

Mill Creek Yellowstone Cutthroat Trout Conservation Project

State(s): Montana

Managing Agency/Organization: Custer Gallatin National Forest (CGNF)

Type of Organization: Government (Federal)

Project Status: Ongoing

Project type: WNTI Project

Project action(s): Riparian or In-Stream Habitat Restoration and Barrier Removal or Construction. This project will restore 13.3 miles of stream, reconnect an additional 1 mile of stream, restore 35 acres of wetland, and construct 1 barrier.

Trout Species Benefitted: Yellowstone Cutthroat Trout

Population: Mill Creek, Upper Yellowstone Watershed

Project summary: Mill Creek, the largest watershed in the Upper Yellowstone River Subbasin, supports a Yellowstone Cutthroat Trout (YCT) metapopulation in 45 stream miles. However, non-native rainbow trout are rapidly expanding their distribution and abundance in the drainage. Through hybridization, they threaten YCT core conservation populations in upper mainstem Mill Creek and its tributaries. Moreover, channelization in three miles of what should be the most productive low gradient YCT habitat on Mill Creek has resulted in a simplified single thread channel, depauperate of pools, large woody debris (LWD), and spawning gravel, rendering it well below its potential for providing quality YCT spawning and rearing habitat. This reach also harbors high densities of non-native brook trout in a connected spring creek that, if not removed, could serve as a source population for invasion throughout the Mill Creek watershed. Partners are working collaboratively through a multi-faceted approach to address these threats to secure, restore, and maintain Yellowstone Cutthroat Trout core and conservation populations in the Mill Creek Sub-watershed upstream from the national forest boundary. Partners have collaboratively prepared a comprehensive strategy for conserving YCT in all 45 stream miles upstream from the national forest boundary. This project seeks to address this problem through multiple objectives listed below.

Problem the Project Addresses: The Mill Creek watershed is one of the few remaining areas in the Upper Yellowstone River Subbasin where gene flow can occur between distinct populations of YCT throughout the watershed. Unfortunately, connected streams present a pathway for non-native fish species to spread and establish new populations. In 1995, concern about non-native salmonids entering the Mill Creek drainage prompted the construction of a boulder fish barrier at the forest boundary to prevent non-native species from invading upstream. Despite these precautions, rainbow trout were found above the barrier in 1997. Genetic testing of YCT in East Fork Mill Creek in 1997 and mainstem Mill Creek above the barrier in 1999 confirmed that hybridization of YCT with rainbow trout was occurring. In 2019, genetic testing of YCT below the confluence with Passage Creek raised the alarm that rainbow trout hybridization is spreading further up into the drainage than expected. Three of 28 YCT genetic samples had rainbow trout admixture ranging from 7% to 39%. The spread of hybridization in the watershed has corresponded with increasing angler reports and photos of large Yellowstone River-size rainbow trout upstream from the forest boundary barrier. In 1997, the same year hybridization was detected in East Fork Mill Creek; brook trout were found concentrated in a spring creek tributary to Mill Creek on the 5 Bar 6 Ranch upstream from the forest boundary fish barrier. That year, 560 brook trout were removed by electrofishing to reduce the potential for expansion of the population. In 2022, FWP issued a decision authorizing mechanical non-native fish removal, and project partners mechanically removed approximately 400 brook trout and 40 rainbow trout in the spring creek. Environmental DNA (eDNA) collection from sites further upstream in the watershed have not yet detected brook trout. However, warming stream temperatures associated with climate change could create environmental conditions suitable for brook trout spread and establishment in upstream YCT waters. The upstream expansion of rainbow trout hybridization combined with the potential for brook trout invasion into connected YCT habitats presents a significant threat to the long-term persistence of YCT populations in the Mill Creek watershed. Therefore, the most immediate conservation action is constructing the fish barrier to secure unhybridized YCT conservation populations in the Upper Mill Creek Sub-watershed from non-native fish hybridization and competition before it is too late (Objective 1). Opportunities for maintaining genetically pure metapopulations within climate shield streams (all stream miles upstream from the fish barrier site are within a 2040 cold-water refuge climate shield) across the historical range of Yellowstone Cutthroat Trout are exceedingly rare and are essential for the long-term persistence of the species. Although aquatic habitat in much of the Mill Creek drainage upstream from the National Forest boundary is meeting desired conditions, some reaches of the mainstem and tributaries are degraded due to a legacy of timber production, mining, agriculture, and riparian roads. The most significant known departure from desired conditions occurs immediately upstream from the Forest Boundary in the broad alluvial valley. Historically, a complex network of channels and springs meandered across the 250-yard-wide floodplain supporting extensive riparian vegetation and wetlands. Between 1949 and 1965 Mill Creek was forced to the southwest edge of the floodplain, channelized, and leveed

with earthen dikes to dewater the floodplain for agriculture. This reduced the stream length by at least 50 % over the mile-long valley, leaving a single-thread, riffle-dominated channel of uniform width and depth. This channel that historically provided some of the most productive YCT habitat in Mill Creek above the National Forest boundary is now relatively devoid of large woody debris and pools and is substantially below its potential for providing spawning and rearing habitat. From 2023 through 2025, TU plans to implement a process-based restoration project over three distinct phases to restore three miles of degraded habitat on Mill Creek in the reach upstream from the Forest Boundary (Objectives 2 and 3). This will include removing the earthen levee in strategic locations to reconnect Mill Creek to its floodplain, placing log jams to encourage water towards the new access points during high flows, and constructing post-assisted log jams and beaver dam analogs to increase habitat complexity.

Objectives: The Mill Creek Yellowstone Cutthroat Trout Conservation Project aims to secure, restore, and maintain YCT core and conservation populations in the Mill Creek Sub-watershed upstream from the national forest boundary. Specific objectives necessary for accomplishing this goal include:

- Objective 1: Construct a fish barrier to secure unhybridized core conservation YCT populations in the Upper Mill Creek Sub-watershed as soon as possible.
- Objective 2: Restore important YCT spawning and rearing habitats between the upper and lower fish barriers to promote population viability and resilience.
- Objective 3: Reconstruct the national forest boundary fish barrier to secure YCT conservation populations in all 45 stream miles above the national forest boundary from continued non-native fish invasion.
- Objective 4: Maintain viability of all YCT conservation populations (metapopulation) upstream from the national forest boundary fish barrier by removing competing and hybridizing non-native salmonids.

Partners:

- NFWF Bring Back the Natives
- USDA Forest Service TU Partnership Funding
- Montana Future Fisheries Improvement Program
- Arthur M Blank Family Foundation
- Jackson Hole One Fly
- Greater Yellowstone Coalition
- Montana AFS RAF
- Joe Brooks Trout Unlimited
- Montana Trout Foundation
- Western Native Trout Initiative

Project Monitoring: Project success will be assessed by evaluating the effectiveness of the barrier in excluding all non-native fish from the upper Mill Creek drainage. The CGNF will inspect the barrier annually before, during, and after spring runoff to ensure that it is structurally sound and functioning as designed. This will require the removal of any LWD accumulation on and around the barrier. Montana Fish Wildlife and Parks (FWP) and the CGNF will cooperatively monitor connected waters upstream from the barrier to facilitate early detection of non-native fish species and initiation of rapid response removal measures. For the first five years after barrier construction, environmental DNA (eDNA) samples will be collected and analyzed for the presence of brook, rainbow, and brown trout DNA. Samples will be collected at 250-meter intervals within one-kilometer-long reaches. This will yield 12 samples per year and 60 samples over five years. Any positive eDNA hits will be followed up with intensive electrofishing to confirm non-native species presence and inform targeted mechanical or chemical non-native fish removal efforts. Genetic testing of the YCT population(s) upstream from the barrier will be conducted annually for the first five years after construction then at a frequency of once every five years to monitor genetic purity and detect any rainbow trout hybridization. Fin clips will be collected from 20 fish in each of the three eDNA monitoring reaches for a total of 60 samples. The fin clips will be submitted to the Montana Conservation Genetics Lab for genetic testing. Detection of hybridized fish would trigger more extensive genetic testing and could result in targeted removal of hybridized fish with electrofishing. The Mill Creek Floodplain and Channel Restoration Project success will be evaluated annually by Trout Unlimited personnel following spring runoff. Individual process-based restoration structures will be evaluated to determine if they are functioning as intended and contributing toward the overall desired condition. This evaluation is part of an adaptive management strategy that allows modifying and adding more structures over time to achieve project objectives. Redd counts will be conducted each spring before and after high water to evaluate spawning use in the restoration reach over time and the position of redds relative to structures by type and location.

Funding Source(s): National Fish Habitat Action Plan

Project cost: WNTI \$110,000, Total \$1,162,300

Start Date: 01/15/2024 **Completion Date:** 09/30/2024

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