

Montana: Maintaining Trout Heaven

Building Climate Resilience for Fish and Communities
through Land and Water Conservation Projects

Trout Heaven

Montana's wild, meandering rivers are home to some of the best fly-fishing in the country. The sport of fly-fishing is not about securing food, but about being on the river, a chance to see a wild trout or two, and spending time in this "Last Best Place," as Montanans call home, with snow-capped mountains covered in dense fir forests interspersed by cottonwoods that line each stream valley.

Montana is trout heaven with large and imposing Bull Trout, the native Westslope and Yellowstone Cutthroats with red slashes along their necks, Mountain Whitefish, and the very last of the lower 48's native stream-dwelling fluvial Arctic Grayling, sleek and silver with an iridescent-spotted dorsal fin that flows like a sail.

Tourism is a substantial part of Montana's economy, and many people who visit Montana come to fish. The angling industry alone generates more than \$350 million each year. Of all the types of outfitted recreation available, fishing represents more than 33% of the total outfitter revenue. The state's recreation and angling industries also generated almost \$700 million in economic output for the state in 2018.

A Warming West

Climate change is having a profound effect on the fish anglers seek, from the timing of insect hatches that trout prey upon to the long-term survival of the fish that give the sport of fly-fishing its meaning. Despite its reputation for long cold winters, Montana's average temperature in 2016 was 3.5 degrees F



Warm waters stress the fish making them susceptible to disease and more likely to die after being caught and released by even the most careful angler. In 2016 the iconic Yellowstone River felt the brunt of these changes when an outbreak of a fish kidney disease (PKD) killed thousands of fish and shut the river down during the peak of the summer tourist season costing Park County an estimated \$676,000 in revenue during the 3-week closure. The cause? A perfect storm of warmer water, lower flows, and stressed fish that succumbed to a disease that had been present at low levels for decades.

above its 20th century average. That's double the warming of the planetary average from the same year. Normally, heavy snows store water in winter and a healthy forest shades the snow, causing it to melt slowly in the spring and percolate into the sponge that is the forest floor. These headwaters areas release the water at a leisurely pace, which means that rivers flow fuller and more consistently into summer. When winter ends abruptly and skips straight into summer, the snow melts faster, customary late spring snows are replaced with rain, and the water is gone too soon, leaving the second half of summer parched. And when that cold water is gone, rivers flow low and warm up fast, a disaster for coldwater fish.



The fluvial Arctic Grayling was once found across Michigan and Montana. Now, the Big Hole is their last river habitat in the contiguous United States, with only about 200 breeding pairs. As a coldwater species, they remain abundant in Canada and Alaska, but in Montana they can only retreat so far to higher, cooler elevations if temperature is a pressure on them. Like many species across the planet, there will come a time when there's nowhere left to go.

It remains to be seen whether Montana's Arctic Grayling can persist given the rapid rate at which climate change is now occurring, along with the many other human-caused stressors they face. However, the Big Hole offers an example of how people can come together to improve the odds for the fishery. Community members have instituted a drought management plan that keeps more water in the river when fish need it most.

Cattle are kept off riverbanks to prevent erosion. Willows are planted to

stabilize banks, shade the water, and create cool hiding spots. Spawning habitat enhancement projects are underway and an acknowledgment of the cultural and economic value of the native and non-native fisheries to the community has increased landowner participation and support. This kind of concerted, community-driven effort can provide respite for Montana's native trout and create or restore areas where they can survive. Addressing climate is the challenge for the ages, but the good news is that the actions that are best for trout are also good for people.

Tail of the Trout

Trout are coldwater fish and generally cannot tolerate temperatures above 72–82°F, depending on the species. When the water temperature is cold, between 45 and 65°F or so, the trout feed and swim actively, but when temperatures are too high, many trout experience reduced growth, survival, and reproductive capacity. Heightened stress can leave them more vulnerable to disease and displacement by competitor species. As temperatures warm beyond the preferred range for a trout species, their habitat shrinks and becomes increasingly fragmented, reducing population sizes and connectivity. If the only water cool enough is in a few disconnected deep pools, trout are crowded into those pools and that makes migrating up or downstream stressful.

Less water in streams does not just affect fish. Droughts increase the demand for limited water for municipal and agricultural uses, and lower streamflows can hurt spawning and put younger fish at risk from predators. Habitat restoration in headwater areas can shade streams, filter pollutants, and reduce warming. Replacing outdated culverts can facilitate fish migration and preserve pool structure in streams. These actions have another benefit—they conserve water for humans to drink, too.



Water Chemistry Fact: *Cold water holds more oxygen than warm water. In warm water, trout struggle to get enough oxygen and low oxygen makes their eggs develop more slowly, which may die before hatching. Conversely, bacteria do better in warmer water, and may infect incubating eggs or the trout's gills.*

By the Numbers—Montana

- **3.5° F** warmer winter temperatures
- **\$350 million** recreational angling industry
- **6,280** jobs supported by fishing

LAND AND WATER CONSERVATION SOLUTIONS



Large-scale watershed restoration projects can aid in climate resilience and provide high quality spawning and rearing habitat for fish.



Healthy forests shade streams and provide steady clean water. Reforestation and soil conservation can store carbon, provide critical wildlife habitats, and improve downstream drinking water quality.



Maintaining and/or storm-proofing roads will protect habitat, water quality, and downstream communities.

Reclaiming unneeded roads will prevent erosion from damaging streams, many of which supply drinking water to rural and urban towns and cities.

Replacing culverts reduces flooding and restores fish passage, aiding the recovery of fish species important to restoration goals, tribal communities, and sportfishing enthusiasts.



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