West Slope Cutthroat Trout (WCT) Restoration – What Does it Take to Restore a Species?

1. Introduction
    a. Overview
2. What is a WCT?
    a. Describe
    b. Briefly Review Readings
    c. Describe Impacts (Brook Trout, Rainbow Trout, Habitat Degradation)
    d. Restoration Techniques (Brook & Rainbow Trout Removal, Stocking, Barriers, Transfers)
3. What is Biodiversity?
    a. Define
    b. Why Important?
        - Intrinsic (value it itself)
        - Value to Us (economic, aesthetic, scientific & ethical knowledge, future)
4. Species Restoration
    a. Managers take into account different points of view in making management plans.
5. Stakeholders for WCT Restoration
    a. Anglers, ranchers, managers, environmentalists, 'Roxy'
    b. What are their interests?
    c. How can they all be incorporated? (finding common ground)
6. What are some plausible restoration results if incorporating the above interests?
    a. What do results need to be effective? (agreements & communication)
        - Meeting friends after school – communicate & agree on meeting time & place
    b. Therefore, important for all parties to "buy-in" to the solution.
        - Friends need to *want* to meet where you agree to.
    c. How? (public meetings, education, etc.)
7. Revisit "Tough Love" Article – Similarities between our discussion and the biologist's tactics.
8. Species Restoration of Wolves
    a. How do stakeholder views change in wolf restoration? Why is this restoration heated?
    b. Do the same rules apply?
9. Conclusion
    a. Restoration can be controversial
    b. What can you do?
10. Discuss tomorrow
    a. Hatchery Tour and Spawning, post articles.
    b. Willow Cutting for Riparian Restoration

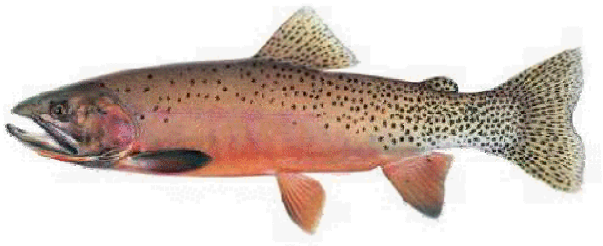
Vocabulary
Biodiversity
Riparian
Rotenone
Stakeholder

Readings
Pre: "Tough Love" Montana Outdoors Magazine. March/April 2004,
Westslope cutthroat trout, Montana Fish Species of Special Concern, MT FWP Website
Post Reading: "Can Hatcheries Help Conserve the Westslope Cutthroat Trout?" Montana Outdoors Magazine. March/April 2002
Optional: Playing God in the Bob, Forest Magazine, Spring 2006

Montana's Fish Species of Special Concern

Montana Fish, Wildlife & Parks Website

Westslope Cutthroat Trout



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Introduction

Westslope Cutthroat Trout (*Oncorhynchus clarki lewisi*) is a subspecies of cutthroat trout native to Montana. Despite the species' common name, its natural range is on both sides of the Continental Divide. The westslope cutthroat trout is found in the Kootenai watershed, the Clark Fork watershed, the headwaters of the Missouri river and the headwaters of the Saskatchewan River. This subspecies is also found in Idaho and Canada and has a few scattered populations in Wyoming, Washington and Oregon. It can be difficult to visually distinguish westslope from other cutthroat trout subspecies, but the westslope cutthroat trout tends to have more small spots by the tail and none by the pectoral fin and the fish is more of a silvery or greenish color. The only way to be certain about identification of this subspecies is by genetic testing.

Status

Westslope cutthroat trout were first described by Lewis and Clark and were once extremely abundant. Unfortunately the species has lost a lot of ground. Various studies have estimated that the westslope cutthroat trout now only occupies between 19-27% of its historic range in Montana and about 36% of its historical range in Idaho (Van Eimeren 1996). But westslope cutthroat trout can hybridize with other cutthroat trout subspecies and rainbow trout. Thus, genetically pure westslope cutthroat trout are estimated to exist in only 2-4% of their historic stream distribution (McIntyre and Rieman 1995). East of the Continental Divide, westslope cutthroat trout are confined to headwater reaches, and most of these small populations face an extremely high risk of extinction.

Westslope cutthroat trout have been included in various "watch lists" of agencies and conservation groups since 1966, the year the US Fish and Wildlife Service first produced the "Red Book". The US Fish and Wildlife Service has been petitioned to include the westslope cutthroat trout under protection of the Endangered Species Act. In 2000, the US Fish and Wildlife Service determined that listing was not warranted, due to the species wide distribution, available habitat in public lands and conservation efforts underway by state and federal agencies.

Life History

Westslope cutthroat trout have three possible life forms, adfluvial (migrates to lakes), fluvial (migrates to rivers) or resident (stays in streams). All three life forms spawn in tributary streams in the springtime when water temperature is about 10 Celsius and flows are high (Liknes and Graham 1988). Cutthroat trout spawn when they are about 4 or 5 years old and only a few survive to spawn again (McIntyre and Rieman 1995). Fry emerge in late June to mid July and then may spend one to four years in their natal streams. While resident fish spend their entire life in tributary streams, migratory life forms can travel several hundred kilometers as they move between adult and spawning habitat.

Spawning and rearing streams tend to be cold and nutrient poor. Westslope cutthroat trout primarily eat insects and zooplankton and do not grow very large, usually just between 6 and 12 inches. Westslope cutthroat trout seek out gravel substrate in riffles and pool crests for spawning habitat. Cutthroat trout have long been regarded as sensitive to fine sediment (generally defined as 6.3 mm or less). Although studies have documented negative survival as fine sediment increases (Weaver and Fraley 1991), it is difficult to predict their response in the wild (McIntyre and Rieman 1995). This is due to the complexity of stream environments and the ability of fish to adapt somewhat to changes in microhabitat (Everest et al 1987).

Westslope cutthroat trout also require cold water, although it has proven elusive to define exact temperature requirements or tolerances. Likewise, cutthroat trout tend to thrive in streams with more pool habitat and cover than uniform, simple habitat (Shepard, Pratt and Graham 1984). Juvenile cutthroat trout overwinter in the interstitial spaces of large stream substrate. Adult cutthroat trout need deep, slow moving pools that do not fill with anchor ice in order to survive the winter (Brown and Mackay 1995). Where the species range overlaps, westslope cutthroat trout are often found in the same streams as bull trout and mountain whitefish.

Threats

There are four primary reasons for the decline of this species. **Habitat loss** is considered to be a widespread problem. Cutthroat trout have declined due to poor grazing practices, historic logging practices, mining, agriculture, residential development and the lingering impact of forest roads. Fish have been unable to use countless miles of spawning habitat due to dewatering of streams for irrigation and because of barriers created by dams and road culverts.

Non-native species have also taken a huge toll on westslope cutthroat trout. Brook trout outcompete juvenile cutthroat trout for food (Novinger and Rahel 1999). Experience shows that once brook trout dominate a stream, cutthroat trout never regain it. Other non-native species like lake trout, brown trout and northern pike prey on cutthroat trout. East of the Continental Divide, westslope cutthroat trout were apparently displaced very rapidly after the introduction of brown trout, rainbow trout and brook trout. By the late 1950's, cutthroat trout were already confined to headwater streams (Tews et al, 2000). Thus, ironically, barriers that disrupted historical migration routes for westslope cutthroat trout have sometimes served to protect them from non-native species.

A third reason for decline is the more insidious role of **hybridization** with other species. Westslope cutthroat trout do hybridize with rainbow trout and even other non-native cutthroat trout subspecies. This is difficult to ascertain since it takes extensive genetic testing to verify the problem. Many remnant genetically pure cutthroat trout populations, on both sides of the Continental Divide, are located above barriers that protected them from non-native species.

A fourth cause of decline has probably been **overfishing**. Westslope cutthroat trout are highly susceptible to angling (Behnke 1992) but it is uncertain how much of an impact this has had on the species overall decline.

Management

Management of this species involves protecting the population strongholds and making tough decisions on restoration priorities for the depressed populations. The State of Montana has altered fishing regulations to reduce fishing mortality. Montana has also developed a Conservation Agreement signed by nine government agencies and conservation groups (Montana Department of Fish, Wildlife and Parks 1999). This agreement prioritizes protecting genetically pure populations first, then slightly introgressed populations. Recovering depressed populations will involve habitat restoration and removing non-native species. Research suggests that it is not a good idea to bolster populations with stocked fish from other watersheds due to considerable genetic variation between watersheds (Leary, Allendorf and Kanda 1998). It will be especially challenging to recover migratory life forms. Governmental agencies will need to work together to share expertise, pool financial resources and monitor progress toward restoration of this species.

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Montana Outdoors Magazine

Tough Love

by Brian Marotz

This article appeared in Montana Outdoors March/April 2004

Why it makes sense to kill some fish in order to save others

As Roxy Hollopeter settled into his chair, his first words to me were, “Poisoning a stream should be a hangin’ offense.” looked around for a rope, because I didn’t think he was kidding. I was visiting the 91-year-old Kalispell resident whose letter to the editor, entitled “Bumbling Biologists,” had been printed in the Daily Inter Lake newspaper that day. The letter took Montana FWP to task for our proposal to use a chemical fish toxin in some wilderness lakes to kill rainbow and Yellowstone cutthroat trout. The nonnative fish threaten one of the last strongholds of westslope cutthroat trout in the South Fork of the Flathead River.

“Sportsmen and citizens must get together and stop this,” the letter had proclaimed, expressing a viewpoint common among those who remember how mining waste and chemicals damaged streams in Montana and elsewhere in the West. “The biologists have already ruined our fishing here with their stream poisoning. There are no salmon flies, mayflies, or hellgrammites left. Fish must eat to live, same as anything else.”

But what FWP was doing was entirely different, and I had made the visit to explain the difference to an obviously concerned citizen.“ Hello Mr. Hollopeter,” I said, when he answered the front door. “I’m the ‘bumbling biologist’ you wrote about in the paper.”

“Speak up will ya? Rose! Come help me with this darned hearing aid!” His wife offered me coffee and cookies as she got him situated.

“I saw your letter to the editor in the paper today, and I see we’ve got something in common,” I said.

I’m sure he was wondering, What could I possibly have in common with a whipper-snapper biologist who says he wants to poison streams? I reminded him that he had written, “The biologists have planted all kinds of foreign fish… rainbow was one of the worst. If we don’t keep [those fish] out of the primitive areas, we can say goodbye to fishing and hunting.”
That, I explained, is precisely the rationale for our proposal. Many of the 21 lakes FWP has targeted for eliminating hybrid trout over the next ten years are in the Bob Marshall Wilderness. Yes, it may seem preposterous to propose poisoning lakes in a wilderness area. I knew Hollopeter thought so. But our proposal is not as crazy as it seems, and I wanted him to understand why it makes sense.

Hollopeter told me he was born in 1912. His family came from Oregon by wagon train to the Swan River valley in 1916. Back then, State Highway 83 was a pack trail, with just a few Englishmen and Finlanders homesteading the area. Today the Swan Highway carries RVs outfitted with TVs and air conditioning, and the valley is dotted with a growing number of cabins and retirement homes. Times have changed dramatically for the people in the area.

And also for the westslope cutthroat trout, a species first recorded by Lewis and Clark. Once common throughout western Montana, the species has dwindled to roughly 10 percent of its historic range. The main reasons for the decline have been habitat loss, stream siltation,

overfishing, competition from introduced fish such as brook trout, and hybridization with non-native rainbow trout. The South Fork Flathead River upstream of Hungry Horse Dam is arguably the most secure and intact stronghold for the species in the entire United States. Hungry Horse Dam, completed in 1952, has blocked the invasion of nonnative fish species moving upstream. However, the pure-strain cutthroat aren't completely protected from nonnatives or genetically polluted hybrids. Some mountain lakes have been "leaking" hybrids into the genetically pure cutthroat population downstream.

As I explained this problem to Hollopeter, he asked why the cutthroat/rainbow trout hybrids—"mule fish," he called them—were a problem. "Mules are strong," he argued. "What makes mule fish bad?"

It's not that hybrids can't do well in wilderness lakes, I replied, but that they can dilute the genetics of pure westslope cutthroat. We're losing the pure strain awfully fast, and once they're gone, they're gone for good. This species has been drastically reduced in its historic range, and the South Fork Flathead River has become an increasingly important reservoir of genetic purity. We don't want to risk ruining that population too, because there should be at least a few places in Montana where genetically pure westslope cutthroats thrive. "Protecting the remaining cutthroat is the only way we can retain a pure gene pool if we want to restore wild spawning runs in their historic range," I added.

Even the state's captive cutthroat brood stock (fish that produce eggs and young fish that are reared and then stocked) held at the Washoe Park state fish hatchery in Anaconda periodically need to be infused with wild genes to maintain genetic diver-sity and wild behavioral traits. Last May, FWP biologists captured wild westslope cutthroat males from streams in the South Fork to fertilize eggs from the brood stock.

Hollopeter agreed it made sense to protect such a valuable native species. "There should be someplace left for every creature in nature," he said. Then he began to reminisce about years ago when westslope cutthroat were abundant in local streams." Once, when I was a kid, there was so much splashing going on in the creek out back I had trouble sleeping," he said. "I got down there early next morning and saw so many cutthroat trying to spawn that all I could see was fish and no water."

I agreed such a sight should be available to people in the future and explained that's what FWP was trying to preserve. Still, he wasn't convinced. It was the poisoning aspect that stuck in his craw. "I've seen what those wildcat miners did to Snowshoe Creek, near Libby. The rocks looked painted red and the insects died and never came back. Now you biologists want to poison more!"

Then he recalled how federal officials once tried to wipe out wolves, coyotes, and porcupines. "They used 10-80 [poison] hanging in salt blocks to kill the porcupines," he said. "It worked well, but the rain made the poison run to the ground, so it killed lots of deer and elk, too. The coyotes died when they ate the porcupines, and birds died when they ate all those carcasses. Man thinks he knows best, but nature only works when we leave it alone."

For the most part, I agreed. People often make a mess of things trying to "improve" the natural world. But the project FWP was proposing was designed to correct a problem already set in motion by humans long ago: the introduction of nonnative fish into waters where they don't belong.

Next, I told Hollopeter about the compounds being proposed for fish removal. Biologists have selected rotenone and antimycin as the preferred toxins because the chemicals break down rapidly and only kill gill-breathing organisms (by preventing oxygen from crossing the gill

filaments). Even though an eagle or osprey that eats a dead fish isn't harmed, FWP removes all floating fish after a chemical treatment to prevent scavenging. We also use potassium permanganate to neutralize the toxin at a lake outlet so that gill-breathing creatures downstream aren't harmed.

As heavy-handed as our project seems, chemical fish removal has a proven track record worldwide as a safe and effective fish management tool. No other technique—netting, no-limit fishing regulations, electroshocking—can completely rid a lake or stream of fish. And if you don't remove them all, they will soon repopulate. If there were any other way to protect native west-slope cutthroat, we'd do it.

"It's like if you had knapweed in your yard," I said to Hollopeter. "You'd want to keep it from spreading. We're doing the same thing with antimycin and rotenone, to surgically remove those 'weed fish' in some lakes and streams."

Like many gardeners and farmers, Hollopeter was familiar with rotenone. "Heck I've swam cows through it, used it on my garden," he said. Then he paused. "But if you kill all the insects and little shrimp, what will the fish eat when you put fish back in the lake?"

It's true the chemicals can kill gill-breathing invertebrates as well as fish, but the insect populations rebound rapidly. When we do a fish removal, we document the entire species assemblage in the lake or stream before treatment and do all we can to make sure every species rebounds afterwards. Lakes are treated just before ice forms in the fall, and the hatchery-reared pure westslope cutthroat are then placed in the lake in spring. Because many amphibians leave mountain lakes during fall, or burrow in the lake bottom until spring, they don't get hit with the toxins. And FWP lab experiments show that amphibians can survive the low concentrations of chemicals we use to kill fish. We also ensure that some small fish are available for fish-eating birds by stocking small cutthroat.

Hollopeter was familiar with planting fish in wilderness lakes. He and a U.S. Forest Service horse packer planted the first cutthroat trout in Van Lake, in the Swan Valley, back in the late 1920s. Back then, both cutthroat species—westslope and Yellowstone—were lumped together as "western spotted trout" or "royal native black-spotted trout." No one realized or cared that the two native species might crossbreed and threaten each other's existence.

Hollopeter told me he was also hired to help plant rainbow trout in Smoky Lake (now part of what are called the Necklace Lakes) and Lena Lake. I remarked that those lakes were now being considered for chemical treatment because the rainbow trout threaten the pure westslope cutthroats farther downstream in Big Salmon Lake, in the heart of the Bob Marshall Wilderness.

He put his head in his hands when I told him this. But I wasn't blaming him. He had just been doing his job, and back then people didn't know about the problems of fish hybridization.

I then told Hollopeter about other parts of the project that were being debated. The Bonneville Power Administration, the U.S. Forest Service, and FWP are jointly preparing an Environmental Impact Statement for the lake rehabilitation project. One of the questions posed by the EIS is whether it is appropriate to use aircraft to carry the toxins to lakes in wilderness areas.

The main concern is that airplanes or helicopters would ruin the quiet wilderness experience for hikers. The counterargument is that pack stock, which can be used to carry the toxins and equipment to some lakes, aren't allowed in the Jewel Basin Hiking Area, which has lakes proposed for rehabilitation. And some wilderness lakes have no trails at all and can only be treated using aircraft. Also, the horse traffic and prolonged human activity needed to treat lakes from the

ground can damage fragile vegetation more than aircraft treatments would. There is also cost to consider, and aircraft treatments are less expensive.

Another question raised by the EIS and many wilderness advocates is whether or not lakes that historically had no fish should remain fishless after nonnative fish are removed. The argument there is that a fishless condition is the true way to re-create the wilderness setting for these lakes.

Yet many people now consider catching native fish in a remote lake, even if historically there were no fish there, as an important part of their wilderness experience. Moreover, it's nearly impossible to keep a lake completely fishless. If just two non-native trout of the opposite sex survived the treatment, then the problem population could recover, requiring additional chemical treatments. Then there's the possibility that someone angry about the lack of fish might stock a lake illegally, potentially introducing a problem species or a fish disease. Any of these possibilities would compromise the goal of protecting westslope cutthroat for future generations.

Several weeks after that first visit, I returned to see Hollopeter. He had asked me to come back when the weather warmed and drive him up to his old homestead, which he hadn't seen for years. We got in my truck and headed up the hill. Though we could see the clearing from a forest road halfway up the mountain, we couldn't reach the old home property. The land had since been subdivided and was built up with huge log homes sporting No Trespassing signs.

"Doggone it, everything's changed," said Hollopeter, as I turned the truck around and headed back to his house. "If I would have known, I would have hung on to more of this land." Hollopeter has seen many changes in this area of Montana over the past several decades. And he's seen that much has been lost. He told me he now agrees that it makes sense for FWP to take steps—even those as seemingly drastic as "poisoning" lakes—to prevent yet another part of this natural world from disappearing.

Brian Marotz is an FWP fisheries biologist in Kalispell.

Editor's Note: The Environmental Impact Statement for rehabilitating wilderness lakes is in its final draft stage and will be released for public comment later this year. A final EIS is scheduled to be released by the end of 2004.

Playing God in the Bob

By Patrick DelHomme
Forest Magazine, Spring 2006

The Bob Marshall Wilderness Complex in northwestern Montana is 1.5 million acres of wilderness bliss. It's a place where the Continental Divide runs wild like a meandering river for sixty miles. More than a thousand miles of trails lead hikers and packers to places like Gateway Gorge, Curly Bear Mountain and the twenty-two-mile-long vertical wall of rock known as the Chinese Wall. The Bob, as the locals call it, is *the* destination in the lower forty-eight states for those looking to camp, fish and hunt in a place where noise and man have little presence.

In the far western portion of the Bob, the South Fork Flathead River has its beginnings, fed by more than 350 alpine lakes. Fish species such as rainbow and Yellowstone cutthroat trout, as well as hybrid and pure strains of westslope cutthroat, call these lakes home; some outfitters and their clients call the lakes heaven.

Yet if the U.S. Forest Service accepts a proposed plan to save native westslope cutthroat populations in the South Fork Flathead River, heaven will be in for a change. Through intensive management using helicopters, pack stock and motor boats inside the boundaries of the wilderness, the project would eradicate all fish species in some of those lakes using antimycin—a poison that kills fish and their eggs, but is reportedly not harmful to humans. The lakes would then be restocked with westslope cutthroat.

For this project, officially named the South Fork Flathead Watershed/Westslope Cutthroat Trout Conservation Program, the area slated for treatment has the potential to provide a stronghold for genetically pure strains of westslope cutthroat that are already monitored as species of concern. If the fish populations aren't restored, some conservationists, anglers and wildlife officials fear that the remaining westslopes will hybridize with nonnatives, eliminating the last pure strains of the species. Others, such as outfitters who depend on those lakes for their livelihood and citizens who have fished the lakes for years, have voiced their objections to both the intent and implementation methods of the project.

Virgil and Barb Burns own the Bob Marshall Wilderness Ranch. They have packed in clients for thirty years to the lakes proposed for treatment and know the plan would put a strain on their business. They take around 100 clients to the lakes every year and say those folks couldn't care less if the fish they catch are westslope or Yellowstone cutthroat trout.

"If anybody can say what is happening with the fish up there, we can," says Barb. "They're big, strong, healthy fish, and they shouldn't be messed with." Virgil adds that others already tried a similar plan in Europe during the 1940s. "Hitler wanted a pure strain of people, too, and that didn't work."

Most of the public objection to the project stems from the proposed application methods of the poison to the lakes in the wilderness. Montana Fish, Wildlife & Parks officials, who would carry out the treatments, would prefer to use helicopters in some areas of the wilderness to transport supplies, people and powerboats. They say that for some lakes this is the most cost-efficient method to implement the plan, even it isn't consistent with wilderness values that prohibit any mechanized use.

"Agencies have a tendency not to take processes as seriously as they should," says John Gatchell, conservation director of the Montana Wilderness Association. "I don't think there would be as

much of a problem if they were going to be on horseback. [They should] start small and see how it goes."

State officials say that because of the size of the lakes—some exceed 100 acres—it would be difficult to achieve a high fish mortality rate without equipment and methods that would disrupt, if temporarily, the serenity of the Bob.

George Lake, which lies just inside the wilderness boundary, illustrates the difficulties. At 120 acres, it is one of the larger lakes in the area. Even though there isn't an official trail, the lake receives an estimated 105 angler days—the number of anglers multiplied by the number of days they fish—per year.

Treatment of the lake and almost four miles of George Creek that flows out of it would require more than 10,000 pounds of antimycin. Because of the lack of trail, sixteen helicopter flights would be needed to bring supplies and personnel to the site. The crews would use rafts with outboard motors to distribute the antimycin. According to the Environmental Impact Statement, the poison will naturally detoxify and break down once it hits the lake bottom. The entire process would take about one week.

Once officials could determine that George Lake was devoid of any fish, approximately 11,400 fish from the Washoe Park state hatchery would be dumped in the lake in each of the first three years after treatment.

In the northwestern United States, genetically unaltered westslope cutthroat trout occupy a mere 8 to 20 percent of their original range because of stream siltation, overfishing, and competition and hybridization with introduced species. In Montana, the South Fork Flathead watershed represents half of the statewide range for genetically pure westlopes.

The area proposed for treatment, the high alpine headwater lakes that feed into the South Fork Flathead River, provides a unique opportunity to save some of the last remaining wild populations of westslope cutthroat trout, says Brian Marotz, the fisheries program manager for the state.

With the completion of Hungry Horse Dam on the South Fork Flathead River in 1953, fish populations upstream from the dam in the Bob were cut off from nonnative fish populations below the dam, creating a contained area for local fish populations in the South Fork watershed. Those fish, though, weren't strictly native.

Decades before the dam was constructed, agency officials and sportsmen alike stocked some lakes in the watershed with rainbow and Yellowstone cutthroat trout. Some lakes were previously barren of fish, while others contained native populations of westslopes. In the late 1950s, fish managers recognized the impact that stocking the lakes with nonnative fish was having on native populations and began stocking the lakes only with native westslopes. But the damage had been done. Eventually, the westslopes began to interbreed with rainbows and Yellowstone cutthroats, creating hybrids.

The area of the South Fork drainage above the dam is home to 355 lakes, fifty of which have fish. Of those fifty, a little more than half have been determined to contain genetically pure westslopes. Officials fear that the hybrids in the remaining lakes will eventually migrate out of these headwater lakes, use the South Fork as a highway and breed with existing pure westslope populations.

The Bonneville Power Authority, which owns the Hungry Horse Dam, is responsible for providing mitigation money to projects like this one that will help fish and wildlife affected by the dam. In the case of this project, the mitigation money is intended to combat losses to fisheries incurred by construction and operation of the dam, which includes the elimination of some bull trout and westslope cutthroat trout spawning runs.

While the proposed plan is going to cost the Authority an estimated $2.5 to 3 million, the entire process to treat all of the lakes will span a decade. The plan is to treat two to three lakes per year at a cost of around $300,000 annually.

The fear that current populations of Yellowstone cutthroat and rainbow trout will eliminate pure strains of westslope cutthroats in the South Fork is at the core of this project. While some couldn't care less about a fish's heritage, others, such as Bruce Farling, executive director of the Montana Council of Trout Unlimited, say hybrids are a problem.

"Hybrid fish will eventually take over," Farling says. "We're making assumptions that the natural disposition of wild fish to adapt to climate of the area, drought, fire, geology, predators and a fairly sterile food system will do better than hatchery-raised fish. Any fish like Yellowstone cutthroat or rainbow are not going to be as fit to adapt to the aquatic ecosystem up there as the fish that are ancestral to the area."

Farling and Trout Unlimited have also recognized other areas of concern in regard to the proposed fish poisoning. Some environmental groups, such as Wilderness Watch, have suggested that certain lakes should be left barren, as they were in the time before Lewis and Clark. Farling feels that it would be a "wonderful opportunity to see how a lake recovers once that predator is taken away." But he realizes that many anglers don't see it that way.

"We've figured out an approach and made some suggestions to where 80 to 90 percent of people would get what they want," he says.

But those not getting their way, mainly outfitters, have been outspoken in their opposition to the plan. Farling admits that not everyone is happy about the proposal, but he says annually, the lakes only receive a combined 2,000 to 3,000 angler days.

"It's not like we're going in and nuking the Madison River [near Bozeman] and 100,000 angler days a year. There are plenty of other angling opportunities for cutthroat in that area. There's the whole South Fork," he says.

Farling suggests agencies should use pack stock where they can, but he says that in his experience, using a motor on lakes is necessary for a successful fish-kill. He adds that one of the biggest risks is that the project simply won't work. The antimycin that would be used in the Bob is effective often, but not every time. After a lake is treated in the fall, it would then be monitored the following spring and summer. If it is determined that fish remain, a second application of poison could follow. Even so, Farling says the project should go on. "It's not 100 percent perfect," he says. "It's not risk-free, but man, conservation of these fish is not a risk-free business anymore."

One of the biggest bones of contention in the project is the use of poison to kill the fish. When many people hear the words *poison, water* and *agency* used in the same sentence it makes them cringe—and for good reason. In 1997, California's Department of Fish and Game treated Lake Davis, the drinking water supply for the town of Portola, with rotenone, a poison similar to antimycin. The result was a catastrophe.

The chemical was supposed to break down in two months and destroy all of the introduced pike in the lake. Instead, the rotenone lingered for ten months, contaminated Portola's water supply and didn't kill all of the pike. In the end, the Department of Fish and Game was fined $250,000 by the regional water quality board, and Portola, Plumas County and affected businesses were paid $9 million in reparation by the state.

The antimycin proposed for the lakes in the Bob breaks down in a matter of hours, and studies have shown that its threat to humans in diluted doses is low to none. It kills both gill-breathing organisms and their eggs, but there is some concern about the poison's effect on non-vertebrate populations and amphibians. Recent studies have shown that antimycin would have short-term impacts on amphibians and aquatic insects, yet almost all of the studies cited in the plan's environmental impact statement are more than thirty years old.

Even with antiquated studies, incomplete science and a public that isn't overwhelmingly supportive of the plan, the lakes above the Hungry Horse Reservoir provide a unique, fairly controlled environment to restore westslope cutthroat trout populations. It's a tradeoff. If the Forest Service decides to go ahead with the plan, the solace provided by the Bob Marshall Wilderness could be suspended for a decade, beginning as soon as fall 2006. Water could be contaminated and fish, native and nonnative alike, will be killed. In exchange, westslope cutthroat trout populations could have a safe haven to live without the fear of hybridization. If the project works, it will be a victory for the trout. If the plan fails or gets rejected, it will be one more blow to a species already on the verge of extinction.

Can hatcheries help conserve the westslope cutthroat?

by John Fraley

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Yes, say fisheries biologists, but the big question is where and how

Westslope cutthroat trout have lived in post-glacial western Montana for thousands of years. During that entire time, the species has been able to survive catastrophic fires, massive floods, and severe droughts. But in the less than 200 years since Meriwether Lewis first described the subspecies, the cutthroat's range has dwindled. The population decline is due to stream siltation, dams, overfishing, and competition from—and hybridization with—introduced nonnative fish such as brook trout.

Habitat protection and restoration are important components of a westslope cutthroat recovery program. But is there a role for state hatcheries in the restoration and conservation of westslope cutthroat? Historically, Montana Fish, Wildlife & Parks (FWP) trout hatcheries were primarily used to produce large numbers of fish that were then stocked wherever possible. But in recent years, trout hatcheries have increasingly become the source of fish used in restoration work. FWP has committed itself to conserving native westslope cutthroat, and biologists are now discussing when and where to use hatcheries and hatchery-reared cutthroat as part of that effort.

The first brood fish

Despite its name, the westslope cutthroat is native to both sides of the Continental Divide. A cutthroat subspecies also found in Idaho, Washington, Oregon, and western Canada, the westslope lives in Montana's Kootenai, Flathead, and Clark Fork watersheds and in the headwaters of the Missouri and Saskatchewan rivers. The populations in greatest danger of disappearing are those east of the divide, where they are today confined mainly to headwater reaches.

Efforts to increase numbers of this native species, especially in mountain lakes, began in 1952 when FWP first established a westslope cutthroat hatchery brood stock. (Brood stock are the fish held in a hatchery to produce eggs and young fish that are reared and then stocked.) That winter, three FWP employees flew into Big Prairie airfield in the Bob Marshall Wilderness. From there, they snowshoed to Big Salmon Lake, a remote lake known for indigenous westslope cutthroat trout that biologists believed would make an excellent basis for the department's first cutthroat brook stock. Over several days, they caught 32 cutthroat trout through the ice with hook and line. These fish, flown out and held in the Jocko River Hatchery in Arlee, formed FWP's initial brood stock.

Throughout much of the next three decades, young trout reared from these and later generations of brood stock were stocked in lakes and streams. Then, in 1977, geneticists detected a serious loss of genetic diversity in the brood stock. By 1983, outward signs of problems were emerging, such as low egg hatching success and fin deformities in many of the fish.

Building a more diverse stock

Hatchery managers took this opportunity to start over and form a new, genetically diverse westslope cutthroat brood stock that would survive and reproduce in a variety of habitats. The present stock used by FWP (referred to as the westslope stock) was founded in 1983 when FWP biologist Joe Huston and his crews collected 6,445 westslope cutthroat from 12 Hungry Horse Reservoir tributaries and two Clark Fork tributaries. Pathologists tested the fish from each of these 14 creeks and found them to be disease-free and genetically pure. The fish were then cross-bred to combine the various gene pools and create brood stock containing genes from all 14 unique strains.

Huston says that a diversity of creeks was chosen to ensure that the various life forms of cutthroat trout—those that lived their entire lives in streams, called residents, and those that migrated from rivers and lakes to spawn in tributaries—would be included in the new brood stock. The Clark Fork tributaries were included to ensure that resident fish would be part of the mix.

Managers moved the wild fish to holding facilities at Murray Springs State Fish Hatchery near Eureka. Later the stock was transferred to FWP's Washoe Park Hatchery at Anaconda, where water temperature can be varied to increase spawning success for this subspecies.

The westslope stock grows well and maintains excellent condition in lakes ranging from potholes at 3,000 feet elevation to the highest lake (8,000feet) that supports fish in northwest Montana. In that region alone, 125 mountain lakes maintain popular sport fisheries due to periodic planting of the westslope stock. Many valley floor lakes benefit as well.
" The westslope stock has been a phenomenal producer for us," says Gary Bertellotti, FWP fishery chief. "But, like anything else, these fish are not ideal for all situations. They work well in small to medium lake systems, and they are especially good in high mountain lakes to maintain a sport fishery."

" Anyone who thinks of modern hatchery stock as inferior," Bertellotti adds, "is thinking ancient history."

Appropriate for at-risk populations?

Though few question the success of the westslope stock to improve recreational fishing in lakes, these fish usually aren't considered for stocking in streams (or in lakes that have outlet streams) where small, unique populations of westslope cutthroat are in danger of disappearing. The hatchery fish could interbreed with wild fish in nearby waters and thus compromise the genetic uniqueness of cutthroat populations downstream of areas where the hatchery fish are planted.
Biologists generally believe it is better, when possible, to restore dwindling cutthroat populations using unique cutthroat stocks that have a genetic makeup similar to that of the population being restored. This "nearest neighbor" concept holds that cutthroats from a nearby stream are a better source for genetically specific cutthroat than are FWP's westslope hatchery stock.

Rob Leary, a University of Montana fish genetics expert who has studied cutthroat genetics for nearly two decades, works closely with FWP staff. He agrees that the westslope stock has a role in westslope conservation and restoration. But because that mixed-origin stock is more genetically diverse than the average westslope cutthroat population, it may have limitations for any restoration program where the paramount goal is to maintain the original genetics of a specific cutthroat population.

" Essentially, these fish are mutts," Leary says. "For management situations, that may be good. But I'd avoid using them where they have a chance to interbreed with existing native cutthroat."

In a situation where westslope cutthroat stocks are needed for recovery, Leary and FWP biologists say it's best to use fish from the closest possible source geographically. If that's not possible, they maintain, using the westslope stock is still better than stocking fish other than cutthroat, such as rainbow trout.

Leary says that there are large genetic differences among populations of westslope cutthroat, which probably indicate a lack of interbreeding among these many small populations. And that, he says, may give each population important local adaptations. Each may be better adapted to its particular stream than the more genetically diverse westslope stock would be, although this has not been documented.

Leary and many other fisheries scientists contend that keeping particular strains of cutthroat as unique and distinct as possible may, in some cases, allow the subspecies to survive better in the long run.

Bertellotti agrees, but he adds that the westslope hatchery stock should not be discounted entirely for its potential for future restoration on some streams where other techniques aren't feasible. He notes that the hatchery stock could actually provide more of the genetic fitness that swindling strains may need to survive. What's more, Bertellotti says, hatchery managers continue to improve the westslope stocks by mixing in wild fish from genetically pure populations.
" With new research and careful hatchery practices, we can produce an excellent native fish in terms of genetics and performance," he says.

Though FWP isn't currently using the hatchery stock for westslope restoration, it remains a tool that fisheries managers can use if other options aren't possible. Bertellotti points out that because of the westslope stock's

genetic diversity—finding its origin in more than a dozen pure populations that were then mixed together in the hatchery—it could actually introduce genetic resilience into diminished populations.

Importance of genetic diversity

Hatchery managers aren't the only ones touting the westslope stock's potential for restoration. "This is a genetically variable stock that performs in a variety of environmental conditions," says Bob Snyder, FWP native fish coordinator. "We don't know which genes may impart resistance to drought or impart successful spawning. We don't have the cutthroat genome mapped, and that's why these fish are so important. We can introduce a diverse stock and let nature sort it out."

In fact, genetic inbreeding may have made isolated westslope cutthroat populations more susceptible to environmental threats that the genetically diverse brood stock would be. Geneticists have found that westslope cutthroats from the same stream are nearly genetically identical. Yet those same fish have a far different genetic makeup from that of other westslope cutthroat populations living in different streams, even those within the same drainage.

What accounts for the wide genetic differences among various westslope cutthroat populations? According to Snyder, some scientists theorize that it may be due in part to the species' harsh environment, which historically has forced many streams' populations to reestablish themselves with a small number of individual fish, leading to a narrowing of the genetic makeup of the trout in that stream.

For example, if an environmental event such as a drought had killed most cutthroat trout in a stream, then the population would have rebuilt itself by the breeding of just a few surviving individual fish. This phenomenon, known as a population bottleneck, results in inbreeding, a loss of genetic variation, and increased genetic similarity of individual trout.

Long before these changes occurred, says Snyder, all the various cutthroat populations likely came from a more genetically diverse founding population.

Interestingly, FWP's westslope hatchery stock—which combines genes from fish of many streams—may be more similar to the westslope cutthroat's original population than the many different unique strains in the streams now.

Genetics issues aside, FWP currently lacks hatchery space to rear dozens of unique cutthroat stocks while maintaining adequate numbers of existing westslope stock. That means citizens and FWP will need to make some hard choices regarding the future of the state's hatchery brood stock program.

" Do we want a sport fishery for this native fish and a genetic reserve for a diverse cutthroat stock?" asks Bertellotti. "If so, then the current westslope cutthroat stock is great for both those purposes. Or do we want specific stocks for recovering specific streams? We can't have a large program for both types of stocks."

Keep all the parts

In 1994, due to concern over cutthroat recovery, FWP formed an interagency cutthroat technical committee to examine the issue. The committee recommended that managers strive to preserve each existing population of westslope cutthroat trout whenever possible, while acknowledging that this could be difficult in some situations.

" Managers should be conservative and assume each population should be retained," says the University of Montana's Leary, a committee member.

This approach is consistent with a westslope cutthroat conservation agreement among FWP and other agencies.

As part of its commitment to restoring unique cutthroat populations, FWP has created an experimental recovery hatchery program at Sekokoni Springs, east of Kalispell, where biologists soon will be developing nearest neighbor cutthroat stocks for recovery efforts in specific streams of the Upper Flathead River Drainage.

" This has lots of potential," Bertellotti says, "but we have to start off small. We can't do five streams at one time."

He explains that conserving specific populations is expensive. It also doesn't produce significant numbers of additional fish for people to catch.

In some at-risk cutthroat populations, not enough fish remain to provide donors that could be reared in hatcheries to help restore those streams. In these cases, Snyder says, one alternative would be to cross a few individuals from an at-risk population with fish from the existing westslope brood stock, and then stock the resulting offspring into a fishless stream. This would preserve the genes of the unique population along with the more diverse genetic makeup of the westslope stock. The approach has not yet been tried, Snyder adds, “but we’re considering it as an alternative for conserving extremely reduced populations.”

Much still yet to learn

Fisheries scientists continue working to improve the genetic quality of westslope brood stock and to understand how inbreeding alters fish health and fitness. One major unknown is the significance of observed genetic differences among fish from different streams. Researchers don’t yet know whether stream-to-stream gene differences reflect evolutionary adaptations or simply random changes due to small population sizes.

Because scientists have much to learn about trout genetics, the various unique westslope cutthroat populations are being conserved and restored whenever possible. In some waters, managers are removing nonnative fish such as brook trout from sections where they might compete with westslope cutthroat trout. And land management agencies are working to lessen environmental damage that threatens westslope cutthroat trout habitat.

Meanwhile, the westslope stock continues to be used mostly in mountain and valley floor lake waters, where it provides an excellent recreational fishery and superb food for a backcountry meal, yet is unlikely to mix with endemic cutthroat populations (which are mainly in streams). Managers maintain that keeping westslope cutthroat available for anglers’ harvest and enjoyment is an important step in maintaining public support for cutthroat conservation.

What about the use of westslope hatchery stock to restore at-risk populations? FWP continues to improve the westslope hatchery stock and hold it available to use in recovery efforts where other options may not work. Fisheries managers, geneticists, and hatchery biologists continue to discuss when and where the westslope brood stock should be used to create new angling opportunities and to restore dwindling populations. But ultimately their common goal is to preserve the species that, on a June evening in 1805, Meriwether Lewis and his men cooked and ate—a species that Lewis afterwards proclaimed “a very fine trout.”

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