

Great Plains river basins threatened by pumping of aquifers

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The Arikaree River and other Great Plains river basins are losing stream flow through the pumping of aquifers, endangering native fishes. (photo by Jeffrey Falke)

Suitable habitat for native fishes in many Great Plains streams has been significantly reduced by the pumping of groundwater from the High Plains aquifer – and scientists analyzing the water loss say ecological futures for these fishes are "bleak."

Results of their study have been published in the journal *Ecohydrology*.

Unlike alluvial aquifers, which can be replenished seasonally with rain and snow, these regional aquifers were filled by melting glaciers during the last Ice Age, the researchers say. When that water is gone, it won't

come back – at least, until another Ice Age comes along.

"It is a finite resource that is not being recharged," said Jeffrey Falke, a post-doctoral researcher at Oregon State University and lead author on the study. "That water has been there for thousands of years, and it is rapidly being depleted. Already, [streams](#) that used to run year-round are becoming seasonal, and refuge habitats for native fishes are drying up and becoming increasingly fragmented."

Falke and his colleagues, all scientists from Colorado State University where he earned his Ph.D., spent three years studying the Arikaree River in eastern Colorado. They conducted monthly low-altitude flights over the river to map refuge pool habitats and connectivity, and compared it to historical data.

They conclude that during the next 35 years – under the most optimistic of circumstances – only 57 percent of the current refuge pools would remain – and almost all of those would be isolated in a single mile-long stretch of the Arikaree River. Water levels today already are significantly lower than they were 40 and 50 years ago.

Though their study focused on the Arikaree, other dryland streams in the western [Great Plains](#) – comprised of eastern Colorado, western Nebraska and western Kansas – face the same fate, the researchers say.

Falke said the draining of the regional aquifers lowers the groundwater input to alluvial aquifers through which the rivers flow, creating the reduction in streamflow. He and his colleagues estimate that it would require a 75 percent reduction in the rate of groundwater pumping to maintain current water table levels and refuge pools, which is "not economically or politically feasible," the authors note in the study.

Dryland streams in the Great Plains host several warm-water [native fish](#)

species that have adapted over time to harsh conditions, according to Falke, who is with the Department of Fisheries and Wildlife at Oregon State University. Brassy minnows, orange-throat darters and other species can withstand water temperatures reaching 90 degrees, as well as low levels of dissolved oxygen, but the increasing fragmentation of their habitats may impede their life cycle, limiting the ability of the fish to recolonize.

"The Arikaree River and most dryland streams are shallow, with a sandy bottom, and often silty," Falke said. "The water can be waist-deep, and when parts of the river dry up from the pumping of groundwater, it is these deeper areas that become refuge pools. But they are becoming scarcer, and farther apart each year."

Falke said the changing hydrology of the system has implications beyond the native fishes. The aquifer-fed stream influences the entire riparian area, where cottonwood trees form their own ecosystem and groundwater-dependent grasses support the grazing of livestock and other animals.

Pumping of regional aquifers is done almost entirely for agriculture, Falke said, with about 90 percent of the irrigation aimed at corn production, with some alfalfa and wheat.

"The impact goes well beyond the Arikaree River," Falke said. "Declines in streamflow are widespread across the western Great Plains, including all 11 headwaters of the Republican River. Ultimately, the species inhabiting these drainages will decline in range and abundance, and become more imperiled as [groundwater](#) levels decline and climate changes continue."

Provided by Oregon State University

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