

New research advocates a basic strategy for native fish recovery: Access to water

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Rivers need water—a fact that may seem ridiculously obvious, but in times of increasing water development, drought, and climate change, the quantity of natural streamflow that remains in river channels is coming into question, especially in the Colorado River basin. Newly published

research poses a tough question in these days of falling reservoir levels and high-stakes urban development: Whether the continued development of rivers for water supply can be balanced with fish conservation.

The Colorado River basin is historically a highly dynamic river with a wide range of streamflow during the year, a wide range of river temperatures, and large sediment loads in some seasons. Native fish evolved through periods of wet and dry cycles when the total flow was relatively large or relatively small. But water-supply development has further depleted the flow of many [rivers](#) in the Upper and Lower Colorado River basins, and today's river habitats are increasingly decoupled from that natural cycle of spring snowmelt and monsoon season floods and intervening low flows in favor of depleting the natural flow and stocking nonnative sports fish in some places.

The health and recovery of [native fish](#) species now depends largely on the public's willingness to protect those rivers that retain some semblance of a natural flow regime as freshwater conservation areas, say authors Casey Pennock, Phaedra Budy, Wally Macfarlane and Jack Schmidt of the Watershed Sciences Department in the S. J. and Jessie E. Quinney College of Natural Resources and colleagues Matthew Breen of the Utah Division of Wildlife Resources and Justin Jimenez of the U.S. Bureau of Land Management.

"The bottom line is that everyone knows fish need water, and most people who study or manage fishes know that complex habitat required by native fish is created and maintained by adequate river flows, or a natural flow regime," said Budy. "The White River of Colorado and Utah is a perfect example of such a natural river; it is the only tributary of the four considered in our research that still has a natural flow regime and it is the only tributary of the middle Green River with abundant complex fish habitat and a thriving native fish community. Nonetheless, society continues to manage our desert rivers as if we think that fish

don't need water. If we continue down this path, we will watch native fishes, some of which are found nowhere else on Earth, blink off the planet."

Natural flows are vital to the health of rivers. The survival of native fish populations, water quality and river habitats all depend on the variable flows of flood and base flow that rivers experience when left to their own devices. Dams have changed the natural flow in many rivers in the Colorado River basin, but a more pressing problem is the depletion of flow such that little remains in the channel. At a regional scale, water in the Colorado River basin is completely consumed and no water reaches the Gulf of California in most years. Thus, the delta of the river in Mexico has been transformed from an internationally recognized refuge of biodiversity to a dry, sandy channel. Even in the Upper Colorado River basin, some streams, such as the Duchesne, Price, and San Rafael Rivers are nearly completely depleted of natural flow. Declines in native fish have been profound and persistent. If there is not enough flow in the river, other conservation efforts don't really matter, say the authors.

Endangered fish recovery programs designed to aid native fish populations are required by law to use strategies that benefit endangered fish, but those programs can not interfere with existing or proposed future water development. Thus, these recovery programs are limited in protecting the one thing that fish most need—water. The task of recovering endangered native fish populations may be an impossible goal wherever natural streamflow is declining due to a warming climate and consumptive water uses are increasing, according to the authors. Despite decades-long efforts by state, federal, tribal and private organizations, some native fish can't maintain self-sustaining populations in the Colorado River basin today, and some species would be extinct without federal stocking programs. Long-term conservation of native fish is directly tied to natural flow, say the authors, and very few rivers still maintain that function.

"Managing for the minimum amount of water necessary to sustain native fish during dry spells is a common approach, but there are not many places where this strategy is sufficient to recover and protect native fish. We think conservation of natural flows is critical for long-term conservation of fish," said Pennock. "In some rivers there have been attempts to recreate the benefits of natural [flow](#) with managed releases from large dams to reduce the negative downstream impacts of water development. These kinds of actions can have some localized benefit, but they are not likely to help native fish long-term or large-scale because societal needs, drought, climate change, and infrastructure are limiting how much water is available for rivers."

"This study reminds us that increasing consumptive water use in an era of declining natural streamflow caused by [climate change](#) inevitably jeopardizes one of the Colorado River's most distinctive attributes—its endemic native fishery," said Schmidt, who also directs Utah State's Center for Colorado River Studies. "If we care about protecting natural river ecosystems, then we as a society are going to have to care about leaving significant amounts of water in our rivers."

What native [fish](#) need, say the authors, is access to adequate [water](#) in rivers to maintain the complex, nuanced, messy flows in which they've evolved.

More information: Casey A. Pennock et al, Native Fish Need A Natural Flow Regime, *Fisheries* (2021). [DOI: 10.1002/fsh.10703](https://doi.org/10.1002/fsh.10703)

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