PAT CLAYTON/ENGBRETSON UNDERWATER PHOTOGRAPHY

# Saving Montana's Prairie Trout

## FWP biologists fight rainbow trout hybridization to save westslope cutthroat east of the Continental Divide from local extinction.

By E. Donnall Thomas, Jr.

Montana Fish, Wildlife & Parks fisheries biologist Clint Smith, fisheries technician Rob Beattie, my wife Lori, and I are driving east toward the crest of the Judith Mountains 20 miles north of Lewistown, where Lori and I live. Although I've spent decades exploring this terrain, I've never seen or heard of our destination: Alpine Gulch. As we turn south on a barely passable two-track on this August afternoon, the reason becomes apparent:. The rocky creek bed is completely dry. Since our mission today is to find fish, this would seem discouraging, but the lack of water here turns out to be one of the very reasons the population of westslope cutthroat trout we seek still exists.

Despite its name, the westslope cutthroat's historic range extended well east of the Continental Divide to the Little Belt, Crazy, Highwood, and Judith mountains. At one time westslopes swam in streams that flowed past the vast herds of bison, and before them the woolly mammoths and giant sloths that roamed these grassy plains.

But the same westslope populations that survived multiple ice ages have struggled since Montana became a state and was settled. Over the past 50 years, the species' historic range east of the Divide has declined by a stunning 90 percent. Today, some headwater streams contain only a few dozen non-hybridized westslope cutthroat, and FWP rates the risk of local extinction for many populations as "high to extreme." This has made saving the species east of the Divide a top priority, says Eileen Ryce, FWP fisheries chief.

The greatest driver of this decline—stocking non-native fish—illustrates the law of unintended consequences.

In the early 1900s, the state and local angling clubs stocked brook, brown, and rainbow trout throughout much of Montana, including the streams where westslopes swam. The non-natives competed with the westslopes for food and habitat—and usually won.

To make matters worse, rainbow trout interbreed with their cutthroat cousins to create a hybrid known as a cutt-bow. Eventually, all the unique genetics of westslopes on the prairie may be gone—and with them, biologists fear, the ability to adjust to the region's changing environment, something westslopes have done for thousands of years.

Our crew's goal today is to capture two dozen westslopes upstream of the dry stretch, which has mostly kept them isolated from rainbow trout. After clipping a tiny piece of fin tissue for genetic analysis at FWP's genetics lab at the University of Montana, we will release the fish back into Alpine Gulch's headwaters. A 2015 study showed that Alpine Gulch westslopes were 99.5 percent genetically intact. By 2019 that had slipped to 98.1 percent. Smith and others want to know if the downward trend is continuing—in which case they would have to figure out a way to protect the population.

Smith shoulders a backpack containing electroshocking equipment, Beattie grabs an armload of nets and specimen containers, and we set off uphill in search of cutthroat habitat—hopefully with some water in it.

## EAST VS. WEST

Like all trout and salmon of the genus *Oncorhynchus*, cutthroat originated in the North Pacific where the coastal subspecies still migrates between freshwater and saltwater. Cutthroat spread inland throughout the Great Basin and Rockies some 2 million years ago, when Pleistocene Epoch glaciation created new topography and stream flow. The species adapted to this dispersal process better than other Pacific salmonids; rainbow trout didn't make it across the Continental Divide until humans put them there.

Cutthroat migrated eastward up the Columbia and Snake rivers, and the westslope cutthroat, named for its abundance in the headwaters of the Pacific drainage, retained the moniker even on the far side of the Divide. (The westslope's close cousin, the Yellowstone cutthroat, has a native range extending even farther east, to today's Miles City.)

This wide dispersal benefited cutthroat by introducing them into a variety of habitats—a biological version of not putting all your eggs in one basket. If for some reason a population failed to thrive in, say, Kootenai River tributaries in southwestern British Columbia, or in Sheep Creek, southwest of Dillon, the species would continue to survive.

One problem, though, is that small, isolated populations end up with restricted gene pools that can lead to inbreeding that results in decreased survival and reproductive success. Denied access to fresh genes, inbreeding can produce offspring less capable of dealing with environmental changes or competing against invasive species.

> "Allowing westslope cutthroat to disappear from their native range is not going to happen if we have anything to say about it."

West of the Continental Divide, cutthroat populations have contracted much less, likely because the habitat includes large expanses of contiguous mountains with abundant cold water and fewer roads and other human infrastructure.

In contrast, westslopes on the eastern edge of their historic range are now limited to small, isolated headwater streams like Alpine Gulch in island ranges. Historically, these island mountains receive a deeper snowpack and produce more consistent stream flows in summer than the surrounding warmwater prairie streams, allowing cutthroat to thrive.

But over the past century, forest access roads and culverts have prevented native trout from migrating up- and downstream, where they can reproduce with cutthroat containing different genes, thereby lessening genetic isolation.

Add to that hard-rock mining and other human actions that degrade cutthroat habitat. For instance, years of unauthorized four-wheeler crossings on the Middle Fork of the Judith caused silt to wash downstream, smothering trout eggs and suffocating aquatic insects. In 2023, Trout Unlimited and the U.S. Forest Service rerouted most of the trail, which will allow the stream to flush out silt and recover.

## CLEANING THE SLATE

Keeping four-wheelers out of streams definitely helps westslopes, but not nearly as much as keeping non-native trout from muscling out or breeding with the native trout. Though it's been decades since anglers and FWP dumped buckets of browns, brookies, or rainbows into westslope streams, the introduced species are thriving and reproducing naturally.

That's fine if you like catching those fish. But not if you're trying to recover native westslope trout.

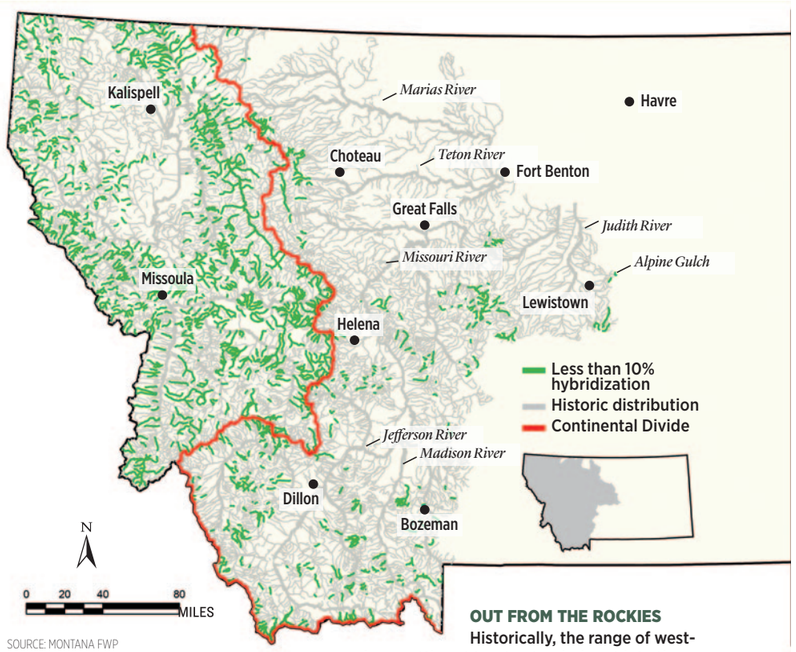
To eliminate rainbows and hybrids from key westslope habitat, FWP uses rotenone, a plant-derived fish-killing chemical used to remove unwanted species. It affects only gill-breathing animals, and it breaks down quickly. FWP then restocks treated waters only with cutthroat.

Blocking rainbows from reaching headwater cutthroat habitat is another way to

**REDIRECTING THE FOUR-WHEELERS** Left: In 2023, Trout Unlimited and the U.S. Forest Service rerouted a four-wheeler trail that repeatedly crossed the Middle Fork Judith River, causing massive siltation downstream. The new route will keep vehicles away from the stream and allow the habitat to recover. That will open the possibility of FWP someday protecting the remaining cutthroat in the headwaters that have unaltered genes. Below: Historically, mountain streams east of the Divide, like the Middle Fork Judith River, held strong populations of genetically intact westslope cutthroat. Today almost all of the native fish in this and most other streams have been hybridized with non-native rainbows.

FROM TOP: BILL PFEIFFER/MONTANA TROUT UNLIMITED; JOHN LAMBING

## The Westslope Cutthroat's Shrinking Range




SOURCE: MONTANA FWP

**OUT FROM THE ROCKIES** Historically, the range of westslope cutthroat trout extended east into the prairie to today's Lewistown and on the Missouri and Teton rivers downstream to Fort Benton. Brown, brook, and rainbow trout introduced in the 20th century have muscled the native fish out of most of their range east of the Continental Divide. Rainbows also hybridize with cutthroat, reducing the number of populations with unaltered genes to a fraction of former levels.

MAP: MONTANA FWP

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protect native trout, and sometimes nature does the work. For instance, the water in Alpine Gulch disappears underground for 1.5 miles and seeps through porous limestone into Warm Spring Creek and then the Judith. The same thing happens on the South Fork of the Judith in the Little Belts. The dry stretches block upstream rainbow migration.

Unfortunately, the stretches sometimes flood in spring, allowing rainbows to move upstream. That's likely how a handful of rainbows reached upper Alpine Gulch and began breeding with the native trout.

Another way FWP aims to preserve isolated cutthroat populations is with a process called "genetic rescue," used successfully on inbred wildlife like the Florida panther. FWP geneticist Ryan Kovach leads a team exploring this novel approach to restoring westslope cutthroat genetic health.

From 2017 to 2023, FWP and the University of Montana conducted an extensive genetic study of multiple cutthroat populations in eastern Montana. They identified the best candidates for genetic rescue: isolated populations with little genetic variation within the population and genetics that vary considerably from other nearby populations. Trout from healthy gene pools were then introduced into four populations that met those criteria.

## DOESN'T TAKE MANY

Wildlife studies show that adding just a few new individuals may successfully improve genetic diversity within an isolated population. The same may hold true for fish. A complete assessment of the eastern Montana experiment will require several years to study the genetics of multiple cutthroat generations. Kovach says that his team so far has found that trout with recently introduced genes are showing better reproductive success and survival. And this improvement is greatest in populations that began with the most restricted gene pools—all consistent with theoretical models of genetic rescue.

These results illustrate the familiar concept of hybrid vigor, in which a species or breed may become stronger with the introduction of new genes. So why not simply let the invasive rainbows reproduce with westslopes and accept streams full of genetically diverse and theoretically healthy cutt-bows? The main reason, says Ryce, the Fisheries Division chief, is that eventually there would be no more non-hybridized westslope cutthroat left in eastern Montana. The species would disappear from the region, the very definition of local extinction. "And that's not happening if we have anything to say about it," she says.

Thus, westslopes face an apparently contradictory genetic problem. In streams like Alpine Gulch, populations must be physically isolated from other trout species to prevent hybridization. Yet, as Kovach notes, isolation is itself a major genetic problem. "That's why we have to occasionally translocate westslopes between streams, to increase genetic variation," he says. "It's not a forever solution, but it buys us, and the fish, time to figure out and invest in more permanent conservation fixes."

**MONITORING THE MIXING** Clockwise from top: FWP fisheries biologist Clint Smith and technician Rob Beattie collect cutthroat for gentic sampling from Alpine Gulch in the Judith Mountains northeast of Lewistown; collecting a small tissue sample from the anal fin of an anesthetized westslope for DNA analysis to see if hybridization with invasive rainbows is worsening; westslopes in these small headwater streams don't grow large, as shown by this three- or four-year-old trout.

PHOTOS: LORI & DON THOMAS

## BARELY HANGING ON

Back on Alpine Gulch, we have finally reached flowing water. Although cool and clear enough to support cutthroat, it's little more than a foot deep in most places and appears too shallow to hold fish. After assuring me of two deeper holes ahead, Smith heads upstream.

The first hole looks promising. We immediately spot a dozen or so trout holding below an overhanging root in knee-deep water. As Smith works the electrofisher through the pool, temporarily stunned fish rise to the surface, where he collects them gently with a small handheld net. After transferring the fish to a bucket and adding an anesthetic to the water, he snips a tiny piece of tissue from each anal fin and gives them to Beattie, who puts the samples in test tubes for shipment to the DNA lab in Missoula. All the fish recover quickly and swim off when returned to the stream.

After the team samples the second hole and retrieves samples from several more trout, we head back downstream to the truck. Though he came up a few fish shy of the sample goal, Smith says the efforts were productive and helpful. DNA analysis will reveal how much intact westslope genetics these fish contain and how inbred the population has become.

No matter what that testing shows, I can't help but admire the resiliency of this native population of fish out here in central Montana that has somehow held on against multiple threats to its survival. There's no way of knowing for sure, but Smith says cutthroat may have been living in this stream for hundreds of thousands of years or even longer. Add to that the fish's beauty and intrinsic value, as well as the angling opportunities they provide, and it seems clear we should be giving westslope cutthroat all the help we can to prevent the species from disappearing for good.

*Editor's note: In February 2024, FWP began revising its Cutthroat Trout Conservation Strategy, updating it from the last revision in 2007. "There have been a ton of scientific advancements and technological improvements since 2007 that we need to incorporate into the new plan," says David Schmetterling, fisheries research coordinator.*

*Schmetterling notes that biologists are increasingly recommending management strategies previously used only east of the Divide to westslope streams west of the Divide.*

*"We're finding that rainbow trout hybridization is in many cases the number one problem facing westslope cutthroat in western Montana, as it has been east of the Divide," he says. "And the best fix for that is to install fish movement barriers, as we've done in the island ranges for years now."*

**NO MORE MIXING** Above: Though fine sport fish, rainbow-cutthroat hybrids lack the genetic vigor of nonhybridized cutthroat trout. Below: To keep rainbows from migrating upstream and mixing with cutthroat in headwater reaches, FWP has installed fish barriers on a dozen streams east of the Divide, including this one built on the South Fork Judith River in 2005.

CLOCKWISE FROM TOP RIGHT: PAUL N. QUENEAU; MONTANA FWP; JEREMIE HOLLMAN

## The mixed news about warming water and westslopes

**For decades,** the accepted wisdom among western fisheries biologists has been that westslope cutthroat need cold water to survive and that they can't handle warmer water. It turns out that's not entirely true.

Recent studies show that the native trout actually can thrive in water several degrees warmer than previously thought. "The main reason for the old assumption comes from confirmation bias," says David Schmetterling, FWP fisheries research coordinator in Missoula. "The only place we see cutthroats nowadays is in mountain streams, where the water is coldest, so we assumed that's the only habitat they can tolerate."

Historically, westslopes swam as far downstream on the Missouri as Great Falls, and in waters like the Madison, Bitterroot, and Clark Fork, now dominated by introduced rainbows.

According to Schmetterling, the reason westslopes aren't thriving in more rivers where they historically swam is not due to the warming climate—"They'd actually be thriving in those waters today," he says—but from being pushed out by browns and brookies or, more commonly, hybridized with rainbows.

As well as westslopes do in warmer-than-average trout streams and rivers, rainbows do even better. "As rainbows thrive in this warming landscape, that is coming at the expense of cutthroats," Schmetterling says.

The one bit of good news is that as stream temperatures continue to rise, cutthroat could prosper if their habitat can be kept safe. "In waters where we can either remove rainbows or keep them away from westslopes, we could see cutthroat doing well in the future," Schmetterling says. ■