



NOTCHING BIG WINS *for* BIG HOLE GRAYLING

SLIP STREAM FWP fish biologist Ryan Kreiner creates a temporary gap in a beaver dam on Steel Creek, one of several spawning tributaries for Arctic grayling on the Big Hole River of southwestern Montana. Biologists time this work just as fish are about to swim upstream to spawn. PHOTO BY HOLLY PICKETT

Beaver dams are good medicine for rivers. But they can block the spawning runs of Arctic grayling in the Big Hole. Biologists have found a way to give grayling short-term gaps for long-term gains.

BY DAN CROCKETT

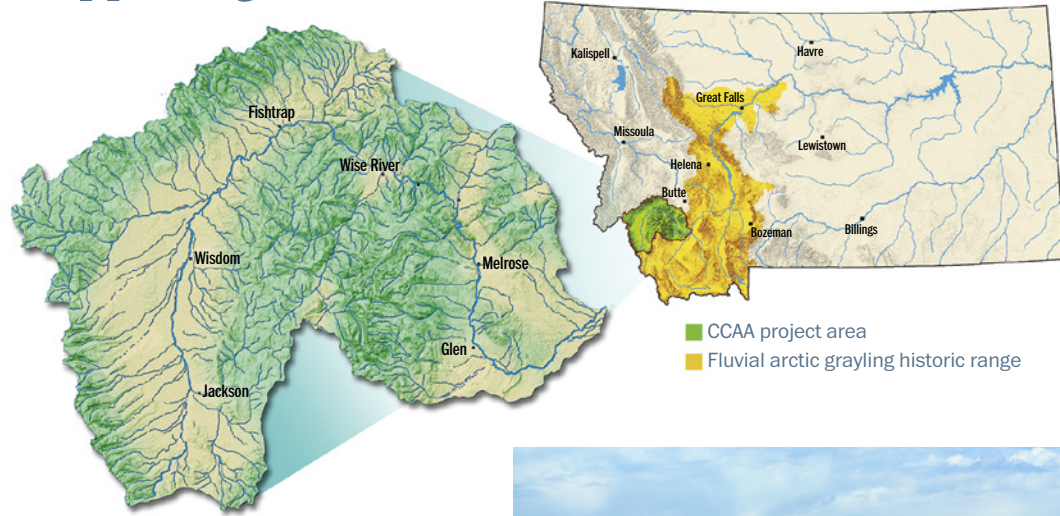
With a four-toothed rake on his shoulder and wearing waders that look like they've been dragged behind a truck, Ryan Kreiner stands on a bluff overlooking the upper Big Hole Valley. It's Earth Day, and we've come to do a little spring cleaning for Arctic grayling.

Sparkling below us on this cool April morning, Steel Creek wanders across the valley, carving horseshoes and doubling back as if drawn by a kid fed three Pop Tarts then handed an Etch A Sketch. With beaver ponds scattered liberally along its path, Steel is the essence of a healthy creek—unless you're an Arctic grayling trying to swim upstream to spawn, which they'll soon be doing in the last week of April and first week of May.

"Sampling Steel Creek in the fall, we typically find 20 to 40 young-of-the-year grayling spread over the lower 3 miles," says Kreiner, a native fish biologist for Montana Fish, Wildlife & Parks. "But after several years of low-magnitude runoffs, we only found six, and they were all stuck in the last quarter-mile below the lowest beaver dam."

We pick up our rakes and head down to the creek; it's time to start notching dams. This is as low-tech as stream work gets: Stand at one end of a dam, take a good swing, pull hard, repeat. Eventually the pressure of the water stacked up above begins gnawing at the breach. Then the current starts ripping and it all goes in a satisfying rush of silt and willow cuttings. The end result for grayling is clear passage upstream and freshly scoured gravel ideal for laying eggs.

Upper Big Hole River



The mighty Missouri River begins its journey east in the headwaters of the upper Big Hole River, fed by a wide web of tributaries converging from every direction in a valley 75 miles long and 30 miles wide. Biologists have found that Arctic grayling spawn in just six or seven of the cleanest, coldest creeks.

Notching beaver dams mimics how the structures fail naturally. In a good runoff year, high water will find its way around one corner of a dam and carve a new channel. But a string of low-runoff years allows the dams to keep growing and become ever more formidable to grayling.

“When we started doing this in the Big Hole in 2022, if you stood at the base of those dams, you’d need a periscope to see over the top. At almost any flow, no fish had a prayer of getting over,” Kreiner says. “Now that we’ve been notching dams every spring, they are a lot more manageable, and we’re finding 25 to 70 young-of-the-year grayling spread across the last three miles of Steel.”



HIGH, WIDE, AND HANDSOME Averaging 6,000 feet in elevation, the Big Hole is one of Montana’s highest and widest mountain valleys, rimmed by the Pioneer Mountains to the east and the Bitterroots to the west. Those snowcapped peaks provide copious cold water to its river system.

HISTORIC PRESERVATION

When the Corps of Discovery came up the Missouri River in 1805, Lewis and Clark found grayling shimmering all across its southwestern Montana headwaters. Today, the Big Hole holds the last native fluvial (river-dwelling) grayling population in the Lower 48.

For millions of years, beavers served as both nurses and engineers for creeks across the West, keeping them healthy and dynamic. As settlers arrived, over-trapping and habitat destruction decimated beaver populations. But in recent decades, the chisel-toothed rodents have resurged as a vital force for restoring streams. Kreiner makes it clear that FWP views beavers and grayling as natural allies.

“Beavers do a ton of good work for these

Dan Crockett is a freelance writer and long-time magazine editor in Missoula.

creeks and the species that depend on them,” he says. “They are not the primary driver of the grayling population. But all the grayling left in the Big Hole now spawn in just six or seven tributaries. If three of those are blocked, we’ve lost half our potential spawning population.”

Notching dams just before rising stream temperatures and early runoff spur the grayling to spawn goes a long way toward ensuring every fish can reach the riffles and runs it needs.

A FISH FELLOWSHIP

Grayling look like relics from another age, and they are. They’ve been living in the Big Hole since woolly mammoths and short-faced bears roamed this country.

In the brutally dry summer of 1988, though, they came perilously close to joining

those beasts as ghosts among the sage. For 24 days, not so much as a trickle dampened the Big Hole riverbed at the Wisdom Bridge, with nothing upstream or down but cracked dirt and desolate cobbles.

A few years later, an environmental group sued the U.S. Fish & Wildlife Service (USFWS) to designate Arctic grayling an endangered species in the Lower 48. That potential listing under the Endangered Species Act became the catalyst for an outstanding alliance of landowners, state and federal agencies, and nonprofit conservation groups. They vowed to never let one of America’s most beloved trout streams run dry again and started working to ensure that grayling swim its waters far into the future.

Thanks to this remarkable partnership, crucial summer flows are both colder and more consistent than they were 35 years



NORTHERN STAR True to its name, the Arctic grayling is a fish of the far north mostly relegated to Alaska and northern Canada. Montana’s Big Hole River holds the last native river-dwelling grayling in the Lower 48 after the one other population in Michigan went extinct in the 1930s.

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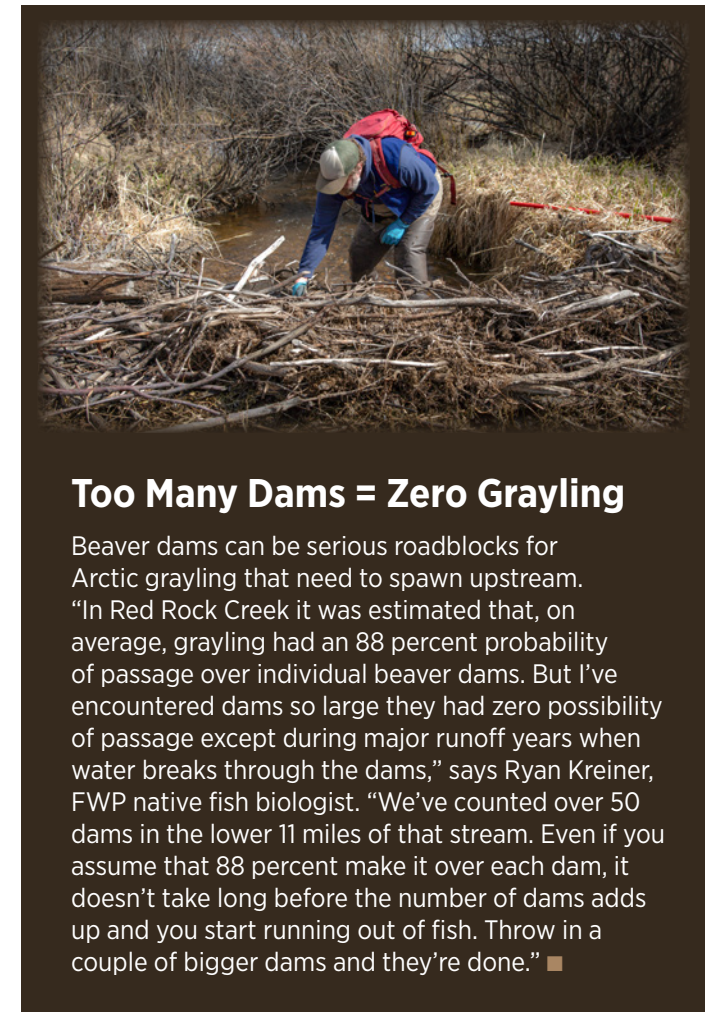
ago, despite higher air temperatures, lower snowpacks, and smaller runoffs.

There are far more grayling spawning successfully than when that first lawsuit was filed, and they still haven’t crash-landed onto the list no creature wants to make.

“All of that comes down to one thing: the landowners,” says Matt Jaeger, native species and Beaverhead-Ruby program manager for FWP. “They provide the foundation that has made so much good work on the river possible. Everything we do relies on that collaboration.”

In 2006, the USFWS cemented that alliance when it launched a Candidate Conservation Agreement with Assurances (CCAA) program aimed at recovering and sustaining grayling in the Big Hole. The CCAA is a 10-year contract that offers ways for ranchers and other landowners to improve their operations and benefit grayling. Those strategies almost always come with substantial funding and often labor, materials, and equipment provided by state and federal agencies as well as nonprofits.

In exchange for undertaking conservation measures,



Too Many Dams = Zero Grayling

Beaver dams can be serious roadblocks for Arctic grayling that need to spawn upstream. “In Red Rock Creek it was estimated that, on average, grayling had an 88 percent probability of passage over individual beaver dams. But I’ve encountered dams so large they had zero possibility of passage except during major runoff years when water breaks through the dams,” says Ryan Kreiner, FWP native fish biologist. “We’ve counted over 50 dams in the lower 11 miles of that stream. Even if you assume that 88 percent make it over each dam, it doesn’t take long before the number of dams adds up and you start running out of fish. Throw in a couple of bigger dams and they’re done.” ■



Riparian fencing



Stock tank



Headgates with a fish ladder



Solar-powered fish screen



Fish-friendly bridge

CCAA All the Way

Though its name is a mouthful, the Big Hole Candidate Conservation Agreement with Assurances (CCAA) has played a crucial role conserving fish and wildlife in the Big Hole Valley, engaging ranchers to help preserve stream flows; protect riparian zones using stock tanks and fencing; keep grayling out of irrigation ditches and other entrapments using headgates, fish ladders, and fish screens; and remove barriers to migration on creeks and rivers such as replacing culverts with bridges (see photos on left).

Since 2006, 31 ranches and landowners have enrolled in the CCAA, which encompasses:

- ▶ **161,000** acres
- ▶ **51** creeks and the Big Hole River
- ▶ **267** miles of river and tributaries vital to grayling spawning and thermal refuge
- ▶ **95%** of core grayling habitat

CLOCKWISE FROM TOP LEFT: JOHN LAMBING; JOHN LAMBING; PATRICK CLAYTON/ENGRETTSON UNDERWATER PHOTOGRAPHY; MONTANA FWP; MONTANA FWP; MONTANA FWP; MONTANA FWP



DASHING DORSAL
Arctic grayling are the only member of the salmon family with a tall, sail-like dorsal fin, gorgeously sequined with turquoise spots that turn crimson during spring spawning in late April and early May, especially on the larger fish.

PHOTO BY LAUREN KARNOPP/FWP

“The landowners provide the foundation that has allowed so much good work on the river. Everything we do relies on that collaboration.”

landowners are guaranteed by the agreements to not be on the hook for any measures beyond what’s set forth in their agreement and site plan if grayling are listed as endangered.

CCAA conservation measures include removing barriers blocking grayling migration, maintaining minimum streamflows for fish survival, improving and protecting streamside habitat, and reducing the number of fish stranded in irrigation ditches, known as “entrainment.” Everyone who signs up gets a plan tailored to their land and their goals. Rather than

heavy-handed mandates, it relies on forging partnerships.

“A big part of earning trust was us not coming in saying, ‘It’s my way or the highway,’” Jaeger says. “Instead, we said, ‘Here are some things that we need to do for this fish. How do you think that can work best on your place?’”

Participating ranchers have since built miles of wildlife-friendly fences to keep livestock out of sensitive riparian areas. They’ve installed stock tanks on higher ground above those areas to protect streambanks from cattle while still allowing wildlife to drink and cross. They’ve replaced broken and damaged headgates, allowing them to use water far more efficiently. And they’ve installed fish screens at the entrance of irrigation canals, preventing grayling and trout from getting drawn from the river into the ditches and becoming stranded.

This work has also helped willows to flourish, anchoring banks and keeping the

channel narrower, deeper, and shadier to provide colder water and cleaner gravel.

These investments paid big dividends for grayling and trout in the witheringly dry summer of 2025. Ranchers’ water rights entitled them to keep pulling water into their ditches. Instead, almost every ranch in the CCAA closed all their headgates two weeks early, leaving precious flows in the river.

“Delivering what grayling need to succeed is our driving goal,” Jaeger says. “But the bottom line is if it works for the fish but doesn’t work for the ranchers, it doesn’t work. We never forget that.”

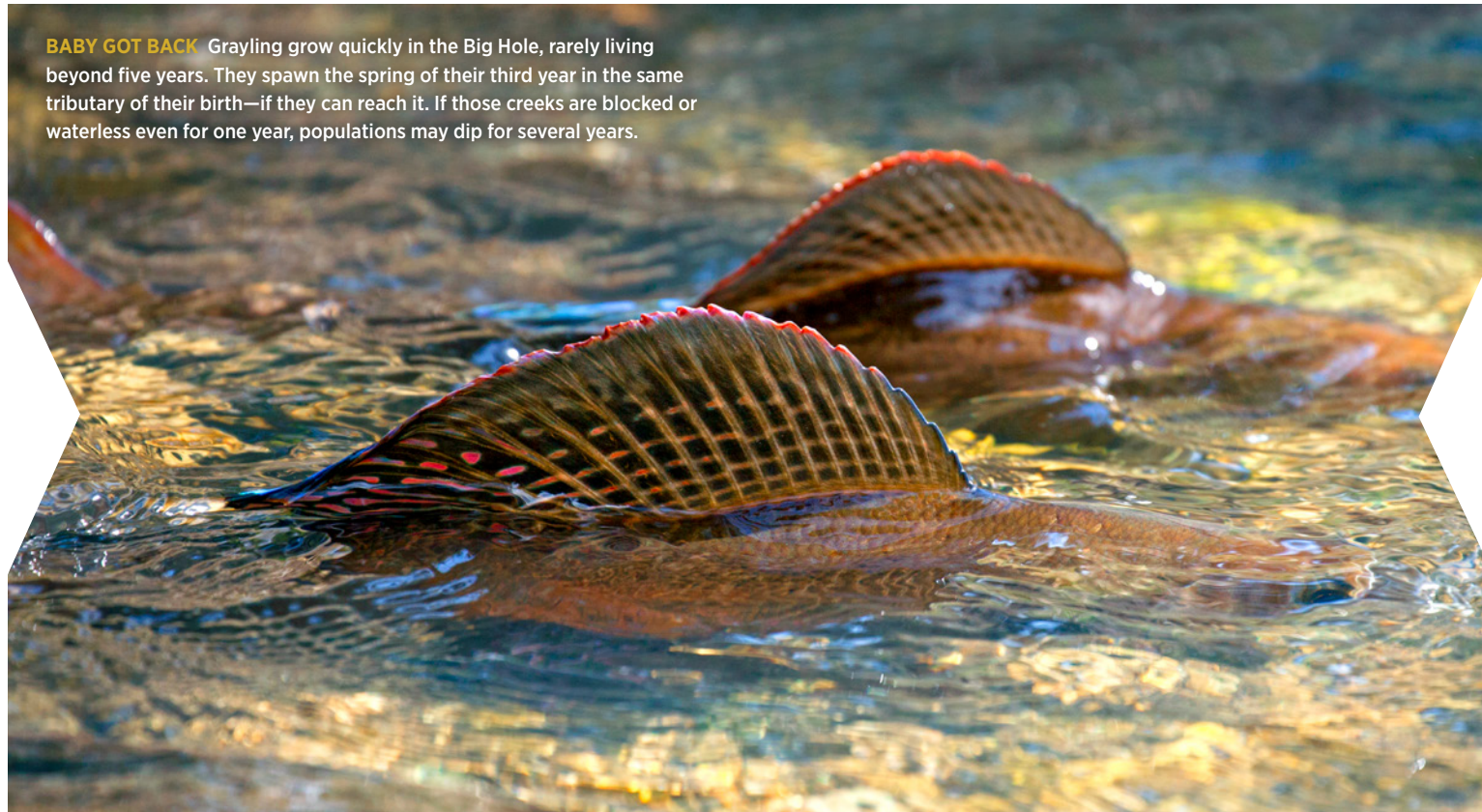
NICK-OF-TIME NOTCHES

Late in our morning along the Big Hole, Kreiner and I meet the rest of the notching crew, two fisheries biologists from FWP and two from the Forest Service, busy working their way down Steel Creek. They’ve already notched eight dams on Swamp, Pintler, and Plimpton creeks and jumped in to help here.

The pair from the Beaverhead-Deerlodge National Forest spurn garden rakes in favor of tools built to hack fire lines. One lugs a Pulaski, the other a monstrous McLeod with a massive rake on one side of the head and a hoe blade on the other. He tears out half the last dam with one John Henry-worthy swing. We all head up Christiansen Creek and notch half a dozen more before finishing the day on Fishtrap Creek.

Arctic grayling rely almost entirely on meandering, low-gradient stretches for spawning. When temperatures spike in July and August, they seek vital refuge in quick-tumbling tributaries like Fishtrap Creek that stay 10 to 15 degrees F cooler and better oxygenated than the main river.

“Grayling can make it through some rough times and find a way to survive,” Kreiner says. “But they need access to a lot of different kinds of habitat over the course of the year and over the course of their life. If you hem them into just one stream or even one reach of river, they’re done.”



BABY GOT BACK Grayling grow quickly in the Big Hole, rarely living beyond five years. They spawn the spring of their third year in the same tributary of their birth—if they can reach it. If those creeks are blocked or waterless even for one year, populations may dip for several years.



TIMELESS VALLEY The Big Hole looks much the same as when the Corps of Discovery came up the Missouri River in 1805. What has changed is the shrinking range of the Arctic grayling. Two-hundred-plus years ago, a few beaver dams wouldn't have made a dent in the species's population. But today with so few spawning streams remaining, the fish need every chance they can get to move upstream to spawn.



HOLEY HOEDOWN Armed with garden rakes and firefighting axes, FWP biologists gather in late April on a few of the Big Hole's key spawning tributaries to create safe passage for Arctic grayling through beaver dams. After the fish have moved through the gap to upstream spawning waters, beavers waste no time repairing the notches.

The first spring Kreiner started notching beaver dams in the Big Hole, he hiked up to where Fishtrap joins the main river. Just a few hundred yards upstream from the confluence, a tall dam blocked the creek. Fishtrap is too steep and swift to attract spawning grayling, but on a hunch, he went back in August.

"Fish were just stacked in the mainstem and fanned right across the creek mouth," he says. "Next spring we breached that dam. When we surveyed Fishtrap the following year, we found three grayling. After that, we took out more dams upstream, and the next year we found 25. We've learned that when the river gets hot, all the adult grayling in the upper Big Hole are going into a handful of these cold creeks. So we just keep at it."

"Nothing we've seen in decades of notching dams on Red Rock Creek suggests it does any significant harm to beaver populations."

KIND COMPROMISE

All this raises a good question: Are beavers being persecuted for the sake of a flashy fish?

"Nothing we've seen in decades of notching dams on Red Rock Creek [which also holds grayling in the nearby Centennial Valley] suggests it does any significant harm to beaver populations," says Torrey Ritter, a nongame wildlife biologist for FWP who has brought national attention to the vital role beavers play in riparian health. "These folks are notching dams at the same time they'd get washed out in a good runoff year, like beavers and grayling evolved with. If they did this in the fall, beavers would rebuild them

ECO-ENGINEERS
Beavers play a crucial role as both nurses and engineers for creeks across the West, including the many tributaries of the Big Hole River, keeping them healthy and dynamic.

PHOTO BY RONALD PHILLIPS



that night. But in the spring, they're willing to let it slide until the water drops."

Ritter spearheaded a statewide beaver dam census in 2024 and found that the Big Hole holds some of the highest numbers and densities of dams of any Montana watershed.

"There is so much high-quality beaver habitat in the Big Hole that pulling out dams on a few streams has a negligible impact across the larger landscape," he says.

The pools that beaver dams create are good for everything from caddisflies to cottonwoods, mint to moose. But Jaeger says another key benefit comes not as ponds slowly spread but when they rapidly empty.

"There's a misconception that the backwater behind beaver dams regenerates willows and banks," Jaeger says. "That's true to a degree, but it's the disturbance after dams fail that makes the greatest difference. Rivers are conveyor belts for sediment."

Pull the cork on a beaver pond, and rich sediment and cut willows surge downstream. That creates fresh, fertile seedbeds where willows, aspen, cottonwoods, and forbs take root and fortify streambanks. It also sweeps sediment from the creek bottom above and below the former dam, leaving clean gravel and cobbles that grayling need for spawning.

"Since 2006, the number of adults spawning successfully rose significantly and genetic diversity remained high," Jaeger says. "That's the crux of it: keeping grayling as broadly distributed as possible and sustaining enough genetic variation so they can adapt to change."

FWP's biologists have adapted too, letting the fish show them what they need and responding with a multipronged strategy that now includes swinging rakes each spring.

Ninety-nine percent of the world's grayling live among tundra and great slabs of ice in rivers that run to the North Pacific or the Arctic Ocean. The waters of the Big Hole eventually roll south into the Gulf of Mexico. The fact that these holdouts from the Pleistocene persist amid sagebrush and bunchgrass is a testament to just how durable this unique population is when given half a chance.

It's genuine cause for hope, affirming the power of true partnerships. This year marks the 20th anniversary of the Big Hole CCAA. By every measure, it has been a success.

"What built my trust with the agencies came down to one thing: They listened to us," says fifth-generation Big Hole rancher Max Lapham, who joined the CCAA at its inception. "Without the funding and help from the agencies and nonprofits, the majority of these projects never would have gotten done. We've already re-upped once on the CCAA and we'll definitely sign up again. It's been wonderful, providing us the opportunity to give something back to this country that's been so good to us for so many years."

Like everything worth doing, sustaining this progress means getting up every morning and working hard at it. This spring, Kreiner and his hardy crew will once again be out there on the headwaters, swinging rakes and McLeods, opening the creeks just in time for sail-finned fish to run free and create the next generation of the Lower 48's last wild river-dwelling grayling. 🐿️

See a video of FWP biologists surveying Arctic grayling in Red Rock Creek at youtu.be/Q7b-eswspBw



OPPOSITE PAGE PHOTOS BY HOLLY PICKETT