities and farms in Mexico. SUPPORT FOR AERIAL PHOTOGRAPHS PROVIDED BY [LIGHTHAWK](#)

Myriad species of fish swam in the river and in the brackish waters of the Gulf of California, including a relative of the white sea bass, the *totoaba*, which grew as large as 300 pounds. They were the buffalo of the sea, pursued for their meat and so plentiful that a whole fish sold for a nickel. Fishermen caught 4 million pounds a year in the early 20th century. Also harvesting the bounty of the delta were the indigenous Cocopah, who threaded the waters in dugout canoes and lived in round houses made of reed and brush.

As a natural river, before it was dammed, the Colorado was a massive, dynamic waterway. It flowed from elevations above 14,000 feet in the Colorado Rockies, then dropped to sea level, which meant that it moved at high water with tremendous force, liquid sandpaper carving out red rock canyons. It flooded the desert plains, carving new channels and braids with every inundation. When it receded, it left behind a mosaic of fecund marshes, wetlands, and ponds.

In its natural state, the Colorado had more extreme flows than any river in the U.S., ranging from lows of 2,500 cubic feet per second in the winter to 100,000 cubic feet per second in the summer. In 1884, an all-time historical

peak flow reached 384,000 cubic feet per second in Arizona.

But extreme flows are too capricious to support a civilization, so over the past century or so humans have built a network of expensive dams and reservoirs, pipelines, canals, flumes, and aqueducts to tame and divert the flow. Yet these projects also strangled the life out of a once-thriving ecosystem. By design, the river will never again function as a free-flowing stream.

Can the Colorado flourish — to some degree and in some places — with the permission of engineers?

Now, however, experts and environmentalists are rethinking this technological marvel of a river, and looking at ways a natural Colorado can flourish — to some degree, and in some places — with the permission of the engineers. One of those places is in the delta.

The water that flowed in the once-lush delta has been replaced by sand, and the cottonwoods and willows have surrendered their turf to widespread invasive salt cedar and arrowweed. Without the river and its load of nutrients, marine productivity in the Gulf of California — where the Colorado River once ended — has fallen [by up to 95 percent](#). But despite the dismal forecast for the future of water on the Colorado, some conservationists are hoping to return at least a portion of the delta to its former glory.



Downstream from the Morelos Dam, the Colorado River delta now runs dry before reaching the Gulf of California. Map by David Lindroth

“We are trying to restore a network of sites that creates a functional ecosystem,” said Francisco Zamora, who manages the project for the [Sonoran Institute](#). “We’ve acquired water rights, but use them for habitat instead of cotton or wheat.”

The delta is one of a disconnected series of restoration projects that government agencies, local groups, and environmental organizations are undertaking along the Colorado. Numerous efforts are focused on tributaries to the main stem of the river, seeking to enhance resiliency by increasing the flow of water and protecting and restoring riparian habitat for fish and other wildlife.

For example, a coalition of groups — including state agencies, nonprofits, and the Arizona cities of Buckeye and Agua Fria — have been removing invasive salt cedar, planting native species, and building levees to reclaim a 17-mile stretch of the Gila River. Invasive salt cedars are a region-wide problem on

the lower Colorado, with a single tree sucking up 300 gallons a day. The invasive forest on this stretch of the river uses enough water to serve 200,000 households.

In the upper basin, meanwhile, a number of groups and local landowners are working to restore a 15-mile-long floodplain with globally significant biodiversity on a narrow section of the Yampa River, another Colorado tributary. Called Morgan Bottom, the section has been damaged by deforestation and poor agricultural practices, threatening bald eagles and greater sand hill cranes, as well as a rare riparian forest of narrowleaf cottonwood and red osier dogwood.

But there are limits to how natural the Colorado River can become, especially along the river's main stem. "We should not kid ourselves that we are making it natural again," said John Fleck, the director of the University of New Mexico's water resources program and the author of a [book](#) about the restoration of the Colorado. "We are creating an intensively managed system to mimic some nature because we value it."

Because of the Colorado's extensive infrastructure, serious disruption of the river's ecology is inevitable.

Indeed, some of the remaining naturalness on the Colorado is, paradoxically, because of the human-made system. "The geography of the Colorado gives it hope because L.A. and southern California, which everybody loves to hate, guarantee that a lot of water stays in the system through the Grand Canyon," says Jack Schmidt, a professor at Utah State University and a member of the [Colorado River Research Group](#). "The best friend endangered fish ever had in the Colorado River Basin is that giant sucking sound" of California withdrawing water.

Widespread protection efforts are focused on native fish in the Colorado. The river once was home to an unusual number of endemic fish. But dams, irrigation, and the introduction of bullhead, carp, and catfish did them in. While the upper basin still has 14 native fish species, the lower basin, according to [one study](#), “has the dubious distinction of being among the few major rivers of the world with an entirely introduced fish fauna.”

The Colorado pike minnow — something of a misnomer for a fish that historically grew to 6 feet in length and weighed up to 80 pounds — once swam through the entire system from Wyoming to Mexico. It is now listed as endangered, with two distinct populations remaining in the upper Colorado and the Green River.

The humpback chub lived in various canyon sections, and though once seriously endangered, it has fared better in recent years through transplantation efforts, growing from 2,000 to 3,000 fish to 11,000. Officials say it may soon be taken off the endangered list.



A fisherman on the upper Colorado River in northern Colorado. Low water flows have endangered fish populations and led last year to the closing of parts of the river to fishing.

Razorback suckers, once common, are now rare. The bonytail, a type of chub that is one of North America’s most endangered fish, no longer exists in the wild. A handful of these fish exist in hatcheries, and attempts are underway to restock them in the river throughout the basin.

Because of the Colorado's extensive infrastructure, serious disruption of the river's ecology is inevitable. Dams trap most of the river's sediment in reservoirs, which means there is no material to rebuild beaches, sandbars, and important fish habitat downstream.

Dams also deprive the river downstream of nutrients, such as phosphorous and nitrogen, and stratify water temperatures. The native fish in the Colorado adapted to a wide range of temperatures, from cold to very warm. They also evolved to tolerate high flood flows along with extremely dry periods. Now, the water is cold in the summer for miles below the dams, and the humpback chub and other fish that had adapted to a range of water temperatures and flows suffer.

Something called hydro-peaking also has had serious impacts on the food web. Dams generate power according to demand. As people come home from work and switch on the stove, air conditioning, and lights, demand soars and dams release more water to produce power. "Prior to the construction of dams, there were almost no major daily changes in river levels," said David Lytle, a professor of integrative biology at Oregon State University. When fluctuations in water levels occur, they "can interrupt the egg-laying practices of some species. It's a serious problem."

Paradoxically, two of the Colorado's most important wetlands are the product of runoff from irrigation.

Insects lay their eggs just below the water level, and if levels drop rapidly it can dry them out. A recent study found that below the Hoover and Glen Canyon dams, there was a complete absence of stoneflies, mayflies, and other species — insects that are vital food for fish, bats, birds, and other creatures.

Because of the ecological effects of the Glen Canyon Dam, the Grand Canyon

stretch of the Colorado is one of the least productive sections of river in the world. The Colorado here will always be highly unnatural, a novel, human-created ecosystem with some natural elements.

Today, there is a large and growing backlash against dams in America and elsewhere as the immense damages they have inflicted on rivers become manifest. Few dams, though, are as reviled as the Glen Canyon, which was built in 1963 and took 17 years to fill Lake Powell.

Before the Glen Canyon was dammed, those who saw it say it was not unlike the Grand Canyon, with towering walls of red, tan, and ochre. Early Native American sites were plentiful. Environmental activist Edward Abbey decried the dam, and in his novel the *Monkey Wrench Gang* fantasized about using houseboats packed with explosives to blow it up. In 1981, members of Earth First!, a radical environmental group with a connection to Abbey, rolled a black plastic “crack” down the face of the dam to symbolize its demise.



Lake Powell in Utah stores water from the Upper Colorado Basin for delivery to Lake Mead, the key reservoir on the Colorado.

Removing the dam was part of the reason the [Glen Canyon Institute](#) was

formed, but activists have now dropped that idea, says Rich Ingebretsen, a Salt Lake City physician who founded the group. Today, he advocates draining Lake Powell to fill Lake Mead, which is downstream and where the need for water is by far the greatest. The [“Fill Mead First” campaign](#) would restore a free-running Colorado River to what was once Lake Powell.

“You’d get much of Glen Canyon back,” said Ingebretsen. “A free-flowing river through the Grand Canyon means you’d restore the river — riparian zones, animals that belong there, a beautiful canyon with arches and bridges and waterfalls. Much of that would come back very quickly.” There would also be increased water in the river, he says, because so much of the Colorado is now lost from Lake Powell; scientists estimate that the lake loses three times Nevada’s allotment of water because of evaporation. As levels in Lake Mead drop due to prolonged drought, a growing number of people are taking this idea more seriously.

Paradoxically, two of the Colorado River’s most important wetlands for wildlife are the product of runoff from irrigated farm fields — and are now at risk from a changing climate and agreements to reduce water use.

In the Sonoran Desert of northwestern Mexico, the 40,000-acre La Cienega de Santa Clara wetland was inadvertently created in the 1970s when U.S. officials built a canal to dispose of salty wastewater from agricultural fields in Arizona. As the water began spilling into the desert, myriad forms of life began to appear. Now its cattail-studded marshes and mudflats are considered one of the most important wetlands in North America, home to 280 species of birds — including the endangered Ridgways rail — on what was once hard-baked desert.

The largest project to restore some semblance of nature on the Colorado is in the delta.

Meanwhile, in California, the Salton Sea was once a shallow inland lake

whose levels routinely fluctuated. In 1905, an effort to increase Colorado River flow into the Imperial Valley led farmers to allow too much river water into their irrigation canal, overwhelming their system; for two years the water poured into the 35-mile-long, 15-mile-wide Salton Sea and expanded it.

But as less water becomes available to agriculture and rising temperatures cause more water to evaporate, scientists are concerned that these wetlands will dry and shrink faster than they already have. A 2003 agreement, for example, allows agricultural water in the Imperial Valley to be sent to San Diego for municipal uses. That could cause water levels in the Salton Sea to drop by more than 40 percent, dramatically reducing bird habitat and increasing toxic dust because wetlands would dry out. Local, state, and federal officials have devised a plan — still not fully funded — to restore 15,000 acres of wetlands, at a cost of more than \$700 million.

The largest project to restore some semblance of nature to the Colorado River, though, is in the delta. An unusual agreement in 2012 between the U.S. and Mexico, called [Minute 319](#), mandated that the two countries would provide water and funding to revive sections of the delta and release a one-time pulse of 105,000 acre-feet to again connect the river to the delta temporarily. Scientists would then study the effects.

In 2014, for the first time in decades, the river flowed again in Mexico — for eight weeks. San Luis Rio Colorado — once a Colorado River town, but now a dusty desert settlement — became a river town for two months, to the delight of locals, many of whom had never seen the river. The pulse offered a glimpse of what reclamation efforts might look like. “It gave us an idea of how the river behaves, and the best sites for restoration,” said Zamora.



Francisco Zamora, of the Sonoran Institute, and botanist Celia Alvarado walk in a cottonwood forest they helped restore at Laguna Grande in the Colorado River delta.

Minute 319 and its 2017 replacement, Minute 323, have funded the restoration of sections of the river. A group of nonprofits — including the National Audubon Society, the Sonoran Institute, The Nature Conservancy, and a Mexican group called Pronatura Noroeste — is working on a project called [Raise the River](#) to revive a significant swath of the delta.

In 2008, the group secured rights to 1,200 acres along the desiccated river channel. Since then, local residents have torn out acres of salt cedar and planted irrigated fields of cottonwood, willow, and other endemic species — more than 200,000 trees in all. A small supply of water mandated by the treaty, along with excess water that flows off of irrigated fields, have been dedicated to the restoration.

On a recent visit, I joined Zamora and botanist Celia Alvarado on a short boat ride to Laguna Grande, a 6-mile section of restored river and estuary. We

skimmed across still water the color of weak tea, minnows darting away from our paddles. Thick groves of cottonwoods and willows lined the river. Zamora remarked that bobcats and beaver lived there now, along with blue grosbeaks and yellow-billed cuckoos. “Impacting the target species is key,” he said.

And what about the jaguar? I asked. It has not returned, he said. Will it come back?

“Yes,” said Zamora, smiling. “Someday. If they allow me to introduce them.”

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