Yellowstone Cutthroat Trout

(*Oncorhynchus clarkii bouvieri*)

Data: Range-wide status assessment of Yellowstone Cutthroat Trout (2001, 2007, 2016) Memorandum of Agreement for Conservation and Management of Yellowstone Cutthroat Trout (2002)

Partners: Idaho Department of Fish and Game, Montana Fish, Wildlife & Parks, Nevada Department of Wildlife, Utah Division of Wildlife, Wyoming Game and Fish Department, US Fish and Wildlife Service, US Forest Service, US Bureau of Land Management, US National Park Service, US Geological Survey, Crow Tribe of Indians, Trout Unlimited, Montana Trout Unlimited, Friends of the Teton River, Western Native Trout Initiative

Photo credit: Mark Smith.

Introduction

The Yellowstone Cutthroat Trout (*Oncorhynchus clarkii bouvieri*) is one among a diversity of trout native to the western United States. They occupy waters in Wyoming, Idaho, Montana, Utah, and Nevada. Like all cutthroat trout, Yellowstone Cutthroat Trout sport a red slash along their jawline. They tend to be golden brown with relatively large, dark spots concentrated towards the tail. The Fine-Spotted Cutthroat Trout is another form of Yellowstone Cutthroat Trout, and as the name suggests, a dense distribution of small spots covers its flanks. This stunning fish lives alongside Yellowstone Cutthroat Trout in the Snake River drainage. The potential for the Fine-Spotted Cutthroat Trout to be a separate subspecies has been the subject of speculation; however, genetic analyses do not support this idea. The fine-spotted form is considered a Yellowstone Cutthroat Trout in management; however, the status of this form is monitored separately.

Yellowstone Cutthroat Trout have disappeared from a substantial portion of their historical range and are less abundant in some waters they still occupy. State and federal agencies assign Yellowstone Cutthroat Trout special status as "species of concern" or "sensitive species". The state and federal agencies in states supporting Yellowstone Cutthroat Trout formed the Interstate Yellowstone Cutthroat Trout Steering Committee in 2000. Among the committee's responsibilities are to continually update a centralized database containing data on distribution, genetic status, and threats to Yellowstone Cutthroat Trout. The information reported here comes from this multi-state, multi-agency collaboration and reflects the most recent data (Endicott et al. 2016).

Historical and Current Distribution

Yellowstone Cutthroat Trout are native to the Yellowstone and Snake River watersheds, a distribution that crosses the Continental Divide (Figure 1) . Historically, or pre-European settlement, Yellowstone Cutthroat Trout were present in an estimated 17,800 miles of stream. This distribution included large parts of Wyoming, Montana, Idaho, with a few streams supporting Yellowstone Cutthroat Trout extending into small portions of Utah and Nevada. Yellowstone Lake, at 90,000 acres, was by far the largest lake available to Yellowstone Cutthroat Trout. Occupied lake habitat was otherwise limited, with 61 lakes providing a cumulative 35,700 acres of lake. Many high mountain lakes formed by glaciers were inaccessible, with waterfalls forming passage barriers.

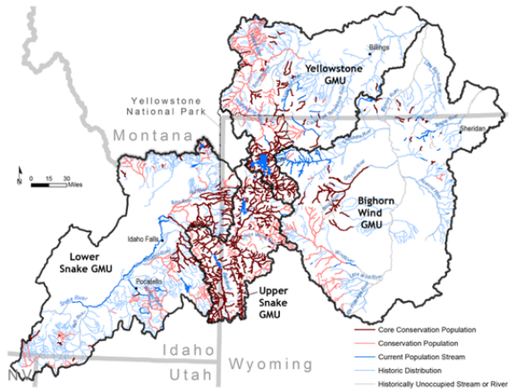

Figure 1. The distribution of Yellowstone Cutthroat Trout crosses the Continental Divide.

Compared to the historical distribution, the current distribution of Yellowstone Cutthroat Trout is a substantial reduction of occupied stream habitat (Figure 1), but the amount of occupied lake habitat has increased markedly. Stream habitat decreased from about 17,800 miles to 7,500 miles, meaning Yellowstone Cutthroat Trout occupy 43% of their historical stream habitat. Stocking mountain lakes for recreation has expanded the number of occupied lakes supporting Yellowstone Cutthroat Trout from 61 to more than 230.

The pattern of reduction of occupied stream habitat is a general contraction towards the center of its historical range (Figure 1). Much of this habitat is at high elevation and is in areas likely to remain resilient to climate change. Small, isolated populations remain on the fringe of the historical distribution. These isolated populations are at elevated risk of disappearing. Isolation from neighbors can lead to inbreeding with disruption of gene flow, and prevent recolonization of habitat where extreme flooding or wildfire kills the occupant fish.

Habitat Requirements

In streams and rivers, Yellowstone Cutthroat Trout have habitat similar requirements to most trout, but they are more sensitive to habitat damage, warmer water temperatures, and sedimentation than nonnative trout. A healthy, functioning riparian area is an essential component of stream health. Trees, shrubs, and herbaceous plants along the bank maintain the stability of stream channels, protect banks from erosion, and provide shade and overhead cover. By reducing erosion and filtering sediment, riparian vegetation helps maintain a clean streambed, which Yellowstone Cutthroat Trout require for spawning. Streams without accumulation of fine sediment produce more invertebrates, which is an important food source for Yellowstone Cutthroat Trout. Shading and channel maintenance reduce the surface area of stream exposed to sunlight, which keeps water cooler.

Yellowstone Cutthroat Trout use a range of habitat types and need to be able to swim throughout their home range. Yellowstone Cutthroat Trout vary by population in the type of habitat they need. The fish in Yellowstone Lake have an adfluvial life history strategy meaning they live mostly in the lake, but spawn in streams feeding the lake. Yellowstone Cutthroat Trout in larger rivers, like the Yellowstone River, spawn in smaller tributary streams, which is the fluvial life history strategy. Their fry drift into the Yellowstone River soon after hatching. In smaller watersheds, the resident Yellowstone Cutthroat Trout are less migratory, but still need access to spawning habitat within a watershed. In smaller watersheds, Yellowstone Cutthroat Trout are less migratory but still need access to a variety of habitat types for spawning, rearing, summer and fall residence, and surviving the winter.

Except for Yellowstone Lake, which provides substantial habitat to adfluvial Yellowstone Cutthroat Trout, lake habitat was historically limited. Expansion of the distribution of Yellowstone Cutthroat Trout into high mountain lakes for recreation has provided more lake habitat, as has creation of reservoirs. To sustain self-reproducing populations, these lakes need inlet or outlet streams with gravel suitable for spawning.

Reproduction

Yellowstone Cutthroat Trout are spring spawners and spawn from May through July. Yellowstone Cutthroat Trout are locally adapted to the waters in which they evolved, so populations vary in timing of their spawning runs, the habitat they select, and the factors that cue their spawning. The most typical high-quality spawning habitat is in the tails of pools, where clean gravel swept with surface water and an upwelling of water provides ideal habitat for females to dig redds and for the embryos to incubate and emerge.

In the Yellowstone River, Yellowstone Cutthroat Trout spawn in tributaries. They time their spawning when spring runoff in the river has passed its peak and flows are decreasing. The tributary streams are often steep, and boulder dominated, with gravel available in small patches, often on the downstream side of boulders or along the channel margins. Yellowstone Cutthroat Trout in the Yellowstone River have adapted to this seemingly marginal habitat, and these small streams can produce many fry.

Embryos incubate in stream gravel for several weeks, after which they hatch, then emerge from the gravel. Resident fry disperse to rearing habitat nearby. Fluvial fry drift out of the tributaries into the river. Like salmon, fry tend to imprint on their natal stream and return there to spawn as adults, although some fish will pioneer new habitat if it comes available.

Sportfishing

Yellowstone Cutthroat Trout are highly valued game fish that attract anglers worldwide to fish waters in Montana, Idaho, Wyoming, and Yellowstone National Park. Each state within the historical range of Yellowstone Cutthroat Trout manages them as a game fish and have regulations in place to prevent overharvest. In many places, mandatory catch and release regulations are in place. Where fishing pressure is unlikely to have population level effects, some harvest is allowed. Yellowstone Cutthroat Trout planted in high mountain lakes are usually managed as recreational fisheries, and state fishing regulations allows limited harvest. Anglers should always check fishing regulations for the waters they are fishing. When in doubt, release them unharmed with minimal handling.

Threats

Threats to Yellowstone Cutthroat Trout come from several fronts and often act together in making streams and lakes less suitable for Yellowstone Cutthroat Trout. Humans have altered the biological, physical, and chemical environment in which Yellowstone Cutthroat Trout have evolved, and these changes are responsible for declines in Yellowstone Cutthroat Trout.

Nonnative Trout and Genetic Status

Introduction of nonnative Rainbow Trout (*O. mykiss*), Brook Trout (*Salvelinus fontinalis*), and Brown Trout (*Salmo trutta*) has been the most influential cause of decline of Yellowstone Cutthroat Trout throughout its historical range. Lake Trout (*S. namaycush*) have devastated Yellowstone Cutthroat Trout in Yellowstone Lake. These nonnatives differ in how they have harmed Yellowstone Cutthroat Trout.

Rainbow Trout and Yellowstone Cutthroat Trout interbreed and produce hybridized, yet fertile offspring. Stocking Rainbow Trout began in the late 1800s, and billions were stocked in waters occupied by Yellowstone Cutthroat Trout for decades before this practice ended. Through much of its historical range, the prolonged onslaught of Rainbow Trout stocked into Yellowstone Cutthroat Trout habitat eventually swamped out Yellowstone Cutthroat Trout genes.

Although stocking of Rainbow Trout into waters supporting Yellowstone Cutthroat Trout has ceased, their nonnative genes continue to threaten Yellowstone Cutthroat Trout with some populations having variable levels of hybridization. Hybridization eventually leads to the loss of the features that make Yellowstone Cutthroat Trout distinctive. Also, although stocking of Rainbow Trout in Yellowstone Cutthroat Trout habitat has stopped, Rainbow Trout are strong swimmers and leapers, and they continue to invade strongholds for Yellowstone Cutthroat Trout.

Brown Trout were also stocked by the billions in streams historically occupied by Yellowstone Cutthroat Trout. Brown Trout are fall spawners, so hybridization was not a problem. Nevertheless, Yellowstone Cutthroat Trout disappeared from many streams and rivers stocked with Brown Trout. The mechanism is unclear and may differ among populations of Yellowstone Cutthroat Trout. Predation is a potential cause, as Brown Trout often eat other fish, although predation does not seem to be the cause in tributary streams studied in Montana (Al-Chokachy and Sepulveda 2019). Competition for food and space likely has contributed to reduction and disappearance of Yellowstone Cutthroat Trout in streams with Brown Trout. In some cases, Brown Trout may have replaced Yellowstone Cutthroat Trout in streams that became less suitable for the sensitive Yellowstone Cutthroat Trout through pollution, warmer temperature, and damaged habitat.

Brook Trout are currently the greatest threat to Yellowstone Cutthroat Trout in headwater streams. Brook Trout excel at invading new habitat, and they share much of the habitat and food needs as Yellowstone Cutthroat Trout. Brook Trout invasion often results in the quick disappearance of Yellowstone Cutthroat Trout. Fall spawning may be a substantial factor contributing to the rapid loss of Yellowstone Cutthroat Trout following Brook Trout invasion. Brook Trout fry emerge in late winter or early spring, and these fish have several months of growth before Yellowstone Cutthroat Trout emerge from the gravel. The tiny new Yellowstone Cutthroat Trout fry cannot compete for rearing habitat with the much larger Brook Trout.

In the mid-1990s, Lake Trout began to be caught in Yellowstone Lake. This nonnative species threatened not only the highly valued Yellowstone Cutthroat Trout, but also the community of animals that coevolved with Yellowstone Cutthroat Trout. Yellowstone Cutthroat Trout are more available to mammalian and avian predators than nonnative Lake Trout, as they live closer to the surface of the lake and spawn in streams. Lake Trout occupy deeper water and spawn within the lake, out of reach of predators. Yellowstone Cutthroat Trout numbers plummeted as the voracious Lake Trout feasted on this population that did not coevolve with predaceous fish. The annual spring spawning runs of Yellowstone Cutthroat Trout into streams feeding the lake crashed, leaving grizzly bears, otters, bald eagles, and osprey without their essential food supply. Ag-

gressive Lake Trout removal actions have been in place for decades and are gaining ground against this voracious predator. The Yellowstone Cutthroat Trout population is on the rise, and their predators are returning. Nevertheless, Lake Trout control will need to continue in perpetuity if we are to protect this precious natural resource in our first national park.

Isolation

Isolated populations of the fringe of the historically occupied habitat are at considerable risk of extirpation. The lack of connectivity with other populations prevents gene flow, which can result in inbreeding. Flooding, wildfire, or drought are substantial threats to these small, isolated populations, as these events can kill most or all of the fish present. Without connection to neighboring populations, Yellowstone Cutthroat Trout cannot repopulate a disturbed area.

Habitat Damage and Pollution

Humans have altered the landscape within the historical range of Yellowstone Cutthroat Trout, and many of these changes were harmful over the short-term and long-term. Livestock grazing and forestry practices that removed riparian vegetation harmed stream channels, fed sediment to streams, and greatly reduced shade provided by streamside vegetation. Towns and residential development also altered streams, replaced riparian vegetation with shallow-rooted nonnative grasses, and delivered pollutants from yards, streets, and parking lots. Forestry practices that removed too many trees increased the amount of runoff to some streams, which overwhelmed the ability of the channel to move the water and added fine sediment. Mining has altered stream channels and added pollutants in discrete portions of the Yellowstone Cutthroat Trout's historical range.

Passage Barriers

Roads, railroads, and irrigation diversions have blocked movement of Yellowstone Cutthroat Trout throughout their historical range. Impassible culverts were installed at road and railroad crossings, and some irrigation diversions block upstream movement of Yellowstone Cutthroat Trout. In some cases, these barriers blocked Yellowstone Cutthroat Trout from spawning habitat. Barriers also isolate fish populations, which restricts gene flow. Paradoxically, some barriers have been beneficial, as Yellowstone Cutthroat Trout would likely no longer exist in some streams without the presence of these human-made barriers that keep non-native fish from invading.

Dewatering and Entrainment

Irrigation is essential to the agricultural economy in western states supporting native trout. Water rights laws generally follow a "first in time, first in right" requirement, where senior water rights supersede fisheries needs, or the ability of those with junior rights to withdraw water from streams. Often, the demand for water exceeds the supply, and streams have low flows, or even no flow, during the critical time when Yellowstone Cutthroat Trout fry are ready to hatch and emerge. Fry or developing embryos often die from desiccation, warm water, or lack of flow to move them to rearing habitat. Likewise, these low flows make dewatered reaches unsuitable for juvenile and adult Yellowstone Cutthroat Trout with warmer temperatures and reduced habitat limiting their use of dewatered streams.

Irrigation withdrawals also have potential to capture, or entrain, fish. Adults entrained into irrigation canals often cannot make it back to the stream. Fry are weak swimmers and are unable to swim against the current flowing into the ditch. In some cases, the potential for entrainment in irrigation canals is considerable.

Climate Change

Climate change is having a measurable effect on stream flow and water temperature within the Yellowstone Cutthroat Trout's historical range. The trend is for reduced snowpack and more precipitation falling as rain. Streams in the Yellowstone Cutthroat Trout's native range depend on snowpack for late season flows. Reduced snowpack, combined with irrigation demands, results in low stream flows and warmer water temperatures. The contraction of Yellowstone Cutthroat Trout's occupied habitat to the higher elevation, center of the historically occupied habitat reflects the role climate change is having on the hydrology and temperature regime of streams. The warming projected for the future will further shrink suitable habitat for Yellowstone Cutthroat Trout, and climate change will work in concert with other threats to make conservation more challenging.

Disease and Aquatic Nuisance Species

Yellowstone Cutthroat Trout are vulnerable to several diseases that affect salmonids to varying degrees. Diseases with potential to infect Yellowstone Cutthroat Trout include the bacterial borne diseases furunculosis, enteric redmouth, and bacterial kidney disease. Parasites are responsible for whirling disease are found in numerous populations of Yellowstone Cutthroat Trout and may have population level effects. A parasite carries proliferative kidney disease (PKD), which has caused fish kills in the Snake River. In the Yellowstone River, a PKD outbreak in 2017 killed mostly Mountain Whitefish (*Prosopium williamsoni*); however, some Yellowstone Cutthroat Trout succumbed. Viruses that can infect Yellowstone Cutthroat Trout include the infectious hematopoetic necrosis, infectious pancreatic necrosis, and viral hemorrhagic septicemia. State, federal, and private hatcheries are screened for these diseases to prevent spread into the wild from hatchery sources. Fishing gear and watercraft can also transport disease-causing organisms into lakes and streams.

Aquatic nuisance species have the potential to reduce the suitability of waters to support Yellowstone Cutthroat Trout. Invasive aquatic plants can choke waterways and impair water quality when they die and decompose. Invasive mollusks can cover streambeds and other surfaces and are not suitable prey species for Yellowstone Cutthroat Trout. Fishing gear and watercraft can spread adult or larval forms of mollusks among waters. Likewise, aquatic nuisance plants can also be spread into new waters from watercraft or fishing gear. These species can reproduce vegetatively, so fragments of a plant are enough to infest new waters.

Conservation

Securing Yellowstone Cutthroat Trout for future generations to enjoy requires a diversity of actions that address the factors contributing to their decline. Educating the public is essential in conservation of Yellowstone Cutthroat Trout, as informed people are more likely to value natural resources. Conservation partners are diverse, with state and federal agencies, nonprofit groups, private industry and private

landowners being key players. As 50% of the remaining Yellowstone Cutthroat Trout are in waters on private land, and recreational use of Yellowstone Cutthroat Trout and the waters it inhabits is substantial, partnerships are essential in effective conservation of Yellowstone Cutthroat Trout and their habitat.

Regulatory Framework

State and federal agencies have regulatory mechanisms developed to provide protection of Yellowstone Cutthroat Trout and its habitat throughout its native range. Federal land management agencies, such as the U. S. Forest Service (USFS), Bureau of Land Management (BLM), National Park Service (NPS) and the U. S. Fish and Wildlife Service (USFWS) must adhere to federal laws such as the National Environmental Protection Act (NEPA) and the Clean Water Act that provide specific consideration of the potential for government actions to affect Yellowstone Cutthroat Trout and avoid or mitigate for actions that could harm them. The USFS develops forest plans that address Yellowstone Cutthroat Trout conservation along with their other forest management activities. Likewise, the BLM develops resource management plans that are blueprints for land management on the land they administer. These plans must follow NEPA requirements. Federal agencies must follow state laws or regulations that address forestry practices, stream channel or wetland protection, water quality, water rights and in-stream flow, habitat mitigation, as well as regulations established by state fish and game agencies designed to protect Yellowstone Cutthroat Trout.

State agencies establish regulations and permitting requirements to protect Yellowstone Cutthroat Trout. Fishing regulations protect Yellowstone Cutthroat Trout from overharvest and range from mandatory catch and release, to prescribing the maximum number of Yellowstone Cutthroat Trout that can be kept per day or in possession. States also issue permits for scientific collection and genetic testing to prevent these activities from harming Yellowstone Cutthroat Trout populations.

In some cases, fishing regulations require mandatory kill of nonnative trout. Such is the case for Lake Trout caught in Yellowstone Lake in Yellowstone National Park. Likewise, some streams in the park have regulations requiring removal of Rainbow Trout caught by anglers. These streams are strongholds for Yellowstone Cutthroat Trout, and Rainbow Trout are threatening the populations with hybridization.

Collaboration among state and federal agencies is an essential component of Yellowstone Cutthroat Trout conservation. States regularly partner with adjacent states when conservation projects cross state boundaries. Likewise, the USFS, BLM, and the National Park Service collaborate with each other and states on projects benefiting Yellowstone Cutthroat Trout. Federal and state agencies are required to implement conservation actions under state and federal law and should apportion funds accordingly. The USFWS often provides funds for Yellowstone Cutthroat Trout conservation with the intention of conserving the subspecies and preventing their inclusion for protection under the Endangered Species Act.

Monitoring and Assessment

Maintaining up-to-date assessments of the distribution, abundance, and genetic status of Yellowstone Cutthroat Trout is essential to their effective management. As signatories of the MOU for Yellowstone Cutthroat Trout conservation, state and federal agencies agree to implement a statistically based monitoring plan. This regular inventory allows assessment of the status of populations and identifies populations in need of quick conservation action, such streams where discovery of Rainbow Trout or Brook Trout invasion into waters previously free of nonnative species.

Nonnative Trout

Nonnative trout have had the largest negative effect on the distribution and abundance of Yellowstone Cutthroat Trout. States develop fisheries management plans that designate which waters will be managed for recreational sportfishing of nonnatives and which will support secure populations of Yellowstone Cutthroat Trout. States balance the importance of the recreational opportunities provided by nonnative trout with the need to conserve Yellowstone Cutthroat Trout. Conservation actions related to nonnative trout include installation of barriers to protect habitat for existing or restored populations and removing nonnatives. In limited situations, removal of nonnatives through capture with nets or electrofishing is possible; however, this option only works in short reaches where the habitat does not provide cover for nonnative fish to escape capture. Where Yellowstone Cutthroat Trout live alongside nonnative trout, and barrier construction is not feasible, maintaining the quality of the habitat can provide Yellowstone Cutthroat Trout resilience and a better chance of persisting with competing species.

Lake Trout in Yellowstone Lake will be a perpetual threat to Yellowstone Cutthroat Trout, as eradication from such a large lake is likely infeasible. The National Park Service will continue Lake Trout removal efforts and explore new technologies to target and remove this voracious predator.

Expansion of Occupied Habitat

The extent to which Yellowstone Cutthroat Trout have been eliminated from historically occupied habitat makes reestablishing populations in streams where they have been eliminated a conservation priority. Construction of barriers and reestablishing populations in formerly occupied habitat are common actions and will continue where feasible. Nonnative fishes have been introduced into historically fishless waters, usually upstream of waterfalls. Removing the nonnatives and stocking Yellowstone Cutthroat Trout can provide secure habitat within their native range. Any unique character these areas had before introduction of nonnative trout is unknown and lost. Moreover, these areas are usually at high elevation and are likely to be resilient to climate change, which is substantially constricting thermally suitable habitat for Yellowstone Cutthroat Trout. National Environmental Policy Act (NEPA) and environmental assessments prepared by states need to evaluate the potential for these projects to negatively affect other ecological values.

Introducing populations of Yellowstone Cutthroat Trout into fishless waters is also an option; however, these projects need to be well-vetted. Introducing Yellowstone Cutthroat Trout into waters where they would harm other species is not appropriate. As most stream-dwelling invertebrates coevolved with fish, introduction of Yellowstone Cutthroat Trout into fishless waters above natural barriers is unlikely to affect aquatic invertebrates. Nevertheless,

extensive sampling of benthic communities should determine any threats to sensitive invertebrates before a project proceeds. Introduction of Yellowstone Cutthroat Trout into historically fishless lakes has potential to adversely affect amphibians. Like invertebrates, amphibians coevolved with Yellowstone Cutthroat Trout, and the coevolved community of fish and amphibians was historically widespread. Still, such projects should consider site specific conditions through the environmental review process in determining whether a project would adversely affect amphibians.

Isolation

Isolated populations are at elevated risk of inbreeding and extirpation from catastrophic disturbance. Isolated populations require monitoring to detect genetic bottlenecks and evaluate their status following floods, wildfire, and other potentially catastrophic events. Options for protecting these populations include genetic enhancement and population replication. Genetic augmentation entails stocking more genetically diverse Yellowstone Cutthroat Trout in streams where the existing population is showing signs of inbreeding depression. Genetic replication means using brood stock from an isolated population to establish one or more populations in other streams. The latter option would also expand the distribution of Yellowstone Cutthroat Trout with locally adapted fish. These actions require consultation with fish geneticists to identify genetic bottlenecks and conserve the diversity of genetics of extant populations. Population replication should not remove enough gametes from the original population to threaten its genetic diversity or population size.

Habitat Damage and Pollution

Agriculture, forestry practices, and residential development have damaged and polluted streams supporting Yellowstone Cutthroat Trout. The USFS and states have best management practices to reduce the potential for timber harvest and associated road building to damage Yellowstone Cutthroat Trout habitat. As about 50% of the subspecies' currently occupied range is on private lands, partnering with landowners and watershed groups is an essential component of conserving Yellowstone Cutthroat Trout. These partnerships facilitate changes in grazing management to reduce stress on streams and improvement of riparian health and function. Where human activities have damaged streams to the point that natural recovery would take decades or longer, stream restoration may be necessary to meet conservation goals more quickly.

Passage Barriers

Restoring connectivity in streams is a major conservation focus. Within forested watersheds and on smaller streams, perched culverts often block fish from miles of available stream habitat. Installing passable culverts or bridges, is beneficial to Yellowstone Cutthroat Trout and the channel, as the improved road crossings are better able to withstand flood waters and move bedload and woody debris. Irrigation diversions block movement of Yellowstone Cutthroat Trout in some streams and replacing or modifying diversions so they are equipped with a fish ladder allows Yellowstone Cutthroat Trout to pass over diversions.

Restoring fish passage is especially important for populations with a migratory life history strategy. For example, Yellowstone Cutthroat Trout in the upper Yellowstone River spawn in tributary streams; however, roads, railroads, and irrigation infrastructure have blocked some of these streams for decades. Providing passage through or under these features in four spawning streams has contributed to the resilience of the fluvial Yellowstone Cutthroat Trout in the upper Yellowstone River.

Dewatering and Entrainment

Reducing the potential for dewatering and entrainment to harm Yellowstone Cutthroat Trout populations requires partnerships with landowners and watershed groups to implement projects to maintain in-stream flows and prevent entrainment. Increasing water use efficiency, water leases, and drought plans are among the tools used in public/private partnerships to maintain in-stream flows. Likewise, these partnerships drive installation of fish screens that prevent loss of fish to irrigation diversions.

Climate Change

Climate change is the greatest challenge to conserving Yellowstone Cutthroat Trout, which require ample amounts of cold water. The approach to conserve Yellowstone Cutthroat Trout in the face of climate change is to increase the resilience of populations through implementation of conservation actions described here. Focusing conservation efforts in high elevation areas likely to support Yellowstone Cutthroat Trout is necessary to promote the most benefit.

Disease and Aquatic Nuisance Species

Reducing or preventing the spread of disease and aquatic nuisance species is accomplished on several fronts. Federal, state, and private hatcheries are regularly tested for organisms causing disease in fish. Fish from hatcheries testing positive for disease are not released into the wild. States supporting native Yellowstone Cutthroat Trout have mandatory check stations for boats entering their borders, and these stations frequently intercept boats carrying nonnative mussels and aquatic nuisance plant species. States also monitor waters for the presence of aquatic nuisance species.

Education of anglers and other recreational water users is a key component of preventing spread of disease and aquatic nuisance species. Recreationists need to clean their boats and gear before entering other waters. Likewise, moving live fish or tissue from dead fish can spread disease and is illegal. State, federal, and nonprofit groups have formed partnerships to educate water users on practices to prevent spreading disease or aquatic nuisance species when they move from one body of water to the next.

WNTI Completed/Ongoing Projects

- 2007: Restore eight miles of Yellowstone Cutthroat Habitat, Rainey Creek, Snake River (ID) ($15,000)
- 2007: Reopen four miles of Yellowstone Cutthroat habitat in Deep Creek, Salt River (ID) ($15,000)
- 2008: Elk Creek Palisades (ID) Reservoir Yellowstone cutthroat trout passage project ($10,000)
- 2008: Teton Creek (ID) Habitat Restoration for Yellowstone Cutthroat Trout

($20,000)

- 2009: Fritz Creek (ID) Livestock Exclosure, Sinks' Drainages for Yellowstone Cutthroat Trout ($11,350)
- 2009: Shields River (MT) Lower Deer Creek Fish Barrier – Yellowstone Cutthroat Trout ($40,000)
- 2010: Barrier construction and restoration of Yellowstone cutthroat trout to Four Mile Creek (MT) ($61,325)
- 2011: Crow Creek (ID) restoration/improvement Phase 2 ($21,400)
- 2011: Yellowstone Cutthroat Trout conservation education kiosks along Teton River (ID) ($1,500)
- 2012: Canyon Creek (ID) Cutthroat: Connecting People and Habitats ($2,000)
- 2012: Chadbourne Dam fish passage project, Yellowstone River Basin (MT) ($50,000)
- 2012: Greybull watershed telemetry study (WY) ($3,000)
- 2013: Teton River Canyon – Canyon Creek (ID) Fish Passage Restoration for Yellowstone Cutthroat Trout ($23,866)
- 2016: Connecting Teton Creek (ID): Green Property Habitat and Stream Flow Restoration ($46,310)
- 2016: Mulherin (MT) Fish Screen and Yellowstone Cutthroat trout Entrainment Prevention ($3,000)
- 2017: Tincup Creek (ID) Stream Restoration ($44,000)
- 2017: Bates Access Signs and Stewardship ($2,500)
- 2018: Tincup Creek (ID) Stream Restoration Project, Phase 2 ($36,225)
- 2018: West Pass Creek (WY) Yellowstone Cutthroat Trout Restoration ($35,000)
- 2018: Popo Agie Gold (WY) ($3,000)

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