

An Upstream STRUGGLE

Two decades after the bull trout was listed as federally threatened, FWP and others continue working to conserve this sensitive salmonid in the face of warmer water, competing fish species, and degraded habitat. BY TOM DICKSON

READY TO REPRODUCE A hook-jawed male bull trout, belly crimson in spawning colors, rests as it moves up a tributary of Lake Koocanusa in northwestern Montana. With cold, clean water and no invasive lake trout, the reservoir is among Montana's most important bull trout fisheries and one of the few waters where the species may be harvested.

PHOTO BY JOEL SARTORE/NATIONAL GEOGRAPHIC AND WADE FREDENBERG, USFWS

“Over here,” whispers Ron Pierce from a patch of alders along a Blackfoot River tributary, roughly 40 miles east of Missoula. He parts the branches and points. A pair of spawning bull trout swim in the tail of a shallow pool. About two feet long, the pale silver fish suspend over pink and powder-blue cobble in water as clear as air. Their dark shadows appear more visible against the creek bottom than the ghostlike fish themselves.

We’ve been hiking upstream for an hour on an early September afternoon. These are the first bull trout we’ve found.

The fish swim back and forth in the current, side by side, gently bumping and nipping each other. “They’ll stay like this for two or three days until they’re done spawning,” says Pierce, a Montana Fish, Wildlife & Parks biologist who works in the Blackfoot watershed.

The stream, averaging about 15 feet wide, is ideal bull trout habitat, Pierce tells me. Icy water feeds into it from snowfields in the Swan Range to the north. Downed Engelmann spruce and Douglas fir create pools where fish can escape bald eagles and ospreys. Pierce points to “upwellings”—light spots in the gravel where spring water bubbles up from the stream bottom (“like a gin and tonic”). Cold, oxygenated water is essential for egg survival. “When it comes to cold-water habitat, bull trout require the best of the best,” Pierce says.

Unfortunately for bull trout and those who value the large salmonids, Montana contains increasingly less of the best.

Bull trout numbers have steadily decreased over the last century. In recent years, public agencies, hydropower and timber

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AGE-OLD PURSUIT Left: In this undated photo, a Kootenai angler fishes from a leather canoe in northwestern Montana. For thousands of years, indigenous people relied on bull trout for protein, eating the fish fresh or drying it for later. Right: Bull trout hold in the cold, clean water of the Middle Fork of the Flathead River near Essex, along the southern border of Glacier National Park.

LEFT TO RIGHT: ROLLIN H. MCKAY/MAUREEN AND MIKE MANSFIELD LIBRARY; MICHAEL HARRING, MONTANA FWP

Helena. “We value bull trout as much as anyone. But large and complex factors challenge our ability to recover them to anywhere near where they once were.”

“ENEMY OF GAME FISH”

Regularly reaching 10 to 15 pounds and occasionally surpassing 20 pounds, bull trout are a type of trout known as char. They are close cousins to lake trout, which are native only to a few Montana waters, and brook trout, non-natives that were widely stocked in western Montana in the early 20th century. Bull trout have pale spots, white-edged fins, and, like some salmon, bellies that turn crimson red when spawning.

It was during spawning season—late August through October—that native Salish and Pend d’Oreille people, for millennia, captured adult bull trout with willow traps and rock weirs. The large fish were eaten fresh or dried for later consumption, providing essential protein in mountainous areas that contained far fewer elk, deer, and bison than the prairies to the east.

For the most part, settlers of European heritage disparaged bull trout. Though some anglers pursued “the poor man’s salmon” with stout spinning rods and wooden plugs, most despised them. Newspapers published photos of the voracious fish (then called Dolly Varden, a name that now refers to a smaller, separate sea-run species found almost entirely in coastal British Columbia and Alaska), with bellies cut open to show dozens of newly stocked non-native brown, brook, or rainbow trout. A 1932 issue of the Department of Fish and Game magazine *Montana Wild Life* dubbed bull trout “an enemy of game fish.” For years, Montana offered bounties on bulls

and encouraged their eradication. One magazine article recommended pitchforks.

Public attitudes toward bull trout began to shift in the 1960s and ’70s with the rise of environmental awareness, increased interest in native fish, and documented population declines. Biologists began to learn that the aggressive predator is surprisingly sensitive, requiring complicated, specialized habitats. Foremost are the “Four Cs”: water that’s cold, clean, connected, and complex (a mix of deep holes, overhanging banks, and downed trees that create hiding areas). Bull trout soon became a symbol of pristine wilderness.

Like salmon and steelhead, bull trout spawn in forested headwaters, where dense conifer stands shade streams and hold snowpack that trickles ice water into creeks during the summer. At age two to four, most bull trout either head downstream to large rivers like the Blackfoot or Clark Fork (known as fluvial populations) or lakes such as Flathead and Swan (adfluvial populations). At age five to seven, adult bulls head back up to spawn in the natal waters where they hatched.

Barriers to these long upstream and downstream migrations are many and troublesome, ranging from hydropower dams on the lower Clark Fork to the numerous small

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“perched” culverts scattered across national forests. The downstream ends of these metal structures, which divert streams under logging roads, often perch a foot or more above-ground, creating tiny waterfalls that bull trout can’t pass. “Bull trout need to migrate, sometimes more than 100 miles, as part of their life history,” says Matt Boyer, FWP fisheries biologist in Kalispell. “Anything that breaks the connectivity causes problems.”

Maintaining connectivity is less an issue for populations of smaller (growing no larger than 15 inches long) and less common “resident” bull trout, which live their entire lives in tributaries without migrating.

MAJOR THREATS

Scientists have learned that, in addition to migration blockage, bull trout face three

other major threats: silt, warm water, and competing non-native fish species.

Silt smothers and suffocates bull trout eggs and clogs upwellings and gravel where eggs nestle for incubation. It washes into streams from logging roads, clear-cut hillsides, mining operations, plowed crop fields, and banks trampled by cattle. “We’re still seeing historic logging roads in headwaters washing out and contributing pulses of sediment 40 or 50 years after they were built,” says Ladd Knotek, FWP fisheries biologist in Missoula.

Bull trout put the “cold” in coldwater fish species. Adults can tolerate water up to 65 degrees, but young bulls can’t survive temperatures above 60 degrees and prefer a chilly 50 to 55 degrees. Such frigid waters are becoming rarer each year. Over the past half-century, snowpack in much of western Montana has declined by 40 percent. As global temperatures rise, remaining snowfields melt earlier, depriving bull trout of snowmelt that cools streams in late summer.

Montana streams also warm when housing construction and other development removes shady tree and brush cover. Temperatures also increase when streams are “de-watered” by irrigators, sometimes



RECONNECTED Above and below: A major threat to bull trout are dams that block up- and downstream migrations. In 2010 FWP removed the Emily-A Dam on the Clearwater River, creating access to key spawning tributaries.



leaving adult bull trout stranded in shallow pools. The lack of cold water is especially dire in west-central Montana (FWP's Region 2), the southern part of the bull trout's historic range. "We're always saying, 'These streams need ice cubes,'" says Pat Saffel, FWP regional fisheries manager in Missoula.

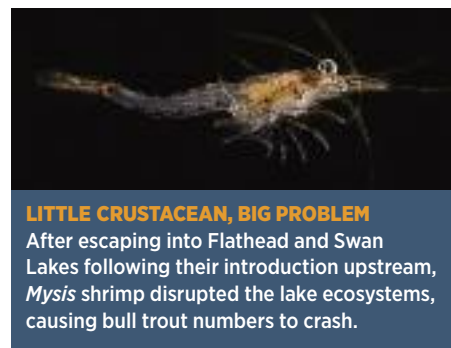
Though streams and lakes remain plenty cold in northwestern Montana (Region 1), "the big problem here is non-native fish," says Leo Rosenthal, a fisheries biologist in Kalispell. Historically, these waters contained only a few species: westslope cutthroat trout, sculpins, and bull trout. Then state and federal agencies in the early 20th century, and lawbreakers in recent years, introduced more than a dozen non-natives, many that harm bull trout populations. In headwater streams, brook trout reproduce more readily and crowd out young bull trout.

Brookies also hybridize with the closely related natives, creating genetically impure hybrids. In lakes, the biggest threat is another large, predaceous salmonid that, with the help of a tiny crustacean, has taken a big bite out of bull trout populations.

A SHRIMP AND A MONSTER

At nearly 124,000 acres, Flathead Lake is the largest natural freshwater lake west of the Mississippi. For thousands of years, bull trout were the largest fish that swam in its waters. Each year in late summer, monster bulls, some topping 20 pounds, made spawning runs up tributaries of the North, Middle, and South Forks of the Flathead River, which flow into the lake from the pristine forests of the Bob Marshall Wilderness and Glacier National Park regions.

In 1905, the U.S. Fish & Wildlife Service



LITTLE CRUSTACEAN, BIG PROBLEM
After escaping into Flathead and Swan Lakes following their introduction upstream, *Mysis* shrimp disrupted the lake ecosystems, causing bull trout numbers to crash.

introduced lake trout into Flathead to boost recreational fishing opportunities. Later the state stocked kokanee, a landlocked salmon. Bull trout, lake trout, and kokanee numbers remained steady for several decades. In the late 1960s and early '70s, FWP planted tiny *Mysis* (opossum) shrimp in three lakes in the upper Flathead watershed to boost kokanee size. The shrimp made their way downstream to Flathead Lake and fueled a lake trout explosion in the 1980s and '90s. Young lakers now had access to an abundant food source and quickly overwhelmed the system. The growing number of subsequent adult lake trout fed heavily on kokanee and young bulls. The kokanee population was decimated, and the bull trout population took a nosedive.

Fishing tournaments and sport angling remove roughly 70,000 lake trout from Flathead Lake each year. The harvest hardly dents the population, today estimated at 1.6 million. Meanwhile, the adult bull trout population in Flathead and its major tributaries has dropped to fewer than 5,000, though numbers have stabilized over the past decade.

The Confederated Salish and Kootenai Tribes (CSKT) have begun commercial netting on the lake's southern half, in the Flathead Reservation, to remove lake trout. The bull trout has cultural significance for the region's Native Americans. "Letting [bull trout] wink out on our watch...would be morally bankrupt," Tom McDonald, head of the tribes' Fish and Wildlife Division, told *High Country News*. Recreational anglers are split over the idea of industrial-scale netting. Many enjoy fishing for trophy lake trout—which sustains a \$20 million recreational fishery in the area—while Trout Unlimited (TU) and the U.S. Fish & Wildlife Service (USFWS) support more aggressive removal

and urge FWP to net lake trout in the northern half, which is managed by the state.

"We're in agreement with the tribes, TU, and the USFWS on nearly every issue related to bull trout conservation in the Flathead drainage, just not with lake trout netting," Nelson, the FWP native fish species coordinator, says. The department maintains that as long as *Mysis* remain in Flathead Lake and support the lake trout population, FWP should invest anglers' license dollars and other funds in protecting and restoring upstream habitat and other projects that sustain not just bull trout but the overall environment.

ANOTHER INFESTATION

A non-native fish invasion of 3,200-acre Swan Lake has overwhelmed its bull trout population, too. Starting in the late 1990s, anglers reported catching lake trout—which

“We wish there was some magic solution [on Swan Lake] that was cost effective and sustainable.”

likely migrated up the Swan River from Flathead Lake into Swan Lake, which contains *Mysis*. Concerned that the shrimp-fueled invaders would crowd out bull trout as they did on Flathead, a working group that includes FWP, Montana Department of Natural Resources and Conservation, Trout Unlimited, CSKT, Montana State University,

and federal agencies contracted with a commercial fishing company to use targeted netting to remove lake trout. From 2009 to 2016, crews harvested more than 60,000 lakers. It didn't help much.

The lake trout population has held steady while bull trout numbers declined by half before leveling off. Though other working group partners want FWP to continue netting, the department has suspended the operation. "We wish there was some magic solution that was cost effective and sustainable," says Rosenthal. "But the level of suppression we tried didn't produce the results we'd hoped for." Until the working group comes up with a well-funded, science-based management program that FWP agrees will benefit Swan Lake's bull trout, he adds, "we're focusing instead on increased monitoring and research to inform future management decisions."

Needs and notes

Bull trout require the "Four Cs": cold, clean, complex, and connected water. Conversely, warm water, siltation, competition from non-native fish, and migration barriers all pose threats.



COLD

Adult bull trout can tolerate warmer water up to 65 degrees, but younger fish can't survive temperatures above 60 degrees and prefer a chilly 50 to 55 degrees.

CLEAN

Bull trout require clean waters and are highly vulnerable to siltation, acid mine drainage, and other forms of water pollution.

COMPLEX

Bull trout streams and rivers need deep holes, overhanging banks, and woody cover where the big fish can hide from otters, bald eagles, and other predators.

CONNECTED

Most adult bull trout live in large lakes and rivers but need to swim far up tributaries to spawn. Adults and juveniles need to move downstream to the big waters.

WARM WATER

The combination of climate change and streamside vegetation removal is warming many streams in west-central Montana to temperatures well above what young bull trout need to survive.

SILT

Silt from old logging roads smothers and suffocates bull trout eggs and clogs upwellings and gravel where eggs need to nestle for incubation.

NON-NATIVE FISH

The biggest threats to bull trout in northwestern Montana are brook trout in tributaries and lake trout in lakes.

MIGRATION BARRIERS

Dams, "perched" culverts, and anything else blocking up- or downstream migration harms bull trout populations.

USFWS and FWP see eye to eye on bull trout (most of the time)

Wade Fredenberg grew up in Kalispell and remembers his uncle and others fishing for migratory bulls on the Flathead River. "Back in the 1960s, they were still a big part of the fishing scene up here," says the recently retired fisheries biologist.

So it's been especially tough for Fredenberg to see numbers of the big fish decline over the past 25 years. "The handwriting is pretty clear," says the former U.S. Fish & Wildlife Service regional bull trout coordinator. "We're losing bull trout."

The good news, according to Fredenberg, is that bull trout still swim in almost all of the same waters they did a century ago. "But instead of hundreds or thousands of fish in many of those tributaries, in some cases there are now just a few dozen," he says.

In 2015, the USFWS issued a revised bull trout recovery plan. The document identifies "historical habitat loss and fragmentation, interaction with non-native species, and fish passage issues...as the most significant [threats] affecting bull trout."

FWP officials concur. "We see eye to eye with the Service 90 percent of the time and recognize our partnership with them as essential in bull trout recovery," says Eileen Ryce, head of the FWP Fisheries Division.

However, the Service and FWP part company over how to respond to



SAME GOALS, DIFFERENT APPROACHES
Above: Wade Fredenberg with a bull trout at Swan Lake. Below: FWP biologist Ron Pierce with a bull on the Blackfoot River.



specific threats, especially non-native species. The federal agency wants Montana to remove non-natives from some bull trout streams and Flathead and Swan Lakes. FWP officials agree that certain removal efforts, like eliminating brook trout in headwaters, can benefit bull trout. But others, like trying to net lake trout in massive lakes, have not worked. "If we can't prove that something will help, it's hard to make the case that it's worth spending angler license dollars on it," says Pat Saffel, regional FWP fisheries manager in Missoula.

Fredenberg points to conservation easements and diversion dam screening as examples of inter-agency cooperation. "In the Blackfoot and elsewhere, there have been systematic improvements to bull trout habitat in key areas," he says. Another area of cooperation: research. "We have a far greater understanding of what these fish are and what they need," Fredenberg says.

Fredenberg, who worked for FWP before moving to the federal agency a quarter-century ago, says he continues to maintain good relations with his colleagues. "We all care about bull trout and want them to succeed," he says. "But our two agencies have different mandates, and that can lead to different opinions about the best ways to achieve success." ■

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CLOCKWISE FROM LEFT: ILLUSTRATION BY JOSEPH TOMELLER; WIKIPEDIA; USFWS; TOM BAUER/MISSOULIAN

SUCCESS STORIES

Despite the setbacks, FWP and its partners can point to many bull trout conservation gains. “The species would be in much worse shape without all the work our crews and partners have done over the past 20 years,” Nelson says.

Federal and state logging and road construction in mountainous areas now routinely retain trees and other vegetation in riparian corridors and prevent silt from reaching streams. To protect individual bull trout, FWP ended almost all harvest and even most recreational fishing for the species. The department also teamed up with Trout Unlimited to educate anglers on bull trout threats and how to distinguish young bulls from other species so the threatened fish aren’t accidentally kept for the frying pan.

Throughout western Montana, biologists work with area ranchers to improve tributary habitat. Teams have restored streamside vegetation, narrowed shallow areas, and installed screens to prevent bull trout from swimming into irrigation ditches. “One day I showed a ranch manager where his cattle were wading right through some spawning redds, and he looked at me and said, ‘Okay, we need a fence here,’” Pierce says.

FWP works with the U.S. Forest Service to regrade and revegetate old logging roads, and to enlarge culverts to prevent remaining roads from washing out after heavy rains and snowmelt. The department also has purchased key tracts containing critical bull trout spawning and rearing habitat, such as Marshall Creek Wildlife Management Area (WMA) in the Seeley-Swan Valley and Fish Creek WMA south of Superior.

For the lower Clark Fork’s migratory bull trout, Avista crews capture adults below Cabinet Gorge Dam and truck them upstream. After DNA analysis, each captured fish is delivered to its natal water, increasing the odds of spawning success. To protect downstream-moving bull trout from non-native predators, dam turbines, and warm water, crews transport the fish around the structures so they can grow and mature in Idaho’s Lake Pend Oreille. FWP also works with the power companies to protect and restore habitat in tributaries where the migratory fish spawn and rear.

“We get excited about taking out a culvert or screening a diversion ditch. To see habitat restoration at such a large geographic scale is mind boggling.”

A fish ladder at NorthWestern Energy’s Thompson Falls Dam allows bull trout to move past that structure.

RESTORING PASSAGE

On the Clearwater River, a major bull trout stronghold, FWP took out the 1950s-era Emily-A Dam, which blocked the native fish from key spawning tributaries. “After removal in 2010, we saw bull trout spawner numbers in the West Fork Clearwater more

than double,” says Knotek, the FWP biologist in Missoula. “If an ecosystem is still intact, we can do a lot to help bull trout just by restoring connectivity.”

Another major connectivity restoration came in 2008 with removal of Milltown Dam. The dam was built a century earlier at the confluence of the Clark Fork and Blackfoot Rivers, a sacred site known to the Salish-Pend d’Oreille as *Nayccstm* (Place of the Big Bull Trout). The dam removal, done in part because FWP researchers proved the structure harmed federally protected bull trout populations, opens up 140-plus miles of spawning tributaries. “We get excited about taking out a culvert or screening a diversion ditch,” says Saffel, the regional fisheries manager. “To see habitat restoration at such a large geographic scale is mind boggling.”

At the same time, FWP biologists have been closely studying the bull trout’s complex life history. They implant bulls with tiny transmitters then follow the fish with radio-telemetry from headwater streams no wider than a doorway downstream to sprawling rivers, lakes, and reservoirs. Breakthroughs in DNA science have allowed scientists to more precisely understand how populations function and interact.



TREE DWELLER An adult bull trout in the Blackfoot River finds safety under a fallen tree. Hiding areas and deep holes created by woody debris like this are critical for bull trout survival.

CLOCKWISE FROM LEFT: BILL MCDAVID; LIZ JUERS; WIKIPEDIA

A breakthrough study done in the 1990s showed the different habitat that bull trout need in every life stage. It detailed the ways mining, logging, livestock grazing, dams, roads, and other human development can damage the places where bull trout live. “We know a lot about bull trout life history and what harms the habitat,” says Tom Weaver, an FWP biologist who co-authored the report and has studied bull trout for 30 years. “But doing something about those impacts is a whole different story.”

RIVER FISHING OPPORTUNITIES?

Several years ago while fishing the Bull River in southern British Columbia, I caught a 31-inch bull trout. The cream-colored giant lived most of its adult life in Lake Koochanusa, which straddles the international border and into which the Bull River flows. About an hour after releasing the fish, I was back in Montana, heading home to Helena.

Though bull trout are showing up more frequently in the Blackfoot and a few other Montana waters, anglers can legally fish for the species only on Hungry Horse Reservoir, Lake Koochanusa, Swan Lake, and the South Fork of the Flathead, a wilderness river that requires a multiday backpacking trip. Will the state ever again offer accessible bull trout river fishing opportunities like I’d experienced in British Columbia, just a short drive north of the border?

Probably not, says Nelson. The combination of broken connectivity, warming water, siltation, and non-native fish continues to thwart recovery. “We will protect them in remnant areas, and our grandkids will more than likely be able to fish for bull trout in Koochanusa, Hungry Horse, Swan, and the South Fork of the Flathead,” Nelson says. Yet as long as *Mysis* shrimp and lake trout remain in Flathead and Swan Lakes, brook trout reside in headwater streams, and water temperatures continue to warm, any conservation gains will be local and small in scale. “We’re by no means giving up. We’ll continue doing all we can to keep bull trout around far into the future,” says Nelson. “But the dream of having them running up and down the Clark Fork, Bitterroot, or mainstem Flathead like they were 100 years ago—that’s just not realistic.” 🐾



Leave those bulls alone, say FWP fisheries biologists

ETHICAL DILEMMA An angler releases a 19-inch bull trout from the South Fork of the Flathead, the only river in Montana where anglers may fish for the species (angling is legal also on Hungry Horse Reservoir, Lake Koochanusa, and Swan Lake). On the Blackfoot River and North Fork of the Flathead River, anglers are increasingly targeting—illegally—bull trout, wrongly assuming that they are not harming the highly stressed fish.

The stories and YouTube videos are becoming more frequent: While an angler reels in an eight-inch cutthroat on the Blackfoot River or North Fork of the Flathead, a big bull trout rushes up out of the depths and grabs the smaller fish, then won’t let go.

Anglers wonder: If, as it seems, bull trout numbers are increasing, why is it still illegal to fish for them in all but four waters?



It’s true that populations in some rivers are growing. But in much of the species’ range, numbers have dropped so low that angling threatens vulnerable spawning adults that carry future bull trout generations. “We know that some anglers and even outfitters are targeting these trout, likely assuming they aren’t doing any harm because they release the fish,” says Ladd Knotek, FWP fisheries biologist in Missoula.

The practice could hurt bull trout. “Big bulls are so aggressive they can get caught easily and in predictable locations,” Knotek says. “They’re in there preparing to spawn, trying to conserve energy in water temperatures approaching their limit for survival. The last thing they need is to be hooked and dragged around the water again and again. Anglers who care about bull trout need to leave bull trout alone.” ■