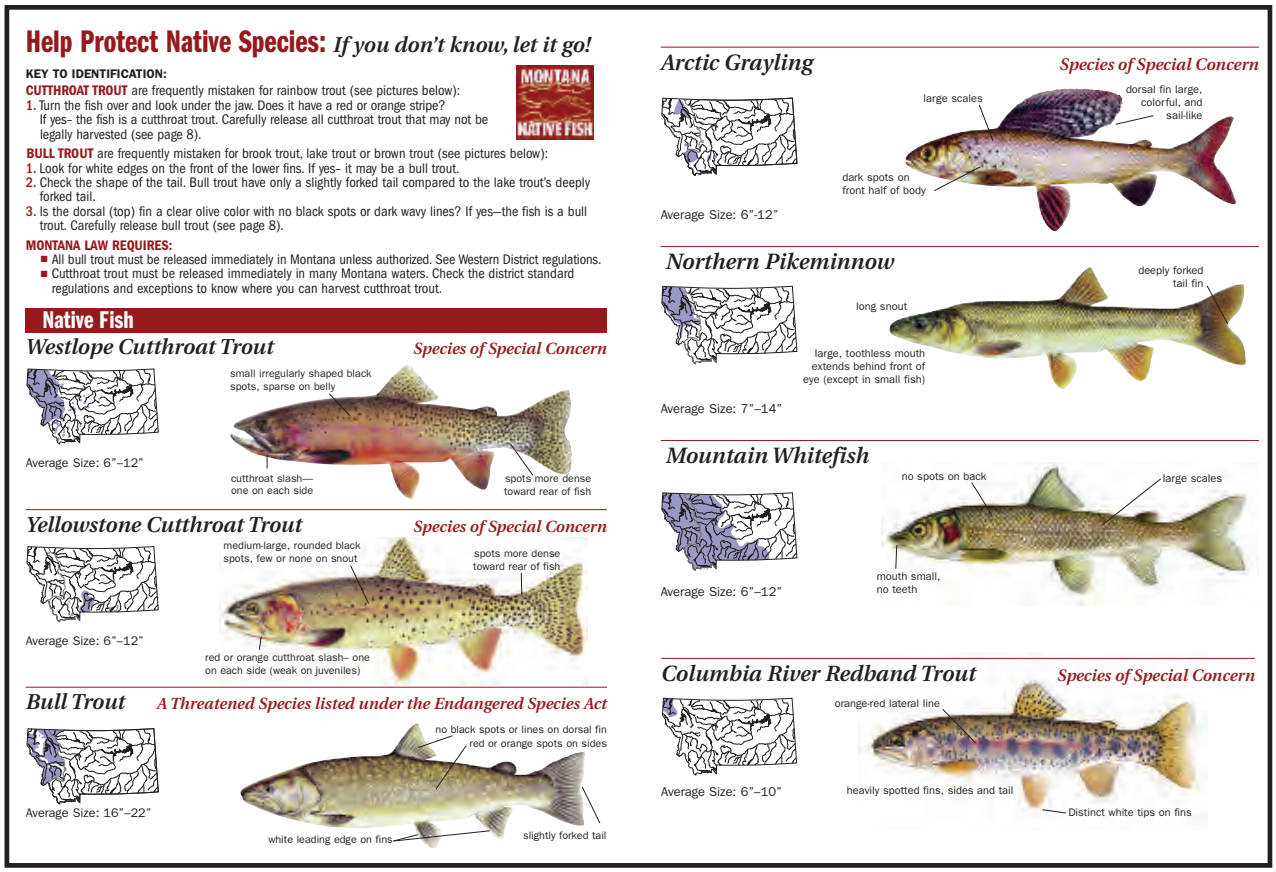
2019
Annual Fishing Newsletter

MONTANA FISH, WILDLIFE & PARKS

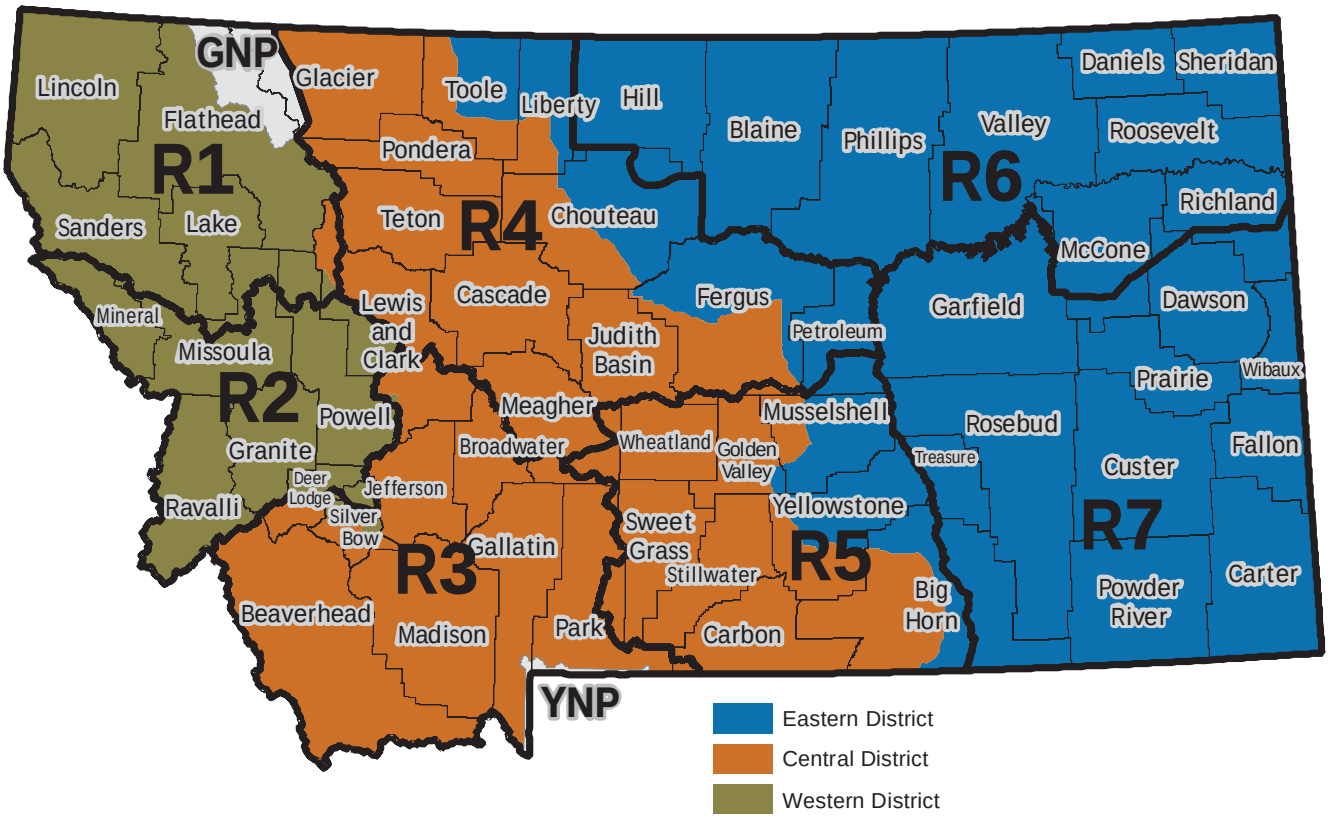
THE **OUTSIDE** IS IN US ALL.

Table of Contents



Front cover: Black Canyon Lake, Beartooth Mountains, Region 5. Region 5 Fish Manager Ken Frazer recently retired after 40+ years.

FWP Administrative Regions and Fishing District Boundaries



FWP Regional Offices

Headquarters
1420 E. 6th Avenue
Helena, MT 59601
406-444-2449

Region 1
490 North Meridan Road
Kalispell, MT 59901
406-752-5501

Region 2
3201 Spurgin Road
Missoula, MT 59804
406-542-5500

Region 3
1400 South 19th Avenue
Bozeman, MT 59717
406-994-4042

Region 4
4600 Giant Springs Road
Great Falls, MT 59405
406-454-5840

Region 5
2300 Lake Elmo Drive
Billings, MT 59105
406-247-2940

Region 6
1 Airport Road
Glasgow, MT 59230
406-228-3700

Region 7
352 I-94 Business Loop
Miles City, MT 59301
406-234-0900

Butte Area Office
1820 Meadowlark Lane
Butte, MT 59701
406-494-1953

Havre Area Office
2165 Hwy 2 East
Havre, MT 59501
406-265-6177

Helena Area Office
930 Custer Avenue West
Helena, MT 59602
406-495-3260

Lewistown Area Office
333 Airport Road, Ste. 1
Lewistown, MT 59457
406-538-4658

Region 1 Northwest Montana

Lower Clark River Drainage Mountain Lakes Monitoring Project

Jason Blakney, Fish Biologist

High-mountain lake fisheries represent a unique angling experience and are popular summer and fall destinations for many outdoor enthusiasts. Montana Fish, Wildlife & Parks (FWP) has dedicated considerable resources to stocking mountain lakes but many of these fisheries have never been evaluated. With funding support from Avista Utilities under the Clark Fork Settlement Agreement, a four-year study was initiated in 2016 to survey mountain lakes in the lower Clark Fork River drainage in Sanders County. High-elevation lakes where FWP actively stocks fish are the focus of these research efforts. By evaluating the physical and biological characteristics of lakes, mangers can help tailor stocking strategies to provide diverse angling experiences. Some lakes that are easily accessible and receive significant angler pressure might be managed as put-and-take fisheries, with these types of waterbodies being stocked frequently with relatively high densities of fish. Lakes that can grow large fish might be stocked less frequently with lower densities of fish, while lakes where fish naturally reproduce may not need to be stocked at all. Data collected at each lake includes length, weight, age structure and condition of fish; catch rates; accessibility; angler use; and physical habitat characteristic. Field data collected for this study will be used help inform fisheries biologists on the best strategy for individual lake management. High-mountain lake fisheries can also present challenges in the management and conservation of native trout. Nonnative trout have been known to invade headwater stream reaches occupied by native trout, through downstream dispersal from these high mountain lake basins. Brook trout in high-mountain lakes are of concern because they are known to outcompete cutthroat trout and hybridize with bull trout. In many western states, rainbow trout and cutthroat trout, have been stocked in mountain lakes outside of their native range. In western Montana, Yellowstone cutthroat trout (YCT) were historically stocked in many drainages occupied by native westslope cutthroat trout (WCT) because at the time they were all that were available. The identification of nonnative trout and trout hybrids in mountain lakes is an important component of native fish management. Genetic analyses to investigate hybridization will be conducted at lakes where stocking records indicate non-native species were stocked in the past, or where visual inspection reveals unusual phenotypic characteristics. To protect native fish species that often occur in stream systems below mountain lakes, FWP now only stocks native WCT in mountain lakes west of the Continental Divide.

Suspected WCT x YCT (Westslope-Yellowstone Cutthroat Trout) hybrid.

Thus far a total of 24 lakes have been sampled, 21 of which were found to be fish bearing. Approximately 12 lakes will be sampled in 2019. Westslope cutthroat trout were the most common fish sampled with average lengths at individual lakes ranging from 8.1 to 13.2 inches. Relative weight, a measure of plumpness, was quite variable for WCT and ranged from 78 to 113, with 100 being considered normal. Suspected WCT-YCT hybrids were encountered at four lakes, which is a

Lower Blossom Lake.

result of historic stocking events combined with natural reproduction, given YCT haven't been stocked in the area in several decades. A stunted brook trout population was surveyed in one lake, while rainbow trout of multiple age-classes were encountered in an easily accessible lake where FWP has no records of the species ever being stocked.

For those seeking information on a specific mountain lake, contact the local fisheries biologist in that area or use the new and improved portion of FWP's website, FishMT (http://fwp.mt.gov/fish/), which is dedicated to providing the public with a plethora of biological information on waterbodies across the Montana.

Thompson River

Ryan Kreiner, Fisheries Biologist

The Thompson River is the lower Clark Fork's most popular trout fishery. Historically inhabited by three native salmonids, bull trout, westslope cutthroat trout, and mountain whitefish, species composition has shifted over the years. As early as the 1930's, rainbow trout and brook trout were stocked into the Thompson River. Rainbow trout quickly became the most abundant trout species in the mainstem, while brook trout became more abundant in some of the tributaries. Remarkably, in some of the colder tributaries, native bull and cutthroat trout still prevail today.

In 1988, brown trout were stocked into the Thompson River. Over the next two decades, their numbers increased dramatically, and they are now the most abundant trout in the mainstem. In the upper river, where water temperatures are warmer due to a source of lowland lakes and a lack of major tributaries, brown trout encompass 85-95% of the trout species. Native trout still dominate some of the tributaries to the upper Thompson River, particularly the streams with intact habitat and cold water, but recent surveys have shown that in some cases brown trout, rainbow trout hybrids, and even brook trout are encroaching further into the headwaters of these drainages.

While it is unlikely that species composition in the upper Thompson River will ever revert to prior conditions, there may be things we can due to protect native trout in the system. Several of these tributaries are high gradient creeks where existing waterfalls could be modified into complete upstream barriers. This action combined with removal of nonnative trout could preserve resident cutthroat and bull trout for generations to come. Additionally, some streams that were historically fishless due to natural barriers contain nonnative brook trout or remain fishless. If determined suitable, these streams could be stocked with native trout in order to begin to balance the amount of habitat lost to natives when exotic fish became abundant. Over the next few years, FWP will continue to work with partners to get suitable projects like these initiated.

Finally, not all tributaries to the Thompson River are in good shape. Several streams (including the largest tributary by drainage area, the Little Thompson River) are listed as impaired for excessive sediment and nutrients by a Montana Department of Environmental Quality program known as the TMDL (Total Maximum Daily Load). Overgrazing, road abundance, and historic timber harvest have left these streams silty and warm. But because of the conditions, these streams primarily

contain small brook trout and therefore do not "qualify" for restoration money directed at native fish.

Recently, FWP began surveying these drainages looking for potential restoration projects and for remnant populations of native cutthroat trout. We used this information, along with information from the primary landowners (Weyerhauser, Montana Department of Natural Resources and Conservation, and US Forest Service), to assist the Lower Clark Fork Watershed Group construct its first-ever Thompson River Watershed Plan. In this plan we identified many projects that range in size and complexity, intensity, which may have both immediate impacts on local populations of fish, or in many cases are just a small step in the overall recovery of the system. Coordination between groups was the key to identifying common goals, and on-the-ground field work was the key to identifying specific projects. Cleaning up and cooling down these streams has the potential to benefit both native species and the recreational fishery in the mainstem Thompson River.

Avid angler and FWP employee, Jayden Duckworth, enjoyed catching westslope cutthroat trout during autumn 2018 on the Flathead River.

Managing for a Legacy: Saving Westslope Cutthroat Trout for Today and Tomorrow

Amber Steed, Fisheries Biologist

Fall 2018 was a beautiful showcase of northwest Montana's stunning natural resources. Mild temperatures and plenty of sunshine provided ample opportunity to get out and enjoy our corner of the state. Many reports came in of anglers catching large, robust westslope cutthroat trout in the Flathead River upstream of Flathead Lake, reminding us at FWP how fortunate we are to work and live with such a fishery.

Westslope cutthroat trout (above, to be released) and hybrid trout (below, to be relocated) from upper the Flathead River system.

Westslope cutthroat trout are one of the handful of native fish species that has adapted over thousands of years to conditions in the Flathead River system. However, the relatively recent introduction of nonnative species like rainbow trout seriously threaten the persistence of our native cutthroat trout through hybridization (interbreeding) and competition for resources. Currently, non-hybridized westslope cutthroat trout exist in less than 10% of their historic range in the United States and less than 20% of their historic range in Canada. Within Montana, the South Fork of the Flathead River drainage upstream of Hungry Horse Dam makes up about half of the remaining large, interconnected habitat for non-hybridized westslope cutthroat trout. The North and Middle forks of the Flathead represent a substantial portion of remaining populations in the state.

Why should we worry about hybridization since many people enjoy fishing for hybrids and rainbow trout? There are several reasons FWP takes the loss of westslope cutthroat trout seriously. First, we may lose traits that have evolved in native species like westslope cutthroat trout, helping them thrive in their environment for thousands of years. Hybrids and rainbow trout may not play the same eco-

system role as westslope cutthroat trout, impacting other organisms including insects, other fish, birds, and mammals. Westslope cutthroat trout are a great sportfish and there are social and economic downsides to losing the opportunity to fish for them. Hybridization increases the possibility of federal Endangered Species Act protection, potentially limiting public enjoyment of the species. And let's not forget, the cutthroat trout is our state fish.

Electrofishing of selected tributary mouths in the upper Flathead River system to relocate hybrid and rainbow trout.

So, what does this mean for management of rainbows, westslope cutthroat, and their hybrid trout offspring? Within the open Flathead River system (not including the South Fork upstream of Hungry Horse Dam), we acknowledge that hybridization will probably always exist. However, slowing the spread and reducing its impacts to our remaining native westslope cutthroat trout is a realistic goal. To meet this goal, we first needed to understand how hybridization spreads in our system. By tracking fish to their spawning areas using radio telemetry and by studying the genetic structure of fish across the drainage, FWP learned how to be most efficient and effective in stemming the loss of westslope populations. Since that research was first conducted in the early 2000's, we have removed hybrid and rainbow trout by electrofishing and trapping in five key spawning streams that have largely contributed to their spread. Most fish removed have been transported to community fishing ponds like Pine Grove Pond in Kalispell to provide continued angling opportunities.

A hybrid trout (westslope cutthroat trout x rainbow trout) implanted with a radio telemetry tag, ready for release.

So, what has changed in the nearly 20 years since hybrid suppression began? FWP asked that question in a recent check-in of our progress. To get our answer, we repeated the radio telemetry and genetic work that was conducted during the early 2000's and looked at our success in removing hybrids from source streams. Results have revealed some changes that will inform our management moving forward. We saw: A slower rate of hybrid trout expansion from downstream sources; A reduced number of spawning adults in hybrid source streams; 50% fewer hybrids and rainbow trout spawning in upstream tributaries targeted for suppression – with more fish spawning in the Mainstem Flathead River.

While these results are largely encouraging, hybridization continues to spread – requiring more creative solutions. Alternatives may include targeting additional source streams for hybrid and rainbow trout suppression, installing barriers near the mouths of streams that still support nonhybridized westslope cutthroat trout in their headwaters, or a combination of these and other approaches to best conserve our state fish. Regardless of how we move forward, FWP will continue to pair the best available science with public engagement and transparency to help ensure that we all may continue to enjoy the rare and valuable resources that make up this unique part of the world.

Libby and Hungry Horse Mitigation Programs

Matt Boyer, Science Program Supervisor

Housed within Region One Fisheries, the Libby and Hungry Horse Mitigation Programs contribute in a big way to aquatic resource conservation work getting done on the ground in the Northwest corner of our State. Part of the larger Columbia Basin Federal Hydrosystem, Hungry Horse and Libby Dams (completed in 1953 and 1972, respectively) play an important local and regional role in flood control and power generation; yet, construction and operation of these dams also directly and indirectly impacts fish species in the Flathead and Kootenai drainages.

Hungry Horse Dam on the South Fork Flathead River (Photo credit: Bureau of Reclamation)

In 1980, US Congress enacted the Northwest Power Act, an important piece of legislation that establishes a Council comprised of Governor-appointed representatives from Montana, Idaho, Oregon, and Washington to oversee Columbia Basin hydrosystem operations and promote a balance between the sometimes-competing objectives of flood control, power generation, and maintenance of river and floodplain ecosystem function. Bonneville Power Administration (BPA) is the federal agency responsible for marketing the hydroelectricity in the Northwest and, through the sale of this power, funds the Columbia Basin Fish and Wildlife Program. This Program directs resources to fish and wildlife management agencies who then implement projects intended to mitigate the impacts of the dams on fish and wildlife species, especially those listed under the Endangered Species Act.

Fisheries staff in the Libby and Kalispell offices work closely with other state agencies, tribal governments, and public groups to design and implement BPA-funded fisheries mitigation projects that benefit fish species such as westslope cutthroat trout, bull trout, redband trout, burbot, and Kootenai white sturgeon. Work conducted through the Libby and Hungry Horse Mitigation Programs follows a science and policy framework that directs on-the-ground actions at three main mitigation objectives: 1) modifying dam operations to improve fishery productivity in the rivers and reservoirs; 2) protecting and restoring aquatic and riparian habitats; and 3) minimizing the impact of nonnative species on native fish. Examples of these types of projects include: hydro operations that better mimic pre-dam river flow and temperature; conservation easements and acquisition of land to protect important riparian habitat for native fish; and removal of nonnative fish to promote genetic conservation of native trout. In addition to helping mitigate the impacts of Libby and Hungry Horse dams on native fish, these projects also contribute to the quality of the fishery and angling experience on the stunning rivers, streams, and lakes in this part of Montana.

Check out more of the articles in this newsletter that feature projects led by the R1 fisheries mitigation staff. For questions or more information, please feel free to contact us by phone at 406-751-4570 or by email at mboyer@mt.gov.

Libby Dam on the Kootenai River (Photo credit: Army Corp of Engineers)

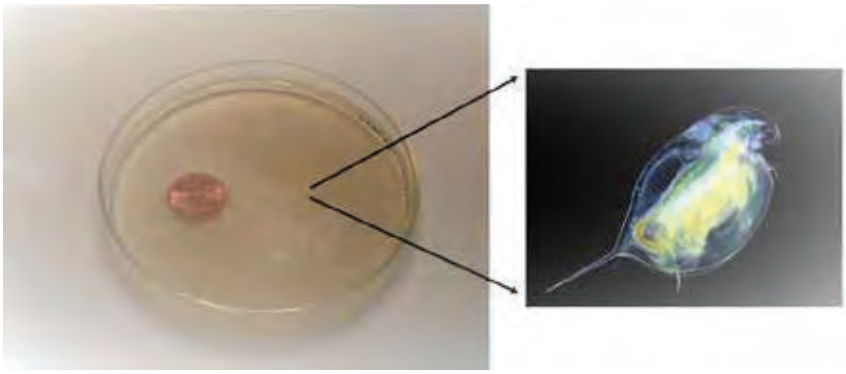
Unlocking the Secrets of Lake Koocanusa Kokanee Salmon

Jim Dunnigan, Fisheries Biologist

Kokanee salmon harvested from Lake Koocanusa by a young angler.

Fisheries biologists are often portrayed as studying an issue to death. However, to effectively manage sport fisheries (and those factors that control the size and number of fish within those fisheries), we must first understand the physical and biological factors that are controlling our valued sport fisheries. Anything less would be trial and error tinkering. Lake Koocanusa is a prime example of this scenario.

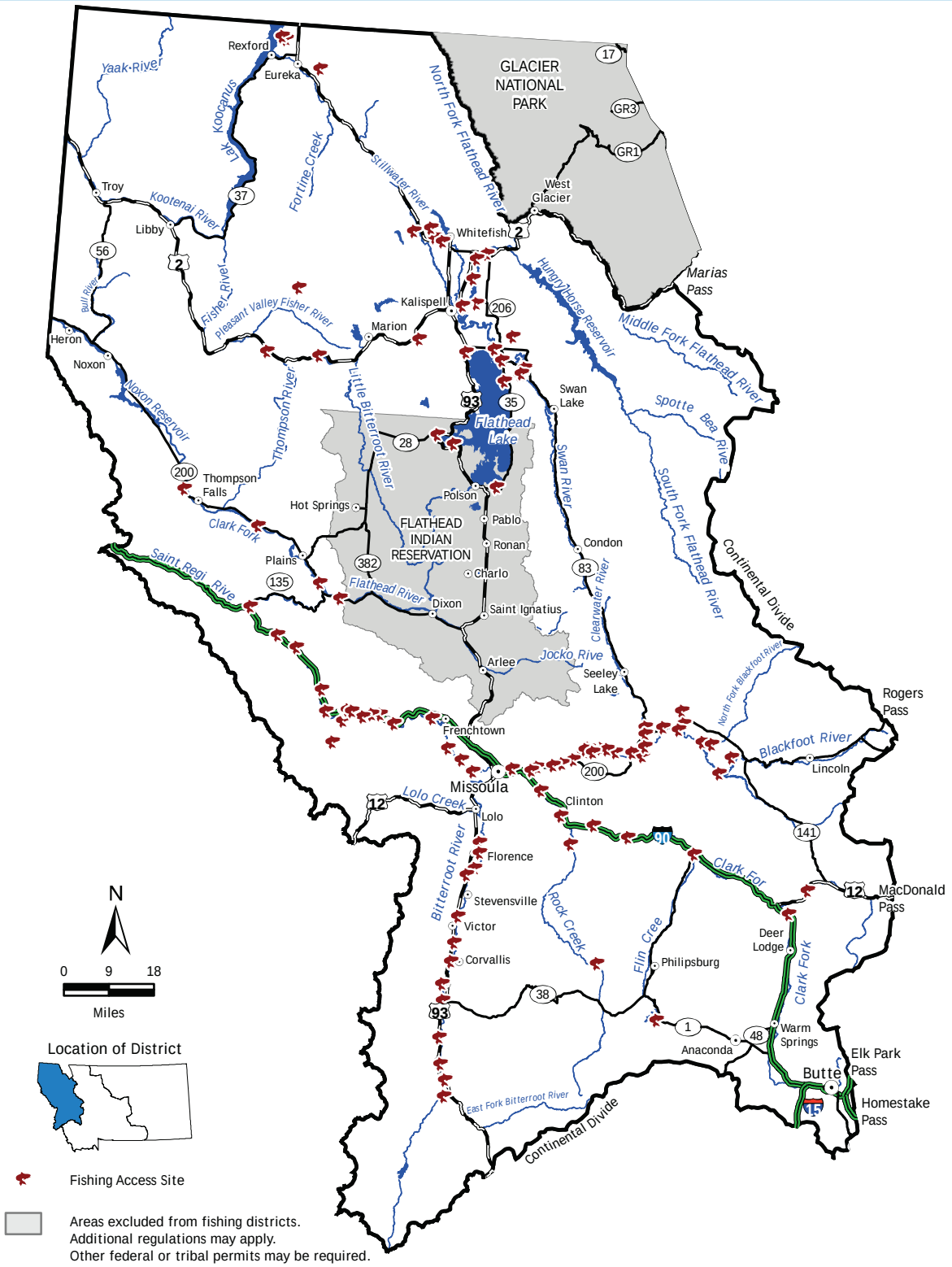
Kokanee salmon in Lake Koocanusa are probably the most sought-after species in the reservoir, and provide an important forage base for cherished trophy rainbow and bull trout that also inhabit the reservoir. The reservoir supports about 30-35,000 angler days per year, which might not seem like a big deal compared to other large lakes throughout Montana, but in the northwest corner of Montana, it is. Over the past decade, kokanee salmon average size has ranged from 8.5 to 12 inches and just over 1/3 of a pound. Anglers in 2018 enjoyed an abundance of 11 to 12-inch fish. The salmon in Lake Koocanusa come exclusively from wild spawning fish since FWP doesn't stock any salmon in the reservoir. Over the past several years FWP biologists have focused our efforts to better understand the factors that determine the size and number of kokanee salmon so that we can better manage the fishery.



Photographs of a sample from Lake Koocanusa that contains about 29,000 Daphnia. The image to the right is a single Daphnia magnified by about 50X.

Despite the generous daily bag limit of 50 salmon per day, angling does little to regulate the number or size of fish in Lake Koocanusa. Biologists conduct annual hydro-acoustic surveys that use a sophisticated sonar system to estimate the number and size of salmon present in the reservoir. Although knowing the number of fish mouths in the population is important, it is not enough. To truly understand those factors that control kokanee salmon, we must understand the food web. The lowest level of this food web is phytoplankton (microscopic plants and algae) that provide food for zooplankton (small animals made up mostly of crustaceans of which the most important is Daphnia). Kokanee salmon feed primarily on these zooplankton. Many of the factors that influence the size and number of kokanee salmon occur early in a kokanee's life prior to being a catchable size. That is why we have devoted substantial effort over the past several years to monitor and understand the conditions that affect phytoplankton and zooplankton in the reservoir. Although admittedly not as glamorous as working directly with the fish, this food web work is critical. We have come to suspect that reservoir operations likely influence the lower levels of the kokanee food web. So, we are now well on our way to unlocking the secrets of kokanee salmon on Lake Koocanusa, and once the puzzle is complete, we can work with reservoir operators to make changes to improve conditions for the food web that will promote better growth for kokanee salmon in Lake Koocanusa.

Western Fishing District



The Western Fishing District includes all waters in Montana west of the Continental Divide.

For additional information about fishing in this district, please call the following regional headquarters Monday-Friday 8:00 a.m. - 5:00 p.m.:

Kalispell 406-752-5501
Missoula 406-542-5500
TTY (Telephone Device for the Deaf).....406-444-1200

REGION 2
WEST CENTRAL MONTANA

Not-So-Traditional Fisheries Management

Patrick Saffel, Fisheries Program Manager

The word "tradition" in the title suggests history. For fish management, our history involves an evolution of approaches that met societal demands. Early fish management was raising and stocking fish for food for settlers and early sport fishing. If there were not enough fish for harvest, the solution was to stock more. Brook trout from Eastern US waters and rainbow trout from the West Coast were common sources. Brown trout from Europe were also stocked. As angling for sport became more popular, harvest regulations like size limits and catch-and-release became common. More recently, emphasis on wild and native fishes has required protection of habitat, and where habitat was damaged, habitat restoration. Providing access for anglers compliments our management of fish populations and habitat. Access to our fisheries is provided by over 70 Fishing Access Sites in Region 2 alone, the state Stream Access Law and abundant public lands.

Fisheries management includes providing angling opportunity (upper right, Bitterroot River) through management of fish populations, habitat and access. River use has changed over the years and some reaches are dominated by non-anglers (left, tubers on the Blackfoot River). FWP manages many access sites that are funded and built primarily for angler access but are now used mostly by non-anglers (lower right, Johnsrud FAS on the Blackfoot). Demand for maintenance at access sites, as well as resolving conflicts among user groups at sites and on the river, is increasing. Photo credits: Missoulian (upper and lower right) and FWP (left).

FWP's history of resource management and public access is one of success. We're fortunate to have the natural resources that provide us with world class trout angling, the means to protect and enhance habitat and fish populations that support angling, and access laws and facilities that provide for use by people. Turns out that its lots of people. More and more people. There are people that use the waters differently, with different expectations and for different reasons. Our amazing waters and surrounding landscapes provide a setting that greatly enhances the excellent angling opportunity. An outstanding resource and lots of people has resulted in concerns about overuse. This leads us to the latest evolution in fisheries management: allocation of use. Allocation of use isn't entirely new to fisheries management. We've already been addressing this when we designate waters or times for floating, motor use and wading, for example. In the early 2000's there was concern about conflicts among angling groups in very popular trout waters near Bozeman that resulted in the "Beaverhead-Big Hole" regulations. These regulations were directed at resolving user conflicts between angling groups. Fifteen or so years later, FWP implemented similar regulations in the upper Bitterroot and West Fork Bitterroot.

Our past allocations were among anglers, a user group we are very familiar with personally and professionally. Nowadays our Fishing Access Sites are used by more than anglers and include beach goers, picnickers, river users such as tubers, and dog walkers, to name a few. Not surprisingly these diverse user groups have

expanded into areas traditionally used mostly by anglers and affect angling opportunity and experience. We aren't just managing anglers any more. With diverse use of our lands and waters and an authority to resolve conflicts, FWP is tip toeing into the realm of recreation management that goes beyond anglers and among groups we have not traditionally worked with and understand.

Balancing instream flow for fishery protection and maintaining agricultural operations in the Blackfoot and upper Clark Fork is the goal of FWP in its efforts to integrate the Milltown Water Right with current water management. Credits: FWP (left) and Mike Cannon, US Geological Survey (right).

Water based recreation is rapidly increasing, and its not just anglers. Traditional users are seeing changes to their opportunities and experience, and new users are increasing demands on facility and resource management and maintenance. FWP has the means to manage this change but doing so with funding that is derived primarily from angler use creates a challenge. Raising and stocking fish, harvest regulations, habitat and access are still important. However, angling opportunity and experience are becoming an important issue that is affected by a complex array of users, expectations and desired experiences. Fisheries management and its inherent goal of providing angling opportunity is evolving too.

Milltown Water Right

A decade after the removal of Milltown Dam there are still resource legacies that bear the name of the dam and nearby community. The property where the dam and reservoir resided is now Milltown State Park. Water rights also came with the property and belong to FWP and are referred to as the Milltown Water Right. The water right use was changed from hydropower to instream flow for fisheries and split into two separate rights: one for the Blackfoot and the other for the Clark Fork above the dam's former location.

The Milltown Water Right was subsequently offered for co-management with the Confederated Salish and Kootenai Tribe. This sharing is part of the "Compact" that resolves off-reservation water right claims by the Tribe in Montana. The Compact is not finalized until it is approved by the US Congress. However, the Milltown Water Right will remain with FWP regardless of US Congress action. Without the Milltown Water Right, the Tribe may seek water right claims through the court system that are far beyond what has been agreed to via the Compact.

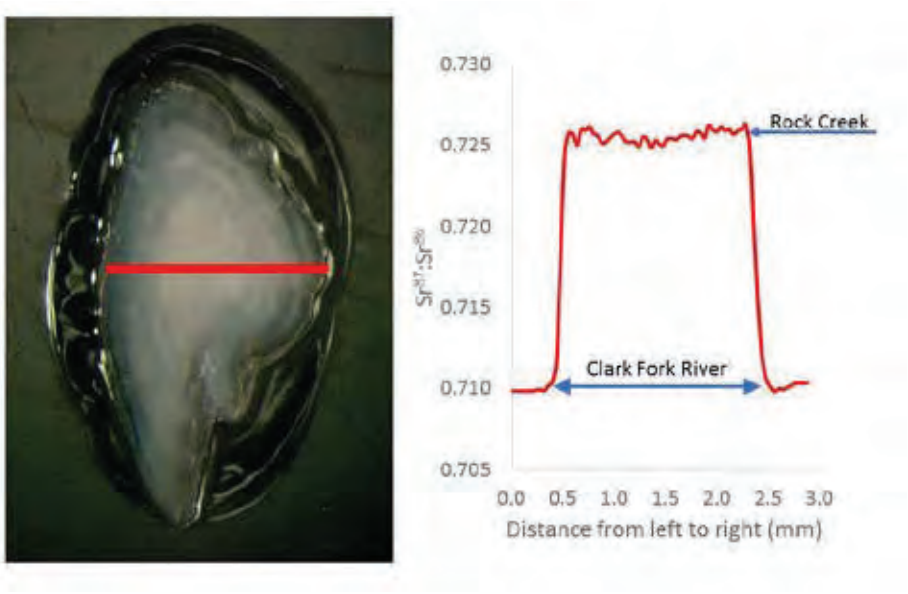
Enforcement of the water right is deferred until 2025, which is 10 years after it passed the Montana Legislature and a little over 6 years from now. This time was given so irrigators can adjust their operations to the change and so FWP can work with water users to integrate the water right with current water management. Integrating the Milltown Water Right with current water use is just beginning. FWP has partnered with the University of Montana and local watershed groups to communicate information about the water right and assess its effects on water availability. The goal of the integration is to maintain agricultural operations and meet instream flow amounts of the water right that protect fisheries.

Resource Violations are Serious Crimes and You Can Stop Them!! Call 1-800-847-6668 or contact your nearest FWP office as soon as possible. The toll-free number is available 24 hours a day, seven days a week.

Where Do Trout in the Upper Clark Fork River Come From?

Nathan Cook, Fisheries Biologist

The Upper Clark Fork River Basin (UCFRB) experienced extensive mining and mineral processing activities during the late 19th and early 20th centuries. Metal contamination from these activities have reduced habitat quality and altered the fishery in the UCFR. Fishery changes include reduced trout numbers and changes in species composition. Trout numbers in the Upper Clark Fork River are estimated to be one-fifth of comparable rivers in the area that have not been impacted by mining wastes. The State of Montana is conducting a massive effort to cleanup copper, zinc, lead, arsenic, and cadmium from the banks and floodplain and restore the Clark Fork River.



The photo above is a brown trout otolith. Annual growth rings are visible with rings near the center indicating earlier years and those near the edges indicating later years. The red line depicts the path of the laser and the graph shows the chemical measurements taken as the laser moves left to right. The shift in the strontium (Sr) isotope ratio shows that this fish moved from Rock Creek to the Clark Fork River at age 3.

Freshwater salmonids use a variety of different habitats to complete their life history requirements. Therefore, enhancing the UCFR fishery requires not only improving mainstem habitats, but also insuring that fish in the mainstem have access to quality habitats in tributaries. But in a system as large as the UCFRB, how do we decide where to spend limited restoration funds? In order to have the largest benefit to mainstem trout populations, restoration should target areas that have potential to be sources of large numbers of fish. Biologists call these areas "recruitment sources."

Biologists have traditionally identified spawning areas by outfitting fish with radio tags and tracking the fish as they make spawning migrations. However, radio telemetry studies alone cannot determine whether those fish successfully spawn, whether their eggs survive, or whether their offspring migrate to the mainstem. Using a novel technique called otolith microchemistry, biologists can track a fish's movements over the course of its entire lifetime. Otoliths are small bony structures similar to ear bones that are used for balance and sound. As a fish grows, otoliths also grow and accumulate layers of calcium and similar chemicals that directly correspond to the chemical signature of the water in which that fish lives. As the fish moves from one water body to another, the otolith permanently records these movements in changes to its chemical makeup. Trout otoliths are quite small, ranging from the size of a child's fingernail to the size of a pin head. So, sampling the chemical signature of different areas of the otolith requires the use of a precise laser.

To determine the sources of brown trout to the Clark Fork River, adult fish were collected from Rock Creek to Warm Springs. The chemical signatures of otoliths from these adults were compared to signatures from juvenile brown trout collected from 22 suspected spawning areas in tributaries and the mainstem. Of the adult otoliths that were analyzed, 29% assigned to spawning areas within the mainstem Clark Fork River. Most of these mainstem spawning areas were between Garrison and Warm Springs. Tributaries also proved to be important sources of fish, with 18% of fish coming from Gold Creek and 12% of fish coming from Rock Creek. Albeit at lower numbers, adult brown trout also assigned to spawning areas in Warm Springs Creek, Lost Creek, Racetrack Creek, Cottonwood Creek, the Little Blackfoot River, and Flint Creek.

This study showed that brown trout are able to successfully reproduce in the mainstem of the Upper Clark Fork River despite current metal contamination in the area. The results also highlighted the importance of tributaries as recruitment sources and identified streams such as Gold Creek and Rock Creek as excellent locations for future restoration projects.

Barbed vs. Barbless Hooks: A New Angle on Angling Gear

Patrick Saffel, Fisheries Program Manager
Chris Clancy, Fisheries Biologist

There is a lot of interest in having regulations that require the use of barbless hooks to protect fish and fish populations. So much so, that our public meetings can turn from one subject to passionate pleas for the regulation. Anyone who's removed a barbed and barbless hook from a fish, finger or fabric can tell you that a barbless hook is easier to retrieve. Muddying the waters is that the objective of the regulation is often not obvious. Is it to reduce mortality rates, scarring, or simply to regulate best handling practices?

A lot of research has been done on several species including saltwater and freshwater fish, including much research on trout. Trout studies found that using barbless hooks reduces handling time but also decreases the number of fish landed, and does not improve survival. Though not as well investigated, one study on injury suggested a higher injury rate to rainbow trout with barbed hooks than with barbless, but both barbed and barbless injury rates were high. The researchers suggested that angler experience with handling fish was more important in determining injury rates than if the hook was barbed or not.

Understanding the difference between scientific studies and individual experience is important. The science is based more on "average" results and does not imply that barbless hooks won't improve survival of an individual fish. For example, reduced handling time could be important if a trout was caught during critically warm temperatures and was played for a long time. In this case the additional time handling the fish may be what tips the scale towards mortality.

FWP's has been resistant response to implementing barbless hook regulations (and associated enforcement) that has little benefit. We do recommend that anglers consider using barbless hooks if they believe it could help fish survival, such as in the scenario above, but such situational conditions do not suggest a regulation that would require barbless hooks when it isn't warranted. In cases like these, FWP seeks to promote education rather than regulation.

Recycling Trout

Angling harvest has diminished over the years. Most trout anglers practice catch-and-release. This has been important to the resurgence of many of our cutthroat trout fisheries. As a result, some trout populations have individual fish that are caught multiple times in their lives or even in a single summer – that is, they are recycled.

How often a fish is re-caught depends on the species. Cutthroat trout are caught the most often, followed by rainbow trout and then brown trout. FWP uses data from our electrofishing sampling to determine this. We look at the percentage of fish sampled that have hook scars as an indicator of how much of the population has been captured by angling. It's not a perfect estimate but it should be a good assessment of the relative capture rate. Most interestingly, cutthroat are 4x more likely to be caught than rainbows and 8x more than browns. Looked at another way, one cutthroat is worth 4 rainbows and 8 browns to angler catch rate and explains why cutthroat are the species that has responded the most to catch-and-release regulations, and one reason why cutthroat trout so are important to our fisheries.

Hook scarring (a.k.a. injury) is common in cutthroat trout fisheries with high angling pressure. This is a typical injury in our river. Notice that the maxillary bone is detached.

A New Angle on Hook Scars

Besides showing relative catch rates, hook scar data indicates there are a lot of cutthroat with hook scars, and some are severe (see photo). Data from Bitterroot River shows that up to 60% of the cutthroat have been scarred by hooking, and that number is higher if we look for the less obvious scars. So, we began to ask: 1) do anglers notice hook scars and does it affect their fishing experience? 2) what kind of angling gear is being used where we see these high rates? 3) how does fish species and angling pressure relate to hook scar rates? 4) does hook scarring affect the well-being of the fish (i.e., do wounds heal what is the effect on fish health)? and since restricting hook type is often suggested as a regulation, we asked 5) how does hook type (i.e., size, treble and single, and barbed and barbless) and capture frequency affect scarring? This is a lot of questions, but here's some information we've gathered for each one. Do anglers notice hook scars and does it affect their fishing experience?

The picture above is from a wild fish but is the type of injury we most often created in our experimental angling. The photo below shows a cutthroat trout without injury. Photos on the left and upper right are from FWP and the photo on the lower right is from Clint Muhlfeld of the USGS.

Yes, anglers notice them, but at a lower rate than FWP biologists do when handling fish during sampling. Biologists saw hook scars about 4x as often as anglers. This is partly due to us looking for them as part of our data collection. However, we generally only record the obvious scars we see during the handling of the several hundred fish we capture during sampling. If we take the time to look closer at the trout, there is a good bit more scarring than what we find in our routine surveys. Ben Rich, a student at UM at the time, conducted a small angler survey and found that anglers considered the amount of hook scarring they noticed was acceptable and did not affect their fishing experience. This data is from the West Fork Bitterroot River.

What kind of angling gear is being used where we see high scarring rates? Again from the surveys on the West Fork Bitterroot River, we found that anglers were predominately fly fishing (over 90%) and using barbless hooks (over 70%). This suggests that high hook scarring rates can occur despite using gear that is commonly believed to cause less injury.

How does species of trout and angling pressure relate to hook scar rates? Higher hook scar rates were associated with cutthroat fisheries with high angling pressure. Not too surprising given that cutthroat are caught more frequently than other species and higher fishing pressure adds more hooking and therefore scarring. We looked at hook scar rates in fisheries across western Montana and it varied with species composition and angling pressure.

Does hook scarring affect the well being of the fish (i.e., do the wounds heal and is there an effect on fish health)?

The most common wounds (i.e., those to the maxillary membrane) tend to heal fast, often within a week or two. We manually tore membranes in the lab and followed the healing times. We also caught fish multiple times at a hatchery, where many of the fish healed from their wounds quickly. However, if there is damage to the maxillary bones (upper mouth bones) or mandible (lower jaw), the damage is most likely not going to heal. The injuries that we observe in the field are the ones where the membrane is totally torn, and the maxillary bone is detached or removed. The lower jaw bone can have lasting injuries if considerable tissue is removed or damaged, particularly in the corner of the jaw.

We looked at the condition of fish by comparing their weight and length, much like a body mass index (BMI) for humans. If they weighed more at a given length, then they are considered healthier. You don't normally see overweight fish, so more weight is almost always

good. We compared condition between scarred and non-scarred fish and found that condition was the same. We can also infer that mortality is the same since mortality would likely be preceded by poor condition. Scarring, as best we can tell at this time, is more an aesthetic issue than biological.

How does hook type (i.e., size, treble and single, and barbed and barbless) and capture frequency affect scarring? The answer is complicated and not well understood despite a lot of effort. The problem in our work was that, although we caught hundreds of fish with various hook types and methods, we were largely unsuccessful at recreating the injuries we commonly see in our river sampling. We would like to understand more about how the injuries are created since this could be key to learning how to reduce injuries. FWP staff and volunteers fished in hatcheries, rivers and streams; with flies and lures; and for cutthroat and rainbow trout of different sizes to understand how the common injuries we see in our rivers are created. We didn't get all the information we needed, but made some progress.

We got a good deal of information on how hook type affected the *potential* for scarring. The potential for scarring was a fallback analysis since we did not create the wounds we were trying to replicate. We ended up looking at the frequency that trout were hooked in the maxillary membrane, which is involved in most scars. The maxillary membrane is the soft, thin tissue behind the maxillary bone (a.k.a. "lips") and is what is often "ripped". After catching hundreds of trout, we found that you can reduce the potential for hook scarring by using smaller hooks (size 14 had fewer scars than 10 which had fewer than size 6), single rather than treble hooks and barbless rather than barbed hooks. Interestingly each of these factors affected hooking in the maxillary membrane about the same. That is, to have the greatest reduction in scarring you should use small, single, and barbless hooks. Conversely, if you don't do one aspect it compromises potential scarring equally. So, employing single barbless hook regulations ignores the effect of hook size.

We wanted to understand the role barbs play in scaring (i.e. injury) rates, wound size and healing time compared to other factors. We looked at handling with and without a net (we used forceps for all releases), hook type and barbs. Wound size, and therefore healing time, were greater for barbed hooks than for barbless, however the difference was small and was negligible with the fast healing rates mentioned earlier. Use of a net did not make a difference nor did treble vs. single hooks (surprising, but was likely affected by our methods). Hooking a fish multiple times could cause scarring if the injuries get worse with repeat hooking. To look at this we captured individual trout several times with barbed and barbless hooks. However, we did not capture many individuals multiple times so our information was more anecdotal. Nevertheless, we did find results similar to other parts of our work. For one, wounds healed quickly. Several of the fish we captured multiple times had injuries but healed during the short time of the study leaving no sign of a wound.

Conclusions…With Questions

We are still left with the question, what specific aspect(s) of angling cause the injuries and scarring that is prevalent in our river populations? We have some clues that suggest that barbed hooks cause more injury but the difference is small and that other factors such as hook size and multiple hooks are an issue too. Our inability to recreate very many of the common injuries that we regularly see in the field is also telling. Maybe the injuries are created by multiple captures that happen in a shorter time, maybe its single captures of smaller fish with relatively large hooks, maybe its hooking and handling scenarios that we did not test, or maybe it is all the above? Hooking, playing, landing and releasing a trout could all play into causing injury and scarring, and is further complicated by weather and water conditions, angler experience and angling methods. The amount of fishing is likely a factor too. It increases the number of times an individual fish is hooked as well as exposing a larger portion of a fish population to hooking. It's a surprisingly complex web of process and conditions that is best addressed by the individual angler in their situation.

The absence of a "smoking gun" in our studies indicates that requiring barbless hooks is not going to make an appreciable difference in the proportion of trout with injuries, or mortality rates and angler experience for that matter. Nevertheless, there may be instances where fishing with barbless hooks is preferred to allow rapid and easy hook removal and fish release. Be prepared to land fewer fish, but this may be O.K. too. Requiring the use of barbless hooks affects a broad range of angling scenarios where it may make little or no difference to the fish but would require a penalty if not followed. That's why FWP's approach to this issue is normally education rather than regulation.

Upper Clark Fork

Jason Lindstrom, Fisheries Biologist

Looking north from the new boat ramp on the recently enhanced Racetrack Pond.

Each spring, the fisheries crew in the Upper Clark Fork heads to the Clark Fork River to gather data on the health of the fishery. In 2018, we boat electrofished four long-term sample sections located between Warm Springs and Gold Creek. Throughout this area of the river, brown trout dominate the trout fishery making up approximately 98% of the trout community. Rainbow and west-slope cutthroat trout are also present, but neither species is overly abundant. Mountain whitefish are common throughout the Upper Clark Fork although we currently do not do population estimates for this species. In 2018, brown trout numbers in our sections near Phosphate and downstream of Deer Lodge were near the long-term average at around 300 fish per mile (estimates are generated for fish greater 7" in length). The estimate for our section above Deer Lodge was a little under 200 fish per mile, which was slightly below the long-term average. It is likely that severe drought conditions in 2016 and 2017 are to blame for the reduced fish numbers in this reach. Low stream flows, high water temperatures, and poor water quality associated with past mining contamination all stress fish and lead to mortality. The stretch of river from Deer Lodge up to Racetrack is the most sensitive to drought conditions and summer irrigation withdrawal. At our most upstream sample section below the Warm Springs Ponds, brown trout numbers were also a little under 200 fish per mile. This estimate was far below the long-term average for this reach, which is around 700 fish per mile. Over the last decade, we have witnessed several ups and downs in brown trout densities in this section of river. The reason for the volatility is still not well understood despite several recent studies looking at juvenile fish survival below the ponds. We know that at times there are issues with water quality leaving the settling pond system, but to what extent this is impacting the fishery is still somewhat unknown and something we continue to investigate. Despite average to below average densities of fish in the upper Clark Fork River in 2018, the well above average water year made for good fishing conditions. Many anglers reported some very good days on the river. While current numbers may not be all that high, many of the fish available to be caught are of good size. The average length of fish captured in the upper river during our spring sampling in 2018 was about

While rainbow trout are not very common in the upper Clark Fork River, some are true trophies.

15 inches, and fish as large as 22 inches were relatively common. We're hoping the great water year of 2018 will lead to good spawning conditions and ultimately an increase in recruitment to the upper river trout population.

Cleanup efforts along the Clark Fork River were quiet in 2018. The Montana Department of Environmental Quality (DEQ) did not have any active cleanup projects going on this past year. For those not aware, the upper Clark Fork River is part of one of the Nation's largest Superfund sites. Historic mining and smelting in the Butte and Anaconda areas led to widespread environmental damage along the upper Clark Fork River, mostly in the form of mine tailings deposited on the banks and in the floodplain. These metal-laden tailings have been blamed for many historic fish kills and have been shown to negatively impact the river's trout numbers. Beginning in 2012, DEQ in coordination with the Montana Natural Resource Damage Program (NRD) began the remediation and restoration of the upper Clark Fork River near Warm Springs. The goal of the cleanup is to remove copper-laden soils from the stream banks and floodplain, which will ultimately lead to an improvement in water quality and the wild trout fishery. The overall project area stretches from Warm Springs to Garrison and includes 22 total phases. To date, four reaches have been completed including Phases 1 and 2 near Warm Springs and Phases 5 and 6 between Galen and Racetrack. All these completed sections are again open to public access. DEQ will begin cleanup of Phases 15 and 16 on the Grant-Kohrs National Historic Site near Deer Lodge in November of 2018. The project is projected to take two years to complete. During construction, a river closure will be in effect to protect public safety. This 2.6-mile section of river is a popular destination for many anglers and DEQ has committed to work with FWP to open the river during the construction period if or when conditions allow.

Anglers familiar with Racetrack Pond near the Racetrack exit off Interstate 90 may notice a few changes the next time they visit the site. The NRD program in coordination with FWP completed a pond enhancement project in 2018. The site will eventually become a new Fishing Access Site managed by FWP. The project consisted of connecting a gravel pit pond located to the north of the main pond, deepening the pond in a couple locations to provide better trout habitat, and lessening the slope of the banks along the pond perimeter to make access safer and to allow for better vegetation growth. Additional features of the project include a new parking area with latrine, a new boat ramp, and a handicap accessible fishing pier. At the time this was written, the parking area and fishing pier had not been completed yet but should be by early 2019. The pond has been restocked with westslope cutthroat trout and sterile rainbow trout and is again open for public access.

Overwhich Creek Fish Removal: A Rotenone Project with a Twist

Chris Clancy, Fisheries Biologist

In 2018, FWP completed the second year of a project to remove fish from a reach of Overwhich Creek, a tributary of the West Fork Bitterroot River upstream of Painted Rocks Reservoir. When we proposed removal of Yellowstone cutthroat x westslope cutthroat hybrids from Overwhich Creek above a 200 foot waterfall we expected some negative comments, but we also encountered skepticism from some local conservationists that we could usually count on to support our actions. They were supportive of removing the nonnative fish, but the fact that we were going to leave the reach fishless did not sit well with them.

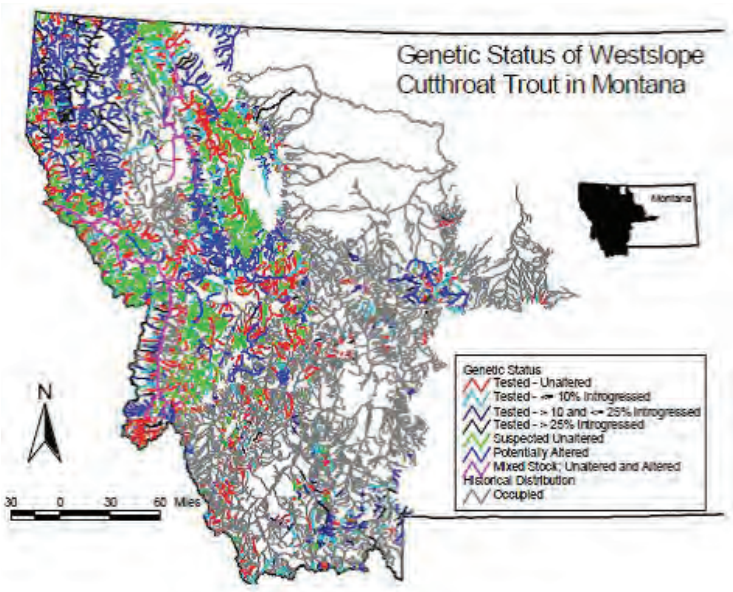
This is the first project that has been done as part of a native fish conservation strategy in the Mis-

Collecting westslope cutthroat and bull trout below Overwhich Falls to be transported downstream out of the "kill zone."

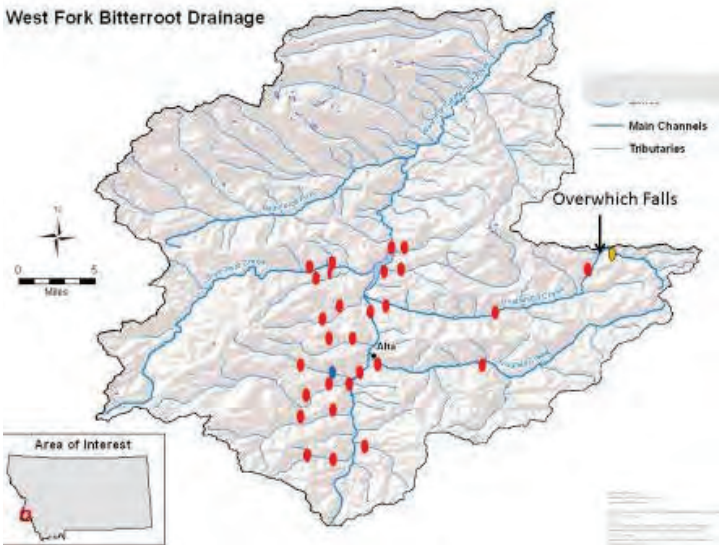
soula region. There are streams in this area, more is not as critical as East of the Divide, in slope cutthroat trout native range (Figure are removed, it is either rier or a barrier is built stocked above it.

West of the Divide, of streams supporting trout. In the West Fork Drainage, upstream of (the red tip of Mon- there are probably more that support genetically A close look at the most of the streams, contain pure westslope The yellow dot on the indicates that Yellow- about 12 miles of Over- above the falls, which is a remote corner of the examination and genetic those genes are dribbling strain fish below. So, we the fish above the falls. falls is pretty slight, so the upstream source is will decline over time.

We also decided not to the falls. That caused a However, after some dis- to understand and sup- did not stock fish above explain by answering we re-stock above the up with a good answer.



Above: Map from 2007 Cutthroat Trout MOU and Conservation Agreement. Below: Genetic status of Westslope Cutthroat Trout in the West Fork Bitterroot Drainage upstream of Painted Rocks Dam (Red dots are where genetic samples indicate genetically pure fish).



many miles of native fish so trying to pick up a few in other parts of Montana. the Missouri drainage, west- are found in 4-6% of their 1). So, when nonnative fish done upstream of a bar- and westslope cutthroat are

there are still many miles native westslope cutthroat of the Bitterroot River Painted Rocks Reservoir tana's "nose" in Figure 1), than 300 miles of streams pure populations.

genetic data indicates that but not all, above the dam cutthroat trout (Figure 2). map at Overwhich Falls stone cutthroat trout inhabit which Creek and tributaries a beautiful 200 foot site in drainage (Figure 3). Visual data indicate that some of over the falls into the pure decided to try and remove Introgression below the far, so we hope that once removed, the introgression

re-introduce any fish above bit of a stir with some folks. cussion, many of them came port the idea. The reason we Overwhich Falls is easy to the question "Why would falls?" We could not come How about re-stocking for anglers? Well, the area is pretty remote. There is trail access right along the creek, but it is not a heavily used reach of stream and the fishery is not terribly unique. So fishing pressure is pretty light. How about for westslope cutthroat trout range expansion? As discussed, the reason we are doing the project is to preserve the hundreds of miles of pure westslope cutthroat trout streams in the area. A few more miles is not all that necessary. Third, and maybe most important, It would most likely have been fishless historically. Even with the fish present, there are quite a few tailed frogs, long-toed salamanders and other amphibians. In this part of Montana, there are not many miles of low gradient stream without fish. So, we decided there should not be fish here for that reason, too. We feel like this is an ecological restoration project above the falls and a fish restoration project below the falls. In the warmer future, maybe this will be a place where fish have to be stocked to preserve their existence. If that is the case it would probably not be westslope cutthroat trout at the top of the list. It would probably be slimy sculpin or bull trout. Could westslope cutthroat trout be part of that mix? Sure, but maybe not. Let's let future scientists decide that. For now, fishless is the goal.

Does habitat quality in tributary streams really affect fish numbers and fishing?

Ladd Knotek, Fisheries Management Biologist
Caleb Uerling, Conservation Technician

Since the mid-1900's, there have likely been more than 100 fisheries publications and scientific articles confirming that stream fish (particularly trout) like pools and cover. This notion is intuitively obvious to most anglers and anyone that has been around streams and fish. The consistent theme is that streams with 'complexity' or varied habitat features provided by large wood, undercut banks, boulders, etc. typically hold more fish, more types of fish, and a more variable range of sizes than straight, uniform channels with consistent depth and shape (i.e., ditch-like channels). These concepts are particularly important in tributary stream networks that provide wild trout reproduction and contribute fish to main stem rivers such as the Clark Fork.

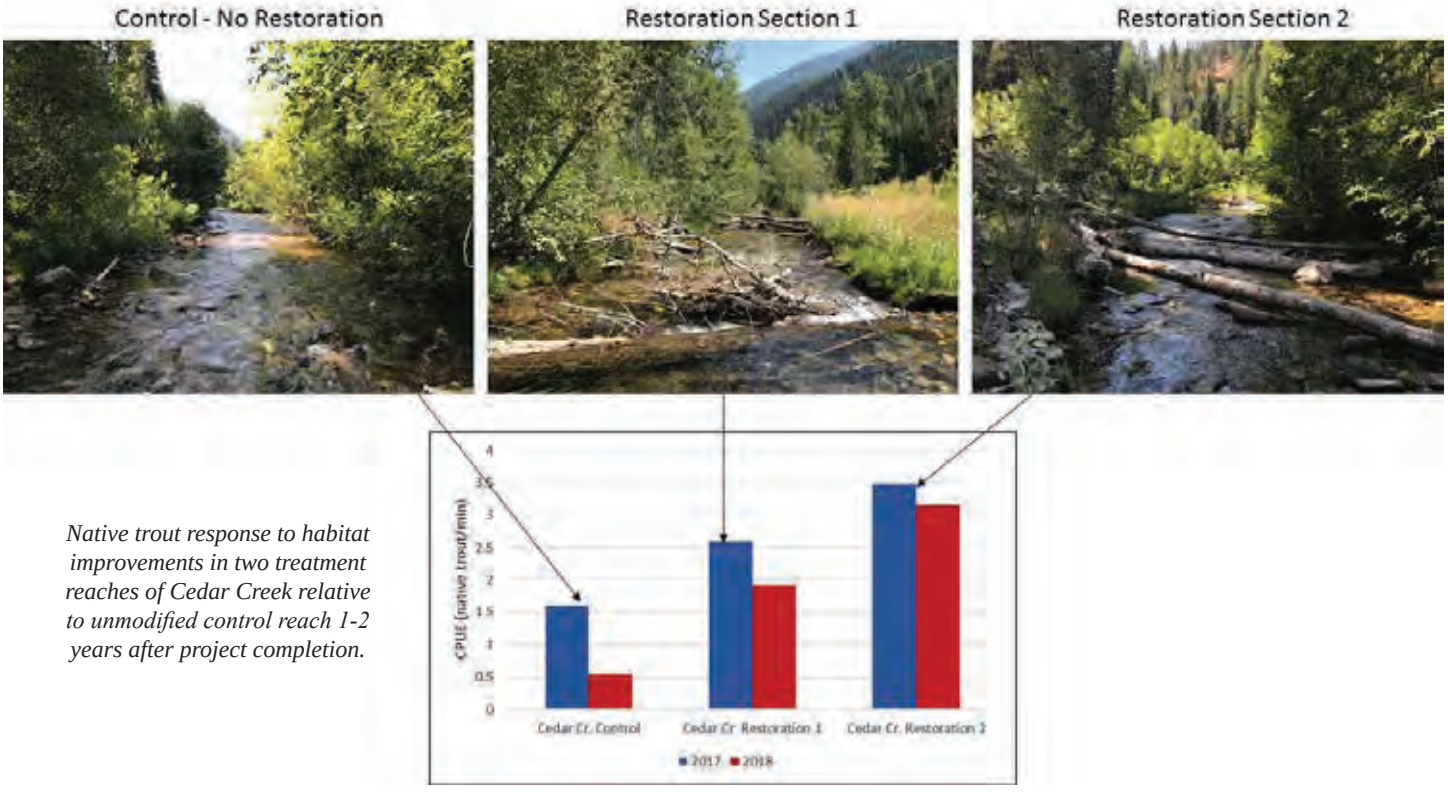
Simplifying and Clearing Streams: A Common Historic Practice and Ongoing Issue

These habitat concepts are relevant to many *restoration efforts* taking place on western Montana coldwater streams, as some formerly productive trout waters have been 'cleared and cleansed'. In other words, instream habitat features have been intentionally removed to make streams 'run better', make mining easier, or even to reduce the threat of erosion and flooding. Some of these harmful principles and practices continue today as private landowners and public infrastructure managers attempt to control and minimize the effects of natural stream changes/processes on lawns, roads, utility corridors, etc that have been built too close to active waterways.

Correcting Some of the Problems

As restoration programs have grown, stream improvement opportunities have been identified and prioritized in systems where road encroachment and channel modifications have had obvious impacts to fish. For instance, many streams in the middle Clark Fork Basin have high water quality, cold temperatures, and perennial flows, but (unlike neighboring unimpacted streams) do not support high numbers of fish or other aquatic species. Projects that enhance instream complexity and restore intact riparian buffers (stream-side corridors) are key parts of the restoration remedy in many of these cases.

One recent project on Cedar Creek led by Trout Unlimited and the Lolo National Forest provided a good case study. This native trout stream has extremely cold water temperatures, but suffered from large scale removal of wood from the channel and a road system that ran directly adjacent to the stream in key trout spawning



Native trout response to habitat improvements in two treatment reaches of Cedar Creek relative to unmodified control reach 1-2 years after project completion.

and rearing reaches. The project remedy included three main components: (1) the road was relocated away from the stream where possible, providing more space for floodplain and riparian vegetation, (2) areas along the stream corridor (formerly road bed) were re-contoured and planted heavily with riparian trees and shrubs and (3) large, whole trees generated by relocating the road were placed in the stream channel to directly provide trout habitat.

Bull trout redd (spawning nest) in gravel deposits upstream of large wood jam.

Monitoring Changes in Fish Abundance and Habitat Quality After Restoration

Relocating the road that ran up Cedar Creek, rebuilding floodplains, and reestablishing riparian woody vegetation will undoubtedly provide *long term* benefits to this stream by providing more shade, enhanancing natural bank stability, and protecting and improving water quality. However, we were most interested in measuring immediate fishery benefits of adding large wood and riffle/pool features to the channel. Specifically, we wanted to know if adding natural channel complexity would increase the number of juvenile westslope cutthroat trout and bull trout that rear in project reaches.

The results were a very clear YES (see figure above). Stream reaches where habitat improvements were completed contained significantly more fish and 2-6 times as many juvenile trout relative to the directly adjacent 'control' reach where no work was completed. In addition, 'treatment' reaches with lots of wood held larger fish on average. In summary, *trout like pools and cover* and providing these habitat features significantly increased carrying capacity in a situation where these features had been intentionally removed.

Another benefit that is less obvious is the effect of large wood jams on the quality of spawning habitat. Because nearly all roughness and irregularity had been removed from Cedar Creek, there was nothing to trap gravels and smaller substrate that naturally move through the system during high water periods (envision a flume). Once complexity was re-introduced, gravel was retained in many areas, forming bars upstream of wood jams. These features are essential for trout spawning and we immediately documented bull trout spawning in the project reaches after completion.

Summary

Stream restoration projects can be an effective tool to enhance tributary health, stream fisheries and trout recruitment to major rivers if limiting factors are carefully identified and addressed. In this case, a series of habitat enhancement projects on Cedar Creek significantly increased trout densities in reaches where the stream channel had been simplified and infringed upon by a road system. Trout numbers and spawning habitat quality were improved by enhancing habitat complexity, while providing for long term recovery of natural floodplain and vegetative recovery in the riparian corridor. Because downstream river trout fisheries are dependent on natural reproduction and recruitment in tributaries like Cedar Creek, these types of projects will only enhance opportunity for anglers.

The project also helped to emphasize the importance of large wood and diverse habitat features in tributary stream systems and highlight some of the impacts of subdivision, poorly located infrastructure, and land management practices that simplify streams.

Nevada Creek: An overlooked trout fishery

Patrick Uthe, Fisheries Biologist
Craig Podner, Conservation Technician

This year was a milestone for the Blackfoot River, as it marked the 30th anniversary of the conservation and restoration program in watershed. Restoration projects have been completed at more than 180 locations on 64 streams. These projects address a suite of limiting factors and include a variety of habitat actions such as barrier removals, fish screen installations, instream flow leases, and complete reconstruction of stream channels. The restoration program is a collaborative process involving many partners such as FWP, Big Blackfoot Chapter of Trout Unlimited, Blackfoot Challenge, Nature Conservancy, Five Valleys Land Trust, MT Department of Natural Resources and Conservation, U. S. Forest Service, U. S. Fish and Wildlife Service, and U. S. Bureau of Land Management. The restoration efforts would not be possible without the generous cooperation of private landowners, who willingly allow habitat actions on their property and remain committed to the success of the program. Some of the major fish and habitat responses over the last 30 years include increases in westslope cutthroat trout abundance in the mainstem Blackfoot River, reestablishment of migratory trout in restored tributaries, and reductions in water temperatures following channel reconstruction in tributaries. To learn more about the tremendous amount of work accomplished in the basin, please check out FWP's 30-year synthesis report available at https://www.fishtalerestoration.com/reports.

As we look forward to the next 30 years of restoring habitat in the Blackfoot River basin, it is important to reflect on the progress already achieved and the work yet to come. This year's newsletter focuses on Nevada Creek, an often-overlooked angling location that has been a major focus of restoration efforts in recent years. Most anglers drive past Nevada Creek without wetting a line as they approach their primary destination of Nevada Reservoir, a perch and westslope cutthroat trout fishery that receives moderate angling pressure. Nevada Reservoir received approximately 800 angler days of fishing pressure in 2017 compared to about 300 angler days in Nevada Creek. Fishing pressure in this drainage is significantly lower than nearby popular fisheries in Brown's Lake (over 8,000 angler days in 2017) and the upper Blackfoot River (over 10,000 angler days in 2017). For folks looking for a solitary angling experience, Nevada Creek certainly deserves consideration.

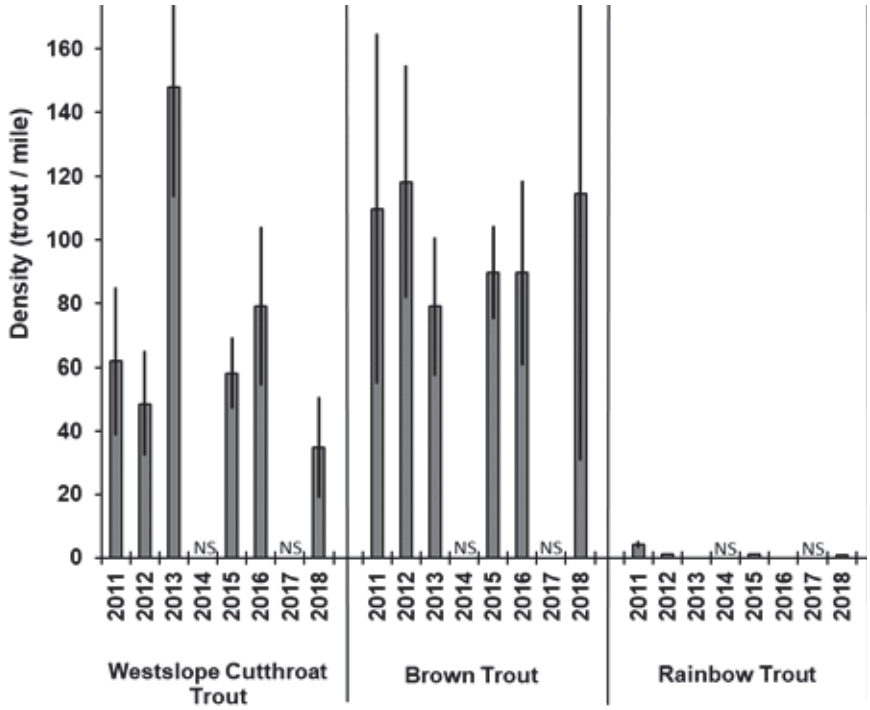


Figure 1. Density estimates of age-1 and older trout in lower Nevada Creek. Vertical lines represent 95% confidence intervals. NS = not surveyed.

Fisheries-related impairments in Nevada Creek include seasonal dewatering, high water temperatures, and fish entrainment, but the low fishing pressure is not necessarily indicative of poor fishing opportunities. FWP and partners continue to increase restoration efforts in the drainage and have had a measurable effect on Nevada Creek and select tributaries. When FWP established baseline sampling throughout the Blackfoot watershed in the late-1980's, surveys in the lower portion of Nevada Creek documented only one brown trout and one rainbow trout in 1989. The following year, only one brown trout was observed in an electrofishing section that encompassed the lower 4.5 miles of Nevada Creek. Intensive restoration and complete channel reconstruction in Nevada Spring Creek was initiated in 2001 and completed in 2010. This is a primary tributary to Nevada Creek that provides sub-

stantial coldwater discharge during late-summer when flows in Nevada Creek are low. The restoration actions resulted in a narrower, deeper channel that significantly reduced instream temperatures in the spring creek. Furthermore, the restored channel provides high quality spawning and rearing habitat for westslope cutthroat trout and brown trout. This improves trout recruitment to Nevada Creek, as well as the Blackfoot River. The consistent coldwater input from Nevada Spring Creek reduces maximum daily temperatures in Nevada Creek downstream of the confluence, making thermal conditions suitable for trout.

Following completion of the Nevada Spring Creek restoration project, FWP established a long-term, mark-recapture electrofishing section in 2011 that starts directly downstream of the confluence of Nevada Spring Creek and Nevada Creek. Westslope cutthroat trout and brown trout are the primary species encountered in this area, but rainbow trout are captured during some surveys. Interestingly, bull trout have been captured in recent years, which is indicative of improving conditions in Nevada Creek because bull trout are more sensitive to warm stream temperatures and poor water quality than other trout species. Fisheries staff surveyed this section in September 2018, and continued to document higher densities of trout, particularly brown trout and westslope cutthroat trout, compared to pre-restoration surveys (Figure 1). The average length of westslope cutthroat trout was 11 inches (range = 6 – 14 inches) and the average length of brown trout was 10 inches (range = 7-18 inches). The average post-restoration density of trout in this section of Nevada Creek is 72 westslope cutthroat trout per mile and 100 brown trout per mile. While these trout densities may seem low when compared to other trout waters in western Montana, this represents a significant improvement in trout abundance given that this section of Nevada Creek was almost devoid of trout before restoration.

Anglers may need to expend extra effort to access Nevada Creek because no fishing access sites are located along its banks and most of the valley bottom is private agricultural land. However, public land exists near the lower end of the stream. The Aunt Molly Wildlife Management Area (WMA) encompasses approximately 2.5 miles of mainstem Nevada Creek. This site provides walk-in access to 1,184 acres, enabling anglers to find a more solitary fishing experience than at other, more popular locations in the Blackfoot valley. Furthermore, the WMA property includes 4.5 miles of the Blackfoot River. The WMA is adjacent to U.S. Fish and Wildlife Service property that also allows walk-in access. The angling experience on lower Nevada Creek is enhanced by frequent sightings of deer, elk, grizzly bears, and numerous waterfowl species. A significant amount of work is still required to restore degraded areas and achieve Nevada Creek's full fishery potential, but previously completed projects have had a positive effect. As we embark on the next 30 years of collaborative restoration in the Blackfoot River basin, the fisheries responses in Nevada Creek provide an encouraging sign that actions are working and continued focus in this tributary drainage is a worthwhile endeavor.

Fish tag program

Biologists use information from tagged fish for a wide range of information. Tagged fish can help track seasonal movements of fish, habitat use, growth, angler harvest rates, among other things. Anglers are encouraged to submit the catch information for any tagged fish that they catch. In some cases a fish may be tagged with a reward tag, which might cover the expenses for your fishing trip!

If you catch a tagged fish, please report the following information to any Fish, Wildlife & Parks office:

* The tag's number and color *
* The date the fish was caught *
* The species of the fish *
* The fish's length and weight *
* Location of the catch *
* If the fish was kept or released *
* The name and address of the angler *

Tag information can be submitted online at are available on the FWP website at http://fwp.mt.gov/fish/taggedFish.html and can be submitted online or by mail to:

Fish Tag Program
MT Fish, Wildlife & Parks
PO Box 200701
Helena, MT 59620-0701

Flint/Rock Creek Drainages

Brad Liermann, Fisheries Biologist

Male brook trout caught by an angler at Georgetown Lake. Outstanding fishing at Georgetown Lake is a precarious venture. The high productivity and excellent growth of fish comes with the need for delicate management of water levels, stocking rates and harvest.

Georgetown Lake has been the center of attention in this portion of west-central Montana in 2018. A fish kill was reported at Georgetown Lake immediately after ice off and unfortunately confirmed by biologists a couple days later. At least 500-1000 fish were observed dead (and many more were likely not observed) and were comprised of mainly 15-20 inch rainbow trout. Testing was completed on a small sample of live fish and no infectious diseases were found. Low dissolved oxygen was observed in March and was the likely cause of the fish kill. Low dissolved oxygen is not uncommon in shallow productive lakes and is caused by the decomposition of weeds, phytoplankton and other detritus in the lake. Dissolved oxygen is taken up by small microbes during decomposition and can reduce dissolved oxygen levels even in a water body as large as Georgetown Lake. While abundant nutrients make Georgetown Lake an excellent trout and salmon fishery, it also can lead to low dissolved oxygen conditions and winter kill.

Gill netting surveys were completed in 2018 to assess the abundance of trout and salmon in Georgetown Lake following the fish kill. During this survey, we found that rainbow trout gill net catch rates were around the average for the previous 15 years. Kokanee salmon catch rates were higher than the previous three gill netting efforts and were approaching the highest catch rates observed in previous years. Brook trout catch rates also improved from 2017 and were also close to the 15 year average at Georgetown Lake. It appears that despite significant mortality due to the fish kill, trout and salmon numbers did not drop significantly in the lake- these results were surprising but welcome. The increase in brook trout numbers also suggests that the recent regulation changes to a limit of one fish over 16 inches may be improving brook trout abundance and size.

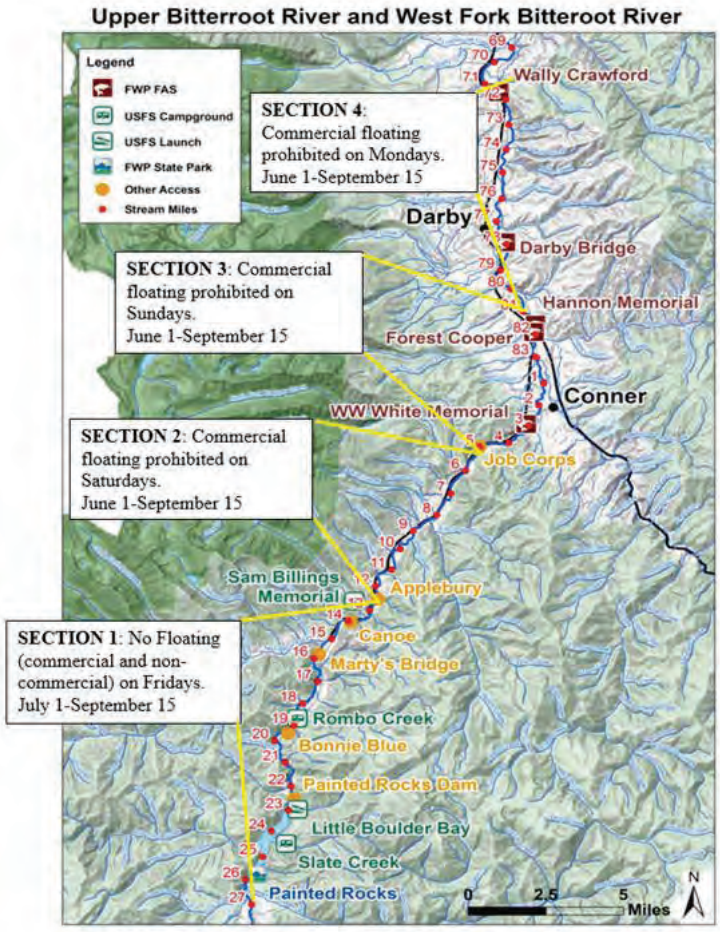
The extremely low dissolved oxygen conditions observed in 2018 was likely due to the winter weather conditions. Ice covering a lake/reservoir prevents the natural exchange of oxygen from the atmosphere into a lake and ice cover that extends longer than normal can cause significantly reduced dissolved oxygen levels. Snow depth also affects dissolved oxygen levels by reducing the amount of photosynthesis that occurs in a lake as photosynthesis produces oxygen. Snow pack was much higher than normal in 2018 at Georgetown Lake which along with extended ice cover, likely caused the low dissolved oxygen conditions. Low reservoir pool elevations can also lead to low dissolved oxygen conditions however, water levels were quite high in 2018 in comparison to previous years and thus likely wasn't the culprit.

Snow pack was above average in the Georgetown Lake region during the winter of 2017/2018. Good snow pack and good water management this year should provide good habitat for the fishery this winter with lake levels currently being above average. MFWP will monitor dissolved oxygen throughout the winter to ensure that dissolved oxygen stays within a normal range. MFWP will also continue to work with Granite County to keep adequate water levels in Georgetown in attempt to avoid any future fish kills. There are many demands for Georgetown Lake's water including hydropower, irrigation, recreation and of course the fishery, and all are affected by water management. We work closely with the other users to meet the multiple uses of Georgetown Lake's water and protect its incredible fishery.

Upper Bitterroot/West Fork River Recreation Update

Christine Oschell, Recreation Manager

There have been reports of crowding and displacement of anglers on the Upper Bitterroot River, particularly the West Fork, for many years. In 2012 managers instituted a data collection effort focusing on the social factors of angling on the Upper Bitterroot. Four seasons of data indicating high commercial use and displacement of local anglers, in conjunction with, information gained in meetings with partners resulted in Region 2 convening a Citizen's Advisory Committee (CAC) to address social issues on the river. This CAC was to advise the department on a system that would alleviate crowding and displacement on these sections of the West Fork of the Bitterroot.



Upper Bitterroot and West Fork Bitterroot River Management Area.

Thirty applications were submitted for the Bitterroot River Recreation Citizen's Advisory Committee (BRRAC). Sixteen of the applicants were chosen. They represented various interests including area landowners, outfitters, Ravalli and Missoula County anglers and other stakeholder groups who are involved and affected by river recreation on the West Fork. They were charged with working together to advise the department on management alternatives to reduce crowding and conflict. FWP used the Statewide River Recreation Rules (statewide rules) to guide development of an Environmental Assessment with a preferred alternative. The preferred alternative went out for public comment and was passed by the F&W Commission in December of 2017.

The resulting administrative rules (12.11.6301, 12.11.6302, 12.11.6306) set up a system to regulate river use with four components. The first component is a permit system required to operate commercially on this section of river that is now capped at 53 outfitters. These outfitters are required to report their use to FWP annually. The second portion of the rule designates four stretches of river within the area from Painted Rocks to Hannon Memorial FAS (Figure 1). The rule prohibits commercially outfitted float trips on one day per week per each designated section of river during the time period of June 1 through Sept 15 (Friday through Monday). To allow for more wade angling opportunities, the rule also prohibits floating of any kind on Fridays from July 1 through September 15 from Painted Rocks Dam to Applebury Forest Service Site. The last component of this new system restricts each commercial fishing and floating operator to two floats per day per designated section of river during the time period of June 1 through Sept 15.

A monitoring program was instituted in June 2018 by Region 2 staff to track trends and follow any effects of the new river management system. This program keeps track of use numbers and type of use (commercial/non-commercial; wade/float) to ensure the new regulations are effective and not creating issues elsewhere. Data will be collected annually to evaluate, guide, and/or modify management. FWP is also collaborating with the Bitterroot National Forest to ensure that monitoring and future research is accomplished. A group of stakeholders will be reviewing the system in January of 2019 and there is a mandatory F&W Commission review in 2024. Data from the first year of the monitoring program will be available in early 2019.

REGION 3
SOUTHWEST MONTANA

Big Hole Basin

Jim Olsen, Fisheries Biologist

In my (Jim Olsen) area, which is the Big Hole River basin, we have had a lot of controversy over the past year surrounding native fish restoration. Some of the controversy surrounds the means of doing native fish restoration which in the case for westslope cutthroat trout generally requires the removal of other nonnative trout and the construction of a fish barrier to keep these species from moving back upstream. People generally do not like the idea of removing trout that have existed in these streams for 100 years or more to replace them with another trout. Additional controversy has surrounded the use of piscicides such as rotenone to remove fish and the misinformation about this chemical. So do native species really matter? Who cares if they go extinct as long as we still have cold water, good habitat and fish to fish for in the in the streams and rivers. These are legitimate questions, so why should we care about native fish?

Westslope cutthroat trout have existed in Montana since the last ice age. During that time there have been warmer periods and cooler periods. This has resulted in a fish that spawns at a different time than any other trout in Montana. Browns and brookies spawn in the fall. Rainbow in the spring before runoff. Westslope cutthroat spawn after highwater usually in June. Why do they do this? We don't know exactly, but presumably this is an adaptation that allows them to persist through changes in the climate found in the Rocky Mountains through generations of time. Unfortunately, this spawning timing is part of what makes them vulnerable to being replaced by nonnative fish. The late spring spawning time is near to that of rainbow trout and the two species can hybridized and their offspring are fertile. The late spring spawning put cutthroat trout at a disadvantage to the fall-spawning brook and brown trout as well. Browns and brookies spawn from September to November and their eggs stay in stream gravels all winter before emerging in April and May. Most cutthroat do not emerge from the gravels until late July or August by which time the fall spawning fish are large enough to outcompete and even eat the juvenile cutthroat. I have heard people say that westslope cutthroat trout are inferior to other nonnative fish trout because when they are together the nonnative fish win. I like to think of it as putting you or I in the boxing ring with Muhammad Ali. The result would be that we would lose. Could we have survived in the ring on our own or against opponents that we were familiar with? Certainly. The same is true for cutthroat. Our experience has shown over the past 10 years performing cutthroat restoration projects that once we remove the nonnative fish from these small streams and lakes, that the native fish thrive. In fact, they often produce a better fishery that what was there before. Take McVey Creek for example. It is a very small stream (less than 3 ft across). Only 160 westslope cutthroat trout remained in 11 miles of the stream. These remaining fish were salvaged, and the nonnative brook trout were removed. The native fish were released back into the stream and then monitored over the following 7 years. Within 2 years the cutthroat trout had expanded into areas farther downstream than cutthroat were documented in the past. Within 4 years cutthroat trout density had equaled the density of brook trout in an area where there were no cutthroat trout previously. McVey Creek was surveyed again this summer and fish up to 12 inches were

McVey Creek where cutthroat to the right was captured.

found in a stream you can easily step across without getting your feet wet. This all started with only 160 fish; now they fill all 11 miles of the stream.

So, cutthroat do well when nonnative fish are removed. Why should we care? Why should we go through the trouble of trying to make sure they don't disappear? We have a fishery now that we like, why would you want to change it? I like to use the lens of time to evaluate this question. More than 100 years ago there were nearly no big game species left in Montana. They have been severely over-harvested, and their habitat had been degraded. A few conservation minded folks led by sportsmen formed this agency (then the Montana Fish and Game). One of the aims of the agency was to restore these big game species. Regulations were enacted, wardens were hired followed by biologist, and native species like elk and bighorn sheep were reintroduced and carefully managed. Today we have robust elk herds, abundant deer and antelope and opportunities for trophy bighorn sheep. Can you imagine Montana without elk or mule deer? Native fish suffered the same decline 100 years ago due to the same reasons as big game, only the restoration of fish over the past century was done primarily through importing fish from the west coast (rainbow trout), east coast (brook trout) and Europe (brown trout) rather than with our native species. Now in the Missouri River drainage westslope cutthroat trout exist in only 4% of their historic range. Can you imagine if elk in Montana existed in only 4% of their historic range? This would be tragic and quite frankly unimaginable. For some reason though, the near extinction of one of our native game fish has not drawn the same attention.

Westslope cutthroat trout from McVey Creek.

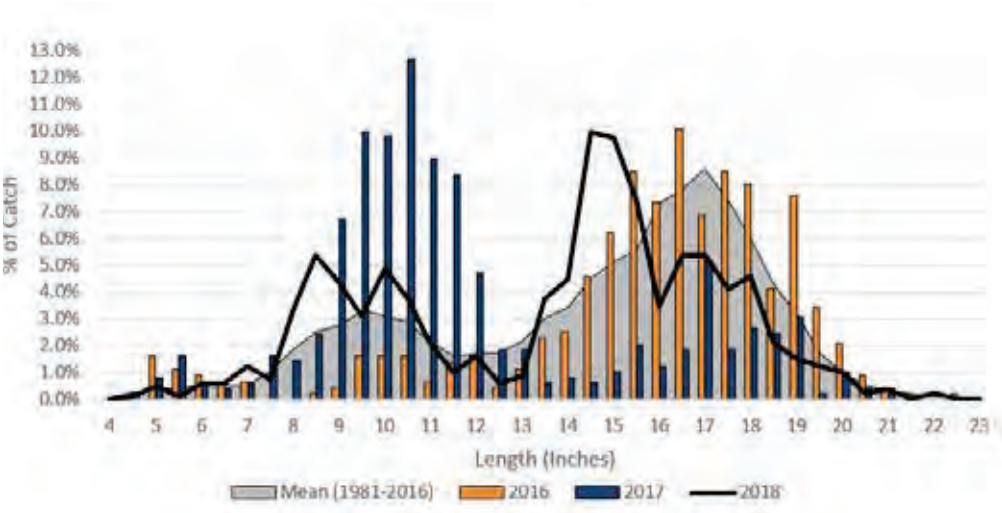
FWP is ultimately seeking balance in its fisheries management. We understand that nonnative trout species are the bread and butter of fisheries management in most coldwater rivers, lakes and reservoirs in Montana. This will continue to be the case into the future. People come from across the world to fish for brown trout on the Madison or rainbows in the Missouri and we are fortunate to have these fisheries in our back yard. However, FWP is also trying to carve out some room for native fish. Native fish restoration will not affect fish management in larger water bodies; native fish restoration happens in smaller tributaries and on smaller scales. The ultimate, long-term goal of native fish management in the upper Missouri River basin is to restore native fish to 20% of their historic range. This means that 80% of the waters will be managed for rainbows, browns and brookies as they are now. If native fish restoration is not done it is likely that the remaining populations of westslope cutthroat trout will decline and the species would become a candidate for listing under the Endangered Species Act. Listing would have far reaching implications for fishing, ranching, water use and other management on the Big Hole and other rivers where the fish formerly existed. FWP has an obligation under state law to ensure that species do no become warranted for listing under the Endangered Species Act.

So, do native fish matter? We think so. They are unique, hardy, beautiful and have existed on the landscape for centuries. If we can do something to make sure they do not disappear we think we should; we have an obligation to do so. Today we praise those who 100 years ago had the foresight to personally sacrifice, regulate themselves, conserve the landscape and reintroduce elk to southwest Montana from Yellowstone Park. Hopefully in 100 years from now Montana's will say, "I sure am glad that a few conservation minded folks didn't let our cutthroat trout go extinct, I can't imagine our state without them."

Mountain Whitefish Kill on the Yellowstone River

Scott Opitz, Fisheries Biologist

In 2016, mountain whitefish (MFW) experienced a large die of at the result of Proliferative Kidney Disease (PKD) caused by the Tetracapsuloides bryosalmonea parasite. While the fish predominantly affected were MWF, extremely low numbers of mortalities were noted in rainbow, brown, and Yellowstone cutthroat trout. Testing of fish did reveal the presence of the Tetracapsuloides bryosalmonea parasite in all three trout species. In 2017, a second MWF whitefish kill occurred in the Yellowstone River. The 2017 event occurred downstream of Livingston between the Hwy 89 North Bridge and the Grey Bear Fishing Access Site. Far fewer dead MWF, 146, were observed in 2017 compared to the thousands in 2016. In 2018, FWP did receive a few reports of two to three dead MWF in the Yellowstone River. The small numbers of fish reported made it hard to determine if the mortalities were the result of PKD or some other cause.



Percent of catch for brown trout in the Mill Creek Section by half-inch group. Right: Mountain whitefish CPUE in the Mallard's Rest Section from 1986 to 2017.

FWP conducted surveys on various sections of the Yellowstone River in 2017 and 2018 to assess impacts on both MWF and trout populations. Some of the more significant findings are reported below.

MWF mark-recapture population estimates in the Yellowstone River are difficult and often produce unreliable estimates. To look at population trends for MWF a Catch-Per-Unit-Effort (CPUE) was completed in the Mallard's Rest Section in 2017 and 2018. This was compared to the CPUE of previous sampling efforts in the section. The 2017 and 2018 CPUEs were much lower than previous years and the long-term mean of 897 fish/mile, indicating notable change in abundance of MWF. The 18-year time span between sampling makes it difficult to determine if MWF have been declining over time or more recently because of the 2016 PKD fish kill, other biotic or environmental factors, or a combination of factors. Continued monitoring will provide insight into the changes.

In 2017, there was an obvious change in the distribution of brown trout from the Mill Creek Bridge Section across length groups when compare to 2016. There was an increase in the 7.5 to 13.0-inch range of 59.6% from 2016 to 2017. Of concern was the 58.4% decrease of fish in the 13.5 to 21.5-inch range from 2016 to 2017.

The decrease in larger brown trout could have been the result of multiple factors including PKD, fall spawning, and/or ice jamming on the Yellowstone River in winter of 2016/2017.

The length-frequency distribution for brown trout in 2018 was much closer to the long-term mean for fish in the 9.0 to 12.0-inch range than 2017. There was an increase of 39.5% in brown trout that were in the 13.5 to 19.5-inch range from 2017 to 2018 indicating good recruitment and recovery from the large decline in 2017. If this trend continues we will likely see the recovery of this population in the next 2 to 3 years.

In the Mill Creek Bridge Sections similar changes in rainbow trout were noted as well. The changes in rainbow trout size classes were not as large as those seen in brown trout in this section.

Monitoring work is planned for 2019 in order to continue to track both MWF and trout populations in the Yellowstone River.

Pedestrian Bridge at Cobblestone Fishing Access Site

Jay Pape, Fishing Access Site Manager

In Region 3, the FAS Program will be building a new pedestrian bridge over the Darlington Ditch at the Cobblestone FAS. In a cooperative agreement between the Madison-Gallatin Chapter of Trout Unlimited (MGTU), Northwest Energy and FWP, the aging log stringer bridge will be replaced by two new bridge sections spanning 60 ft.

Design & Construction provided surveys and site plans while Dave Moser & Jay Pape were able to secure funding for the bridge materials after several site visits with MGTU President, Kris Kumlien. The contributions from Northwest Energy will be used for the minor excavation and crane work needed to swing the four 30 ft beams into place.

The new bridge will be a welcome access improvement to hunters, anglers and all who visit this very popular, 190-acre site on the Madison River. Construction will begin in the Spring of 2019.

Help Protect Native Species: *If you don't know, let it go!*

KEY TO IDENTIFICATION:

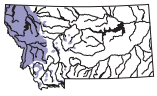
CUTTHROAT TROUT are frequently mistaken for rainbow trout (see pictures below):
1. Turn the fish over and look under the jaw. Does it have a red or orange stripe? If yes– the fish is a cutthroat trout. Carefully release all cutthroat trout that may not be legally harvested (see page 8).

BULL TROUT are frequently mistaken for brook trout, lake trout or brown trout (see pictures below):
1. Look for white edges on the front of the lower fins. If yes– it may be a bull trout.
2. Check the shape of the tail. Bull trout have only a slightly forked tail compared to the lake trout's deeply forked tail.
3. Is the dorsal (top) fin a clear olive color with no black spots or dark wavy lines? If yes–the fish is a bull trout. Carefully release bull trout (see page 8).

MONTANA LAW REQUIRES:
- All bull trout must be released immediately in Montana unless authorized. See Western District regulations.
- Cutthroat trout must be released immediately in many Montana waters. Check the district standard regulations and exceptions to know where you can harvest cutthroat trout.

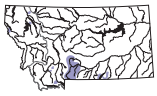
Native Fish

Westlope Cutthroat Trout — *Species of Special Concern*

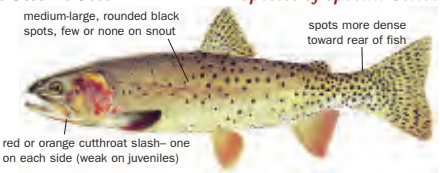


Average Size: 6"–12"

Yellowstone Cutthroat Trout — *Species of Special Concern*

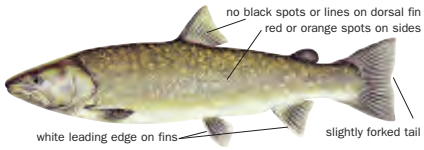


Average Size: 6"–12"

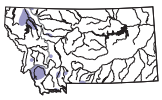


Bull Trout — *A Threatened Species listed under the Endangered Species Act*

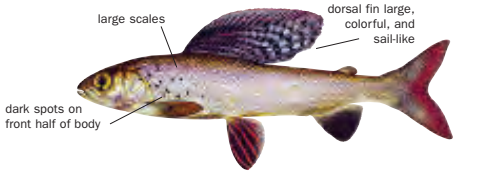
Average Size: 16"–22"



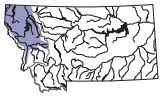
Arctic Grayling — *Species of Special Concern*



Average Size: 6"-12"

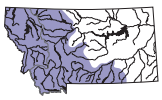


Northern Pikeminnow



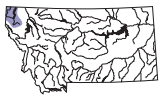
Average Size: 7"–14"

Mountain Whitefish

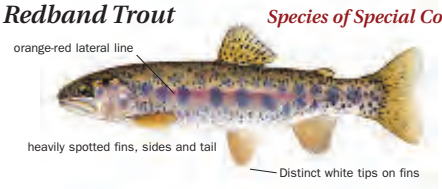


Average Size: 6"–12"

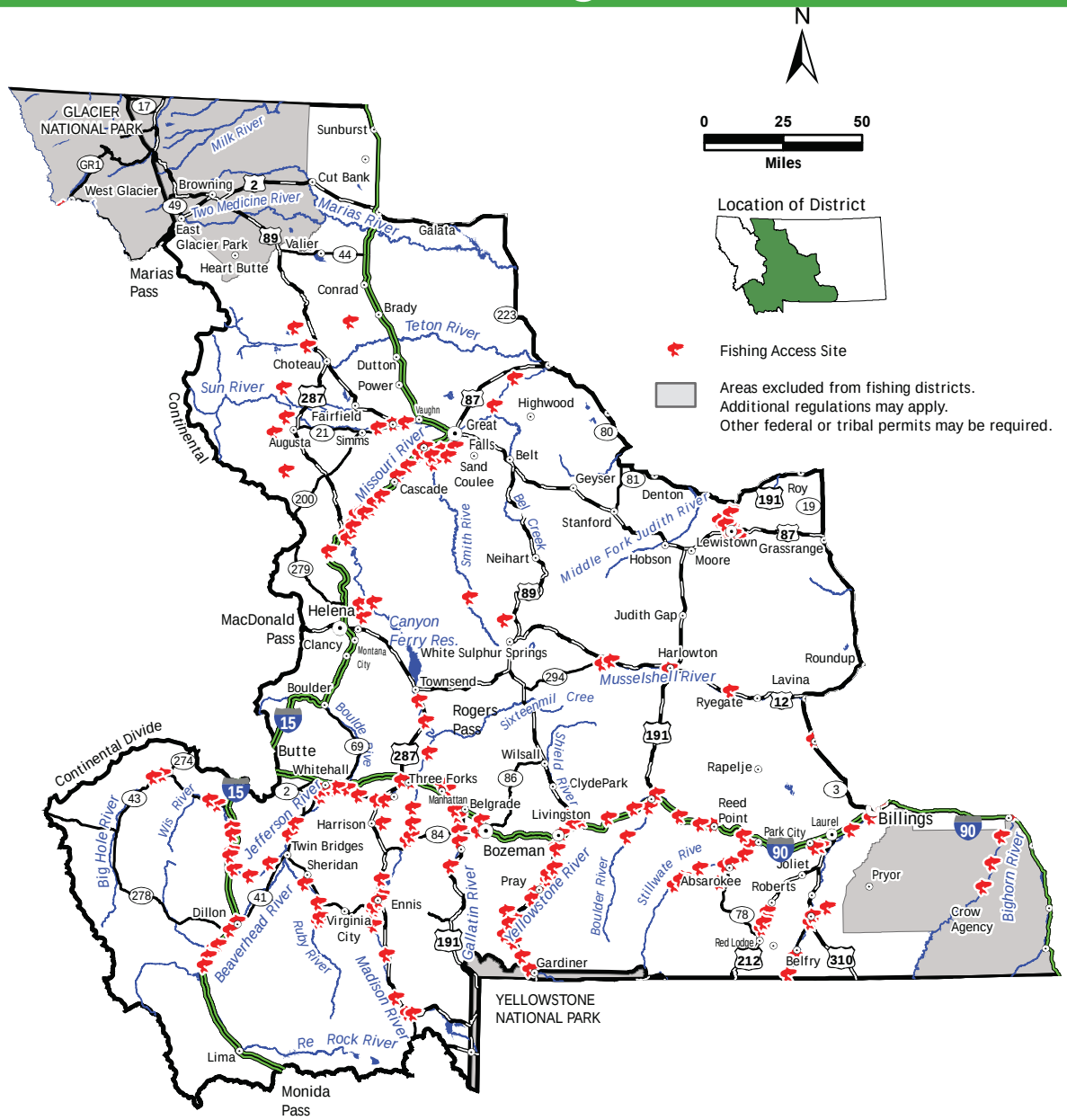
Columbia River Redband Trout — *Species of Special Concern*



Average Size: 6"–10"



Central Fishing District



The Central Fishing District includes all waters in Montana east of the Continental Divide, (including the Belly and St. Mary's River drainages) and west of the following described boundary: Interstate 15 from the Montana-Canada border south to its junction with Hwy 2 at Shelby, then east on Hwy 2 to Chester, then south on Hwy 223 to State Hwy 80 at Fort Benton, then southeasterly along State Hwy 80 to its junction with State Hwy 81, then easterly on State Hwy 81 to its junction with U.S. Hwy 191, then northeasterly along U.S. Hwy 191 to its junction with State Hwy 19, then south on State Hwy 19 to its junction with U.S. Hwy 87 at Grassrange, then south on U.S. Hwy 87 to its junction with U.S. Hwy 12 at Roundup, then west on U.S. Hwy 12 to its junction with State Hwy 3 at Lavina, then south on State Hwy 3 to its junction with Interstate 90 at Billings, then easterly and southerly on Interstate 90 to the first crossing of the Little Bighorn River, then southerly along the west bank of the Little Bighorn River to the Montana-Wyoming border.

Note: Roadways that are used as boundaries between the Central and Eastern Fishing Districts are interpreted to be in the Central Fishing District.

For additional information regarding the boundaries in this fishing district, please call the following regional headquarters Monday-Friday 8:00 a.m. - 5:00 p.m.:

Billings.....406-247-2940
Bozeman.....406-994-4042
Butte Area Office.....406-494-1953
Great Falls.....406-454-5840
Helena Area Office.....406-495-3260
Lewistown Area Office.....406-538-4658
TTY (Telephone device for the deaf).....406-444-1200

Region 4
North Central Montana

Great Falls Management Area

Jason Mullen, Fisheries Biologist

Missouri River

The Missouri River rainbow trout and brown trout populations were above average in 2018 in the Craig section. Rainbow trout numbers in the Craig section remained high for the eighth consecutive year, with 3,792 rainbow trout 10 inches long and greater per mile estimated in 2018. The estimate is less than recent years but remains above the long-term average of 3,405 per mile. While the reported estimate is for only fish 10 inches long and greater, the percent of rainbow trout estimated between 6 and 10 inches long was the greatest observed since 2010. Brown trout 10 inches long and greater in the Craig section were estimated at 892 per mile compared to the long-term average of 573. A well-balanced size distribution of brown trout was observed, with abundant small (6-8 inch), medium (12-16 inch), and larger (16-18 inch) sized fish.

In the Cascade section, rainbow and brown trout population estimates for 2018 were both below average. Rainbow trout 10 inches long and greater were estimated at 1,125 per mile compared to the long-term average of 1,602. Similar to the Craig section, the percent of rainbow trout between 6 and 10 inches long was the greatest observed since 2010 in the Cascade section. Brown trout 10 inches long and greater were estimated at 297 per mile compared to the long-term average of 395. The brown trout size distribution was dominated by larger sized fish, 16 inches and greater.

A burbot (ling) captured during sampling on the Smith River.

Smith River

Flow conditions in 2018 were favorable compared to recent years, with a maximum daily flow at the Eagle Creek gage of 2,350 cfs on May 11th, which is the highest observed flow since 2011. No time of day angling restrictions were implemented in 2018 due to the relatively higher flows and moderate water temperatures observed during the summer. Two fish sampling sites were sampled in 2018. At the Eagle Creek site, which is approximately 2 miles downstream of Camp Baker, the total number of trout 8 inches long and greater was 641 compared to a long-term average of 751 and a long-term median of 669. The number of rainbow trout and brown trout 8 inches and long and greater were 384 and 257, respectively. Both of these numbers were less than the long-term average, but similar to the long-term median. The median represents the middle value of values observed, and accounts for the large influence of outliers (a couple years with very high estimates). An additional site was sampled on the Smith River in 2018 that was also sampled in 2015 and 2016 in the canyon near the Meagher and Cascade county line. The number of rainbow trout 8 inches long and greater estimated in the Smith River at the "County Line" site was 203 per mile and brown trout were estimated at 384 per mile. These estimates are in between the low estimates observed in 2015 and the high numbers observed in 2016 at this site. In each year, the number of brown trout has exceeded the number of rainbow trout at the

County Line site, which is the opposite of the current trend at the Eagle Creek site where rainbow trout are more abundant.

Kokanee spawning in the inlet of Newlan Creek Reservoir.

Belt Creek

Regional staff periodically monitor trout populations at four sites in Belt Creek as part of mine waste clean-up activities in the Dry Fork and Carpenter Creek drainages. Monitoring sites were sampled most recently in 2017, with the exception of the Sluice Boxes site that was last sampled in 2016. The most upstream site, upstream of Neihart had approximately 300 total trout per kilometer 6 inches and greater, most of which were westslope cutthroat trout. At a monitoring site downstream of Neihart, there were an estimated 270 total trout 6 inches and greater per kilometer, with a mix of westslope cutthroat trout, rainbow trout, and brook trout. In the Monarch section, the total estimate of trout 6 inches and greater was similar from 2015 through 2017 with approximately 180 trout per kilometer with rainbow trout most abundant. In the Sluice Boxes section there was an estimated 412 trout 6 inches and greater per kilometer in 2016, with rainbow trout most abundant followed by brown trout. Mountain whitefish are also relatively abundant with a similar density to rainbow trout in this reach in 2016. Monitoring efforts will continue to be conducted throughout the Belt Creek drainage to document changes in fish and benthic invertebrate communities with current and future mine clean-up activities.

Sun River

Monitoring was conducted at only one site on the Sun River in spring 2018, due to a short time frame with suitable flows for sampling. There were an estimated 110 combined trout 8 inches long and greater at the site near Simms, which were approximately half rainbow trout and half brown trout. This estimate was less than the highest estimate observed of 200 trout per mile in 2015, but greater than all previous estimates between 1997 and 2004. Monitoring of this fishery will continue in the future as flow conditions allow, with hope that improved flow management can improve the quality of the fishery. A fish salvage operation was completed in fall 2018 that returned 30 rainbow trout, 13 brown trout, and 43 mountain whitefish from an irrigation ditch back to the Sun River.

Lake Sutherlin (Smith River Reservoir)

Lake Sutherlin has typically provided quality angling for stocked rainbow trout, as well as the potential to catch large burbot (otherwise known as ling). Approximately 16,000 rainbow trout are stocked annually and since 2014 approximately 2,500 kokanee have been stocked annually to provide another opportunity for anglers. Sampling with trap nets in fall 2016, indicated a healthy population of burbot with numerous large individuals up to 35 inches and 13.5 lbs.

Newlan Creek Reservoir

Newlan Creek Reservoir has typically provided quality angling for stocked rainbow trout, as well as the potential to catch large (30+ inches, 10+ lbs) burbot. In addition, kokanee have been stocked since 2014 and gerrard rainbow trout have been stocked since 2015 to increase the diversity of angling opportunities. This stocking of gerrard rainbow trout is in addition to the continued

stocking of other rainbow trout strains. The stocking of kokanee has resulted in a significant run of approximately 16 to 18 inch kokanee into Newlan Creek in the fall, and a successful snagging season was implemented in 2018 providing a unique opportunity for anglers in the region. Sampling in spring and fall 2018 indicated numerous burbot of all sizes were present, including many large burbot that were collected during fall 2018 when 14 of the 84 burbot sampled were 30 inches or greater.

Pelican Point Pond

Northern pike first appeared in Pelican Point Pond #1 in 2012 during routine sampling for bass, perch, and crappie when two pike were caught in trap nets. In 2013, 62 pike measuring 11.9-15.6 inches long were sampled in traps. Based on the size of these pike, we suspect they originated from an illegal introduction that occurred in 2010 or 2011. In 2013 the Fish, Wildlife & Parks Commission approved a no-harvest limit regulation for northern pike in Pelican Point Pond #1 to encourage anglers to remove these fish to maintain the largemouth bass, yellow perch, and crappie fishery. The regulation change began in March 2014. Biologists began active removal efforts in October 2013 removing 28 pike during trapping. Removal efforts continued in 2014, 2015, and 2016 removing 179, 42, and 5 pike, respectively. Sampling was conducted in 2017 and 2018 and no pike were observed. Monitoring efforts will continue in 2019 to continue to evaluate the success of the pike removals.

In 2013 biologists completed the process to begin stocking largemouth bass in this pond to help maintain the bass fishery. Previously the bass fishery was sustained by natural reproduction, but competition for forage by northern pike and the predation of bass by pike necessitated the stocking of bass to maintain angling quality. Largemouth bass were also stocked in 2014, 2015, and 2018. In addition, adult black crappie were transferred from Largent Bend Pond #3 to Pelican Point Pond #1 in 2014 to supplement the population, which was also likely impacted by the northern pike illegal introduction. Wild fish transfers are conducted by the Department only in waters that have had rigorous fish health inspections, including disease testing.

Father and son enjoying ice fishing for burbot on Newlan Reservoir.

Largent Bend Ponds

An abundant population of adult crappie exists in pond #3 ranging from 8 to 13 inches long. To provide an additional fishing opportunity, in 2016 approximately 600 largemouth bass (2.5 inches) were stocked. In 2013, a small number of tiger muskie were stocked in pond #3. Tiger muskie, are a sterile hybrid of northern pike and muskie, and were stocked as a management tool to reduce the number of suckers in the pond. The stocking has also provided an additional opportunity for anglers to catch a large and aggressive predatory fish. Pond #2 was flooded by the high flows of the Sun River in 2018. Sampling was conducted following the flooding event and no largemouth bass were observed. While some individuals may have remained in the pond, and additional 500 individuals (~2 inches) were stocked in 2018. This pond has become a popular fishery for young anglers and families.

Helena Area Reservoirs

Troy Humphrey, Fisheries Technician

Hauser Reservoir

Hauser Reservoir near Helena continues to provide good fishing opportunity for the Helena area. Rainbow and walleye fishing were pretty consistent throughout 2017, with a few perch fishing opportunities as well.

Rainbow fishing wasn't quite as good as it was for the near record year of 2016. In 2016 the catch rate was 0.36 rainbow/hour whereas in 2017 that number decreased to 0.26 rainbow/hour, which is still a respectable catch rate. Even though numbers of rainbow caught decreased in the creel, the average size jumped up from 16.4 inches in 2016 to an outstanding 18.3 inches in 2017.

An angler with a large rainbow trout he harvested while fishing from shore on Holter Lake.

Walleye fishing showed marked improvements over past years with angler catch rates in 2017 being the highest that Hauser has seen in eight years. Even though the walleye population is dominated by smaller sized fish, the high catch rates translated to a smaller than average length and lower relative weights (an index of overall fish condition). Walleye population abundance has been above management targets for the past five years, leading to poor growth due to increased competition for limited forage resources.

Creel surveys didn't show much change in angler catch rates for yellow perch in 2017, but FWP population surveys showed perch continuing to slowly trend upward. Numbers of juvenile perch, which are key forage in the reservoir, were at the highest levels since 2004, while a good number of adult perch were captured as well. Perch abundance in Hauser is typically quite a bit lower than in Canyon Ferry and Holter, but the perch fishing opportunity may improve over the next couple of years.

With the forage base in Hauser already being taxed to near depletion, another top predator has shown up and is increasing in abundance. Creel and netting surveys show northern pike densities increasing over historic levels. An alarming number of pike were caught as young of the year in summer beach seining efforts, indicating that they are successfully spawning.

Most fishing pressure in Hauser is concentrated around Black Sandy, White Sandy, York Bridge, and up the Causeway Arm. Rainbow fishing can be good throughout the entire reservoir, but the best areas are typically where the Causeway Arm enters the main reservoir; near the Trout Creek confluence by York Bridge; or the steep cliffs just above Devil's Elbow. Walleye fishing is typically best on Lake Helena (which is connected to Hauser Lake) or the Causeway Arm in the spring, with another decent fall bite in the York Bridge – Devil's Elbow area. Shore fishing for walleye and rainbows at the Causeway Bridge in the spring can also be really productive.

Holter Reservoir

Yellow perch continued to be the big story at Holter in 2017. Perch abundance has seen a steady decline from record high levels in 2013, but the average size has increased during this period. Not surprisingly, the perch fishing has also been exceptional since 2013. Angler catch rates were a little lower in 2017, but people were catching larger sized perch. The bulk of the perch population is made up of seven-year-old fish that will age out of the system in the next year or two. The spawning potential of this population is still high with above average numbers of young of the year perch being counted in FWP beach seining efforts in 2017. Hopefully a strong year class or two of perch will recruit to the creel in the near future to help sustain this fantastic fishery. With fewer numbers of perch, anglers found themselves spending more time locating fish. Anglers fishing through the ice had to move around a little bit to find the schools of perch, but once they found a school they wouldn't have to move much the rest of the day.

Walleye fishing continues to take a back seat to perch. The number of anglers exclusively targeting walleye has decreased since the perch boom; however, those that do target walleye found fish in great condition with multiple age classes being represented. Average length of walleye in the creel reached an all-time high of 15.4 inches in 2017. FWP population surveys in the fall showed that walleye densities were lower than average, but average length was up over previous years. Walleye fishing usually picks up just after ice out around Gates of the Mountains. Post-spawn the walleye distribute throughout the reservoir, with crank baits or crawler harness around weed beds or mud lines (on windy days) producing fish. A number of walleye that are caught are from anglers fishing the schools of perch and catching walleye incidentally.

Ron Schofield, FWP Creel Clerk for Helena Area Reservoirs, interviews successful trout anglers on Hauser Reservoir.

Rainbow trout fishing was also good in Holter throughout 2017. Holter is known for its spring rainbow fishing by both shore and boat anglers. Schools of Eagle Lake strain rainbow trout cruise the shorelines around the boat ramps during their annual spawning ritual. Great rainbow fishing continues throughout the summer and carries over into the winter ice fishing season. Average rainbow size in FWP creel surveys was 17.5 inches, with a few fish weighing close to five pounds. Most of the fishing action for rainbows through the ice is around Log Gulch and Departure Point, with the fish typically cruising 4-6 feet below the ice. The shoreline bite really cranks up after ice-out, with rainbows hitting a variety of flies and lures. Once the water warms up in the summer deep trolling cowbells between 20 and 40 feet deep will keep you on the rainbows.

Helena Valley Regulating Reservoir

The Helena Regulating Reservoir is a popular kokanee salmon destination that attracts anglers from all over Montana. Winter catch rates in 2017 increased to 0.51 kokanee/hour, which was a welcome surprise after the near record low catch rate of 0.18 kokanee/hour in 2016. Robust winter catch rates have always been one of the attractions for anglers with the long term average being 0.45 kokanee/hour, much higher than average rainbow catch rates in surrounding area reservoirs. Unfortunately average size of kokanee caught has remained at 12.6 inches for three consecutive years. 2013 and 2014 found kokanee lengths at more desirable levels of 13.5 and 13.3 inches, respectively. Larger three year old kokanee are becoming increasingly harder to find. Summer fishing and the fall snagging season saw good angler success as well on kokanee. Yellow perch numbers have increased in recent years as well. Due to its popularity and high angler success rates, the Regulating Reservoir has become a destination winter ice fishery for Helena area school classes for the kids Hooked on Fishing Program.

Summer of 2017 netting surveys showed an increase in kokanee abundance after a three year decline. However, as with the creel the average length remains smaller than what was seen historically. Stocked salmon continue to mature prematurely, resulting in one less year of growth. Stocking in the Regulating Reservoir reached an all-time high in 2009 when 93,000 kokanee were planted. Salmon are highly density dependent populations, so if you stock too many fish you can get a large number of small fish. Stocking densities have been adjusted downward in an attempt to alleviate the overcrowding issue. In 2017 50,000 kokanee were stocked in an attempt to increase the average size of fish caught and hopefully get back to a population where the fish mature and spawn at age 3 rather than age 2.

Canyon Ferry Reservoir

Adam Strainer, Fisheries Biologist

Canyon Ferry Reservoir (CFR) continues to be one of the most popular angling destinations in the state of Montana, but temporary changes to traditional rainbow trout stocking rates, sustained high numbers of small walleye, not preferred by anglers, and historically low bag limits for yellow perch are driving fisheries management and angling trends across the reservoir.

While angler preferred sizes of rainbow trout continue to offer anglers excellent year-round opportunities for a successful day on the water, overall fish numbers trended to record low levels in 2017 and face drastic reductions in traditional stocking rates in 2018 and 2019. Rainbow trout surveys in 2018 saw fish numbers stabilize, but its likely abundance levels will remain low until traditional stocking rates resume. Catchable sized rainbow trout, or fish stocked at 8-inches in length, have been the backbone of the stocking strategy for CFR, as well as Hauser and Holter Reservoirs, since the early 2000's, but agency-wide financial constraints directed a state-wide 50% reduction in catchable sized rainbow trout in 2018 and 2019. Traditional stocking rates are likely to resume in 2020 and, in the meantime, hopefully anglers will continue to have success catching rainbow trout that traditionally average 19-inches and 2.5-pounds. Ice fishing between Pond 4 and the Silos Recreation Area, shoreline fishing in spring on the north end of the reservoir, and shoreline fishing in the fall in Confederate Bay all provide excellent angling opportunities. Boat anglers do well trolling crankbaits or spoons in the spring and fall, while cowbells (or similar flashers) seem to work better during the summer months when the fish are deeper. The CFR rainbow trout limit is: 5 daily and 10 in possession.

Chris Hurley, a FWP Fisheries Technician on Helena Area Reservoirs, measures a large walleye on Canyon Ferry Reservoir just before releasing the fish during an annual fall gillnetting survey.

Walleye anglers continue to have excellent angling opportunities in CFR during open-water months. The number of walleye in CFR remains high and presents anglers the opportunity to harvest high bag limits of fish (current walleye limit: 20 daily, only 1 over 20 inches; possession limit is twice the daily limit) while helping FWP both lower the walleye population numbers to sustainable levels and boost the number of larger, angler preferred, walleye. Boat anglers typically target walleye throughout the open-water months trolling worm harnesses (various colors, styles, and sizes), tipped with worms or leeches, and crankbaits. Vertical jigging, especially on bay points, throughout the reservoir is also a popular tactic for walleye anglers.

A walleye movement study was recently completed by FWP to help understand how walleye move, or migrate, between CFR and the Missouri River upstream to Toston Dam. The project revealed that walleye generally moved from CFR into lower reaches of the river in the spring, continued to upstream locations throughout the river for the duration of the summer, and moved back to the reservoir in the fall. The project concluded that increasing angler use of the river over the past decade is based on seasonally abundant (April to September) CFR walleye that move annually in and out of the river. More details about the project can be found in the Region 3 section of this newsletter under Missouri River – Toston Dam to Canyon Ferry. The project was funded by the Montana Chapter of the American Fisheries Society, Walleyes Unlimited of Montana, the Upper Missouri River Chapter of Walleyes Unlimited, the Gallatin/Madison Chapter of Walleyes Unlimited, and FWP.

Trophy sized yellow perch (>10-inches) continue to be the primary draw for perch anglers on CFR, especially during the winter months. FWP continues to take a conservative population management approach in recent years for yellow perch in CFR by limiting angler harvest to protect a portion of spawning sized fish that

would normally be harvested through more liberal regulations. Anglers continue to catch yellow perch while trolling for walleye during open-water months, but the most effective angling continues to be during ice-covered months. Ice anglers typically use Swedish pimples or Hali jigs, tipped with maggots or worms, in 30-60 feet of water out from the Silos, Duck Creek Bay, and Confederate Bay. The CFR yellow perch limit is: 10 daily and in possession.

With the yellow perch population still needing some help, FWP, in cooperation the City of Helena, Broadwater County Sanitation, and volunteers from two Helena area chapters of Walleyes Unlimited, placed habitat/spawning structures made from upcycled live Christmas trees into the south end of reservoir. The project, known as Pines for Perch, has taken place nearly every spring since the mid-1990's and may be largely responsible for stabilizing numbers of yellow perch in the reservoir in recent years. Pines for Perch would not be possible without area volunteers, so thanks to everyone for your help! If you are interested in volunteering to help with Pines for Perch, or if you're interested in volunteering on CFR in general, please contact the HARO fisheries staff at 495-3263 to spend a day on the water.

Middle Missouri River

Luke Holmquist - Fisheries Biologist

Pallid Sturgeon Recovery - Morony Dam to Fort Peck Reservoir

The Missouri River between Morony Dam and Fort Peck Reservoir provides habitat for the furthest upstream population of endangered pallid sturgeon in the Missouri River watershed, and like downstream populations, little to no natural recruitment has been observed in the last 50 plus years. Recovery efforts have included a very successful stocking program that began in the late 1990's. High survival rates of the stocked fish means that the threat of extinction has been greatly reduced for the near future. However, much work remains for recovering this amazing species. Spawning and natural recruitment has never been documented in the Middle Missouri River, and continued research is needed to understand why. Past research efforts have been hindered by the small sample size of wild produced pallid sturgeon that remain. Pallid Sturgeon are a long-lived fish that are very late to reach sexual maturity (15-20 years old), so it hasn't been until recently that that some of the hatchery produced fish are capable of reproducing. As more and more of these

FWP employees Lena Havron and Charli Just show off rainbow trout captured in an annual fall gillnetting survey on Canyon Ferry Reservoir.

fish reach maturity, FWP and our partners are provided with a better opportunity to learn about what conditions are conducive to spawning and restore natural recruitment. For example, on the Middle Missouri River in 2018 FWP and MSU personnel followed a greater number of reproductively-active fish than have ever been radio tracked before, including six females from the 1997 year-class. In the spring, as water levels rose, three of those females traveled from the Fred Robinson Bridge area upstream over 130 miles and into the semi-regulated Marias River. Use of the Marias River during spawning by reproductively-active pallid sturgeon had never been documented prior to 2018, and provides hope for recovery of the species because spawning in the Marias might allow for natural recruitment to occur. The Marias River has long been recognized as an important spawning tributary for the closely related shovelnose sturgeon when flows are above a minimum threshold. At this point it is unclear if the high flows in 2018 attracted pallid sturgeon to the Marias River or if other factors were at play. In 2018 FWP and MSU personnel recaptured known reproductive females after the putative spawning season to assess spawning success. In past years all females that have been assessed were found to have reabsorbed their eggs, a biological process called follicular atresia. Identifying potential causes for the high occurrence of atresia rates in the Middle Missouri River is the focus of an ongoing MSU graduate project. Of the six female pallid stur-

FWP fisheries techinician Nathan Beckman with a nice channel catfish caught during electrofishing surveys near Fred Robinson Bridge.

geon that were known to be reproductive in 2018, four have been confirmed to have reabsorbed their eggs. We are currently awaiting laboratory results for ovarian tissue samples taken from the other two females to determine if they successfully ovulated. If they did, it would be a major milestone in pallid sturgeon recovery. This collaborative work will continue in 2019. We currently have radio-tags implanted in eight wild pallid sturgeon, seventy-two hatchery-origin pallid sturgeon (sixty-six 1997 year-class, three 2005 year-class, one 2007 year-class, and two 2009 year-class), which are tracked by a combination of boat reconnaissance and 15 solar powered ground stations on the river banks from Fort Peck Reservoir upstream to Morony Dam near Great Falls. Continuing these efforts give us insight into the links between available habitat, environmental conditions, and the behavior of the fish, which in turn improves our understanding of what is necessary to recover this prehistoric species from the brink of extinction.

Pallid sturgeon are targeted during our annual fall standard trammel netting and spring set line efforts. These efforts allow for the calculation of growth rates, survival rates, and provides the opportunity to monitor sexual maturation. High discharges in the spring prohibited FWP personnel from deploying set lines during our normal spring setline effort. Set lines typically make up roughly 50% of the pallid sturgeon we capture annually. Surveys in 2018 only yielded 172 pallid sturgeon, our lowest total since 2008, although decreased catch were also observed during other high-water years even when setlines surveys were conducted such as in 2014.

Fisheries Survey -
Morony Dam to Fort Peck Reservoir

Every year FWP Region 4 staff conduct electrofishing surveys on the Fred Robinson, Judith Landing, Coal Banks, Fort Benton, and Morony sections of the Missouri River. Surveys have been conducted in these areas since the 1980's and 1990's. Boat electrofishing is the primary sampling method for assessing long term trends in sauger, walleye, channel catfish, northern pike, black crappie, and smallmouth bass catch rates. We continue to see high catch rates for smallmouth bass in all reaches upstream of Judith Landing, with some fish weighing over three pounds. This year northern pike catch rates were the highest on record and they were found throughout the river during fall sampling. Historically northern pike were uncommon in the Middle Missouri River, but in other recent high-water years (2011 and 2014) a similar uptick in northern pike catch rates have been observed. Most northern pike sampled were smaller fish (under 20 inches), but some larger northern pike (up to 40 inches in length and weighing 13 pounds) were sampled in the Judith Landing and Coal Banks Sections. Black crappie continued to be sampled in high numbers near Fred Robinson Bridge in 2018, with the second highest catch rates on record, just shy of 2017 record highs. The average size of black crappie has increased to nine inches, an increase of one and a half inches since 2017, and some fish longer than 12 inches were sampled. Throughout the entire reach channel catfish had an average size of 22 inches and just shy of 5 pounds. Catch rates for channel catfish were above average in all sections, with the exception of the Morony Section, which has been one of the best sections for sampling channel catfish in recent years. Sauger catch rates increased as sampling efforts moved downstream with our highest catch rates being recorded in the Judith Landing and Fred Robinson Sections. Sauger averaged 0.75 pounds but fish over 3 pounds were caught. Walleye catch rates were above long-term averages in the Coal Banks, Judith Landing, and Fred Robinson Sections, but were below the long-term average for the upstream sections (Morony and Fort Benton). Average size for walleye was 1 pound and fish nearing 9 pounds were sampled, with the Morony Section having the largest average weight among the five sections surveyed.

Lewistown Management Area

Clint Smith, Fisheries Biologist

A trophy 40" northern pike from Petrolia Reservoir that bottomed out our 22-pound scale.

Petrolia Reservoir

Spring trap netting and fall gill netting have identified a strong year-class of walleye in Petrolia Reservoir. The fish have been abundant in our sampling and are in the 14 to 16-inch range. While not trophies, the fish weigh a pound to pound-and-a-half and should provide good walleye opportunity this winter and beyond. The yellow perch population is currently dominated by age-1 fish, in the 5-inch range, and age-5+ fish, which are in the 12-inch range. Bluegill, via an illegal introduction, are also taking root in Petrolia and we continue to see the occasional 40-inch northern pike. In the spring of 2017, we netted a northern that was right at 40 inches and maxed out our 22-pound scale. The fishery at Petrolia can be fickle and we know we lose a lot of fish when the reservoir spills for extended periods of time, however, all indications are that there are some quality walleye and perch present and hopefully they can maintain a productive fishery in the coming years.

Lewistown Area Ponds

The dry conditions of summer 2017 followed by the long, cold winter created the perfect recipe for winterkill in many area ponds and reservoirs. We documented complete winterkills in Upper and Lower Carter Ponds, Whisker Reservoir, Dry Blood Reservoir, and South Fork Dry Blood Reservoir. Partial kills are believed to have occurred in Payola Reservoir and Holland Reservoir. All the winterkilled ponds have been restocked in 2018, except for Dry Blood, which we hope to stock with crappie in the spring of 2019. The trout ponds should recover quickly, however, the largemouth bass and crappie fisheries will take a few years to rebound, due to the slower growth rates of those species. With the exception of Whisker Reservoir, no management changes are anticipated in restoring the fisheries in the winterkilled waters. As for Whisker, the dam has been breached by a spillway head-cut which has reduced the reservoir's capacity to the point that it will no longer support a fishery. We have had some discussions with Montana DNRC and the BLM (which own the land the reservoir is located on) about repairing the dam structure, but cost may be a limiting factor. Unless dam repair occurs, FWP will no longer maintain a fishery at Whisker. For some good news, Holgate Reservoir, Wolf Creek Ranch Pond (Upper), Kingsbury Pond, Drag Creek Reservoir, and Bubs Reservoir all survived the 17/18 winter and provide some pretty good trout, bluegill, and largemouth bass opportunities.

Judith River – Warm Spring Creek Telemetry

FWP has been studying the movements of an adfluvial population of rainbow trout and a tributary life-history form of Sauger in the Judith River drainage. The study, initiated in 2016 with cooperation from private landowners and funding assistance by the Snowy Mountain Chapter of Trout Unlimited, has documented unique migratory and spawning behavior of a rainbow trout population. These fish spawn in Warm Spring Creek over the winter months and then migrate to Fort Peck, where they summer before making the return migration in the fall. We have also been studying the movements of Judith River/Warm Spring Creek sauger, with funding assistance from NorthWestern Energy. These

fish make a spawning migration to the Missouri River, near the Fred Robinson Bridge area, which is a known sauger spawning aggregation site. These sauger are apparently not reproductively isolated from the main-stem Missouri River population and document the importance of the Judith River drainage to maintaining diverse life histories of this sensitive native species.

Our telemetry work on the Judith River has led us to note four migratory pulses of game fish moving from the Missouri River, presumably related to spawning activity. We are seeing distinct runs of burbot, northern pike, channel catfish, and sauger throughout the spring. These spawning migrations have peaked our interest and in the spring of 2018 we expanded our telemetry effort to include burbot and channel catfish. Our hope is to better understand the movements of these fish and to document the importance of the Judith River to maintaining healthy populations of these species throughout the middle-Missouri.

Above: Dylan Buehler and his nephew Nels show off a nice brown trout. Below: Joe Hagengruber shows off an Ackley tiger muskie.

Big Spring Creek

The trout population in Big Spring Creek showed signs of rebounding in 2017 following a general downward trend since 2011. Because of this, we anticipated the 2018 population estimate in the long-term monitoring section at Carroll Trail to show continued improvement. This was not the case. The 2018 population estimate of trout larger than eight inches was the second lowest on record, going back to 1967 (Figure LMA.1). The estimate of 798 catchable trout per mile is roughly half of the long-term average. We hypothesize many interacting factors are at play, resulting in the general downward trend and the relatively low trout numbers in Big Spring. One factor is whirling disease, which was first documented in Big Spring Creek in 2003. In the years since, the rainbow trout numbers have crashed. Prior to 2003, the proportion of rainbow trout in our estimates averaged 73% (1275 per mile). In recent years, rainbow trout have accounted for 23% of the estimates (213 per mile). Another important factor is the recent high flow events of 2011, 2013, and 2018. High flows, while generally beneficial to habitat and ecosystem function, can drastically impact the aquatic habitat (mobilize substrate, alter stream channel features), food-web dynamics (flush periphyton & detritus, alter macroinvertebrate community), and the fishery (scour redds, flush juvenile & adult fish). Aquatic organisms have evolved with high flow regimes and have various adaptive strategies to manage such disturbances. That said, such disturbances, especially in quick succession, can temporarily reduce the productivity of the aquatic habitat. Another factor, believed to be related to the rainbow trout crash, is the transition to a brown trout dominated fishery. In the Carroll Trail section, brown trout first outnumbered rainbow trout in 2009 and have every year since 2011. While functionally similar, brown trout spawn in the fall and are more piscivorous than rainbow trout. These traits, among others, may mean that a brown trout dominated fishery in Big Spring Creek responds to disturbance differently and/or has a different carrying capacity than the historic, rainbow trout dominated fishery. Another notable change occurring in Big Spring Creek is the increasing abundance of mountain whitefish. Catch-per-unit-effort of mountain whitefish has gone from about 10 fish/hour in the 2000's to 28 fish/hour in the 2010's, with a clear upward trend over that period.

These factors are likely interrelated and resulting in the low trout estimates on Big Spring Creek.

A nice 20" brown trout from the newly restored section on Big Spring Creek, near Lewistown.

We continue to monitor the trout population in the newly restored Machler section of Big Spring Creek, immediately downstream of the Highway 191 bridge. The restoration project, which was completed in 2017, returned a natural meander pattern and floodplain to more than 3,000-feet of Big Spring Creek. The 2017 estimate was relatively low (501 per mile) compared to the pre-restoration average of 1348 per mile. Our 2018 estimate was a slight improvement at 616 per mile in the restored section. The last estimate prior to restoration occurred in 2016 and was 828 per mile. The slight increase observed in 2018, in combination with an increase in brown trout redd counts found in 2017, suggest Big Spring trout are beginning to take advantage of the new habitat. However, the project induced severe disturbance to the creek while also increasing the amount of habitat. These factors may create a lag time for the trout population to return and colonize the new habitat. Additionally, while some habitat complexity features are present in the restored section (root-wads, brushy toe structures), it will likely take a few years for natural habitat complexity to develop (undercut banks, overhanging vegetation, large woody debris complexes, etc.) before full benefits to the trout population are observed.

Aerial image showing the alignment of Big Spring Creek before (top) and after (bottom) the recent restoration project.

In 2018 Big Spring Creek monitoring, catchable rainbow trout were in very good condition and averaged 11 inches, with fish up to 18 inches sampled. Catchable brown trout were in good condition and averaged 12 inches, with fish up to 20 inches sampled.

Ackley Lake

Catch rates of suckers have declined drastically following the introduction of tiger muskie in 2015, falling from a 5-year average of 38 per net-night prior to the introduction to 8 per net-night in 2018. Anglers have likely also noticed a decline in catch rates of rainbow trout as well, going from a 5-year average of 24 fish per net-night before the introduction to 6 per net-night as of September 2018. Rainbow trout size is up, with fish averaging 16 inches in 2018. T he average length of tiger muskie is in the mid-30-inch range, but reports from anglers indicate some fish over 40 inches have been caught. FWP was aggressive with the stocking rate of tiger muskie and the fish appear to be surviving better than anticipated, resulting in some drastic changes to the fishery. It is anticipated that the tiger muskie will reach the desired population size of 250-500 individuals in the next few years. In the meantime, anglers will likely experience slower catch rates of trout while FWP will consider additional rainbow trout stocking and potentially altering tiger muskie regulations to ensure the management goal of a quality rainbow trout fishery with trophy tiger muskie opportunity is maintained.