A whisker away from winking out

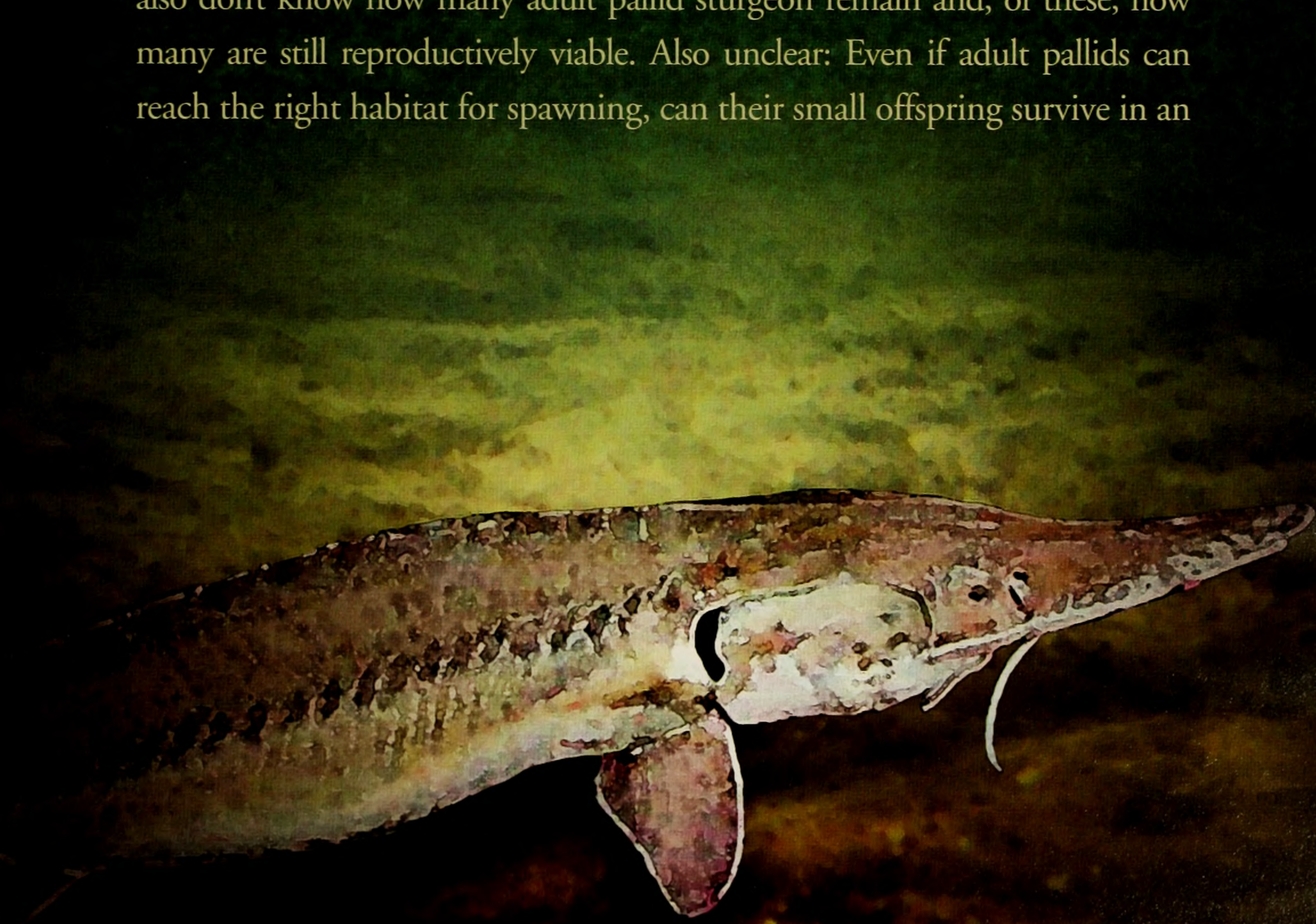
Will the pallid sturgeon go extinct on our watch?

By Andrew McKean

PALLID STURGEON PHOTO ILLUSTRATION BY LUKE DURAN

Frazer Rapids is a quarter-mile of swift, complicated current created by a gravel shoal extending across the otherwise languid Missouri River some 20 miles below eastern Montana's Fort Peck Dam. For boaters trying to negotiate this stretch of the Missouri, these rapids are a stomach-knotting, hull-scraping stretch of water. However, for a pallid sturgeon, among the rarest animals in North America, the swirling, tea-colored shallows may be one of the few remaining natural river features preventing its extinction.

Biologists suspect the bottom-dwelling native fish congregate on this gravel bar in the spring to spawn. But they don't know for sure. Nor do they know if the pallid sturgeon, listed as federally endangered in 1990, would reproduce if it could reach vital spawning habitat on the nearby Yellowstone River. They also don't know how many adult pallid sturgeon remain and, of these, how many are still reproductively viable. Also unclear: Even if adult pallids can reach the right habitat for spawning, can their small offspring survive in an



altered river system that may be sentencing them to a premature death?

Biologists working with pallid sturgeon not only lack information, they also lack time. Most remaining wild pallids were teenagers during the Eisenhower administration. Like humans of the same generation, the ability of these aging fish to reproduce diminishes every year. So few fertile pallids remain in the wild—perhaps just a few hundred—that scientists say the species will likely become extinct within the next 15 to 20 years.

"Unless things change," says Chris Hunter, chief of the Montana Fish, Wildlife & Parks Fisheries Division, "we could see the pallid sturgeon disappear in our lifetime."

Armor-plated, bewhiskered relics of the Jurassic Era, pallids are one of eight sturgeon species in North America. Named for their pale complexion, these slow-growing, shark-shaped fish live in portions of the Missouri, Mississippi, and lower Yellowstone rivers. The pallid sturgeon's stronghold, if it can even be called that, is in eastern Montana and western North Dakota. Roughly 150 adults live below Fort Peck Dam near the Missouri River's confluence with the Yellowstone; another 30 to 50 remain in the Missouri above Fort Peck Lake. Biologists fear that this relative handful of fish represents the last link in a 200-million-year-old chain extending to an age when dinosaurs roamed the continent.

Biologists don't know more about pallid sturgeon because the fish's behavior and habitat resist scrutiny. Adult pallids, which can grow to 5 feet long and weigh over 60 pounds, live on the murky bottoms of some of the nation's largest, most remote rivers. They so closely resemble their cousins, the smaller (and far-more-numerous) shovelnose sturgeon, that pallids weren't even described as a separate species until 1905. During the century that followed, their habitat was damaged or eliminated as rivers were dammed, diverted, and channelized to reduce flooding, generate power, provide drinking water, and float Midwestern barges. This reduced the self-sustaining pallid population to just a handful of geriatric individuals likely born before the dams were built. For biologists, simply finding a single pallid sturgeon these days—much less a group of them—is cause for celebration.

"One reason we know so little about these sturgeon is that we're limited to studying a small population of old adults," says Dave Fuller, an FWP fisheries technician studying pallids and other native fish of the lower Missouri. "We have almost no information about the early life history of these fish, their spawning, or the larval and juvenile stages. We're inferring about their whole life history from just a handful of adults that get older and less reproductively viable every year."

The main cause of the species' demise is no mystery. Monolithic Fort Peck Dam in eastern Montana, North Dakota's massive Garrison Dam, and three smaller dams in South Dakota and Nebraska have drastically altered the Missouri River. Many of the habitats and hydrological conditions that pallid sturgeon need to survive no longer exist.

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Before the Missouri River dams were built, beginning in the late 1930s, the river typically swelled each spring with mountain snowmelt, sprawled across its wide floodplain, and flowed warm and muddy to its union with the Mississippi River at St. Louis. Pallids evolved with the ebb and flow of high-water cycles. They moved hundreds of miles upstream each spring during high water to sandy shoals and riffles in the main river. The sticky fertilized pallid eggs would drop to the river bottom and adhere to rocks and gravel for a few days as the embryo developed. When the embryonic sturgeon were still in the larval stage, they would detach from the substrate and drift in the current for up to two weeks and over hundreds of miles. During this journey, the tadpole-shaped sturgeon developed tails, which propelled them to slack-water estuaries. There, they ate zooplankton, then insects, then minnows as they grew older. After a dozen years, when the sturgeon finally reached sexual maturi-

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LAST OF THE BIG ONES? A 66-inch-long, 38-pound pallid sturgeon caught at the mouth of the Tongue River in 1950. Biologists say fewer than 200 adult pallids now remain. Before long, the fish may be too old to reproduce.

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ty, they would join the springtime spawners and perpetuate the life cycle.

Dams changed all that by blocking the upstream spawning migration of pallids and other native fish. Just as harmful was the U.S. Army Corps of Engineers' water management regime, which tamed floods. Floodwaters once scoured the river bottom and deposited sand and gravel in shallow spawning shoals. High water also inundated side channels where young sturgeon grew up. And instead of the historically warm water that cued the sturgeon's springtime spawn, the dams released a consistent flow of cold water from the reservoir bottoms.

Perhaps most harmful to the pallids was how the dams chopped the river into relatively short segments. For instance, the Missouri River below Fort Peck Dam flows only about 200 miles before it slows and becomes North Dakota's Lake Sakakawea. River stretches below other dams are even shorter. That's not enough river miles for a larval pallid sturgeon to drift downstream before it matures.

According to Dr. Pat Braaten, a U.S. Geological Survey fisheries biologist studying pallid sturgeon, if the larvae don't have ample time to grow a tail to propel themselves, they sink to the reservoir bottom and smother in silt.

"We're increasingly sure that this 'drift distance' is critical to the pallid's recovery," says the biologist.

In 2003 Braaten's crew discovered a single days-old larva drifting just downstream of the Missouri–Yellowstone confluence. It was evidence that adult pallids somewhere upstream had naturally spawned. The spawning may have taken place at Frazer Rapids or Prairie Elk Rapids, which biologists suspect are the Missouri River's equivalent of sturgeon singles' bars. Their discovery renewed hopes that at least some adult pallids are still spawning. If true, that means larvae survival, not spawning habitat, is the most important factor affecting the species' recovery.

To create adequate larvae survival conditions on the Missouri would require releasing warm, muddy water over the Fort Peck Dam's spillway. This would replace the cold water now coming from the dam's base, which keeps adult sturgeon from moving farther upstream to spawn. More warm water would effectively add miles of river available to adult spawners—and, after the eggs hatch, to larval sturgeon for downstream drifting. "Spillway releases" have been tried on other rivers in the United States and appear to benefit other sturgeon species. However, no spillway release can occur at Fort Peck Dam until the lake's water rises to full pool, which is at least five years away in these drought-stricken times.

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DWINDLING RANGE
Pallid sturgeon once moved up the entire Missouri River to Great Falls, and the Yellowstone River to its confluence with the Bighorn River.


RAFE SIGMUNDSTAD

WATER DISRUPTIONS
Fort Peck and other major dams on the Missouri River prevent upstream migration, lower water temperature, and drastically reduce vital spring flooding.

Roughly 100 air miles southeast of Fort Peck Dam, the lower Yellowstone River braids and weaves, carving islands, building sand bars, and occasionally flooding lazy side channels before joining the Missouri just inside the North Dakota border. This 290-mile stretch of the Yellowstone is one of the last reaches of unimpounded, unchannelized river in the Northern Plains. Biologists think it is perfect pallid sturgeon habitat, both for spawning and larvae survival, where the species could rebound to a sustainable population.

However, no one knows for sure if sturgeon would use that part of the Yellowstone. A 5-foot-tall diversion dam at Intake, near Glendive, blocks fish from moving upstream, where all this habitat lies. Biologists have released some radio-tagged sturgeon upstream from the dam to see what habitats the fish would use. Most of the pallids soon swam back downstream to below Intake, leaving biologists puzzled.

Built in 1911, the Intake Diversion Dam is a major source of irrigation water for far-eastern Montana and western North Dakota. Though the Yellowstone is often touted as America's longest "undammed" river, the Intake dam is large enough to prevent sturgeon from moving upriver. In midsummer, the dam also diverts about half of the entire Yellowstone River into irrigation canals. Though the water is essential for farming in the arid region, the dam also diverts thousands of downstream-swimming fish of various species from the Yellowstone and strands them in canals or on irrigated sugar beet fields.

Most people involved in the pallid sturgeon's recovery agree the biggest impediments are the loss of habitat, migration barriers, and historical water flow disruption. But that consensus is tempered with political reality. The kinds of large-scale engineering alterations required to return either the Missouri or the Yellowstone rivers to their historical condition are economically, socially, and politically unlikely.

For example, suggestions to alter the spring water releases from Fort Peck Dam have been met with howls of protest from downstream states demanding steady flows

for barge traffic. And then there's the matter of cost. At the Intake Diversion Dam, the U.S. Fish & Wildlife Service is currently evaluating various options that would allow upstream-moving fish to move around the structure and reduce the diversion of downstream-moving fish into irrigation canals. However, no agency has agreed to foot the $35 million to $50 million bill for building a dam passageway.

Until state and federal agencies can find ways to make substantive habitat improvements, either by modifying dams or changing water-release regimes, the only hope left for pallid sturgeon is to augment the dwindling population of old, wild fish with hatchery-reared progeny.

Biologists are using Montana fish as the crucible of genetic identity that could rejuvenate the pallid population. Every spring for the past eight years, fisheries crews have descended on the confluence of the Missouri and Yellowstone rivers in April to net the adult pallids that congregate there. The biologists carefully transport the sexually mature fish to hatcheries, strip eggs and milt, and then incubate the fertilized eggs. Once the eggs hatch and the young fish reach 3 to 7 inches long, biologists mark them with tags and release them into the two rivers. In 2005, biologists released a record 15,000 hatchery-reared juveniles. Based on the recapture of previous years' tagged fish, it appears the juvenile pallids are able to survive and grow in the wild. However, if wild fish can't find conditions for adequate spawning and larvae survival, it's unlikely the hatchery fish will either.

"We're buying time with the hatchery program," says Braaten. "We're trying to buy a generation of fish while we study the sturgeon and work on habitat alteration so some future generation of hatchery-reared pallids can spawn naturally."

Biologists admit they may not figure out what pallid sturgeon need to reproduce naturally—or be able to remove barriers to spawning success—before the remaining wild fish become too old to reproduce. George Jordan, the pallid sturgeon recovery coordinator for the U.S. Fish & Wildlife Service in Billings, believes the stocking program is essential for preserving the species' genetic identity.

"Through the hatchery system, we're making families of pallid sturgeon with the hopes of conserving the pallid's genome with as much diversity as possible," Jordan says. "Maybe in the future, someone will wake up in the middle of the night with an idea about how to improve sturgeon habitat so these and future hatchery-raised fish can spawn and live on their own. The alternative is that we do nothing and the pallid sturgeon just winks out."

Yet another reason for stocking sturgeon is that the hatchery fish could take advantage of some unforeseen event—natural or human-caused—that provides adequate spawning and larval survival. Though most biologists suspect the remaining wild pallids were all born before construction of Fort Peck Dam, Braaten thinks some successful natural reproduction might have occurred since the dam was built.

"One [study] does suggest that some spawning occurred in the 1940s, '50s, and '60s and the babies from these spawns recruited to adults," says Braaten. "Something may have happened during each of those years, maybe a flood event or some other environmental feature, that was just right for sturgeon to pull off a spawn. If we can learn what it was, maybe we can duplicate it, or it will happen again naturally. That's the best argument for stocking as many hatchery fish as we can. If we get another flood or some other event that creates the right habitat conditions that can produce natural spawning, then we have hatchery fish in the river ready to take advantage of it."

Even if scientists can't solve the pallid puzzle, Fuller doesn't believe the years and money spent on sturgeon recovery will have been in vain. He notes that the Corps of Engineers has agreed to release some water under certain conditions from Gavins Point Dam in southern South Dakota to encourage sturgeon spawning runs downstream.

The federal agency has also committed millions of dollars to re-create shallow-water pallid sturgeon habitat on the lower Missouri River in Missouri. There, where most of the few remaining pallid sturgeon have cross-bred with shovelnose sturgeon, genetically pure pallids are in grave danger of disappearing.

"It's taken a while for people to get serious about pallid sturgeon," Fuller says. "But things are starting to move. Fifteen years ago, the Corps of Engineers wouldn't have considered releases from Gavins Point Dam just to benefit a native fish. Even ten years ago, you didn't see this kind of attention being paid to collecting fish for hatchery augmentation."

Fuller believes the research done to learn why this species has been disappearing will also benefit other fish.

"Pallids are an indicator species for a warmwater ecosystem gone wrong," he says. "What we are learning from these sturgeon may prevent other Yellowstone and upper Missouri native species, such as paddlefish, blue suckers, and sauger, from following them to extinction."

That may be minor consolation when compared to the absolute finality of seeing the pallid disappear forever. But considering how dire the sturgeon's plight is, how little anyone knows about the species, and the massive obstacles threatening its recovery, holding out hope for other warmwater fish might be all there is left.

DAVE FULLER

"We're trying to buy a generation of fish while we study sturgeon and work on habitat alteration."

Biologists measure one of the relatively few remaining adult pallids on Missouri River.

HOLDING OUT HOPE FWP fisheries technician Matt Baxter shows off a hatchery-reared juvenile pallid sturgeon before releasing it into the Missouri River. Because so few wild pallids remain, biologists hope the hatchery fish will survive and, if habitat conditions improve, someday reproduce on their own.

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