

Dude Creek Habitat Restoration

State(s): Arizona

Managing Agency/Organization: Arizona Game and Fish Department

Type of Organization: State

Project Status: Ongoing

Project type: WNTI Project

Project action(s): Riparian or In-Stream Habitat Restoration and Monitoring. This project will restore 0.5 miles of crucial stream habitat for Gila Trout.

Trout Species Benefitted: Gila Trout

Population: Dude Creek, Verde River

Project summary: Dude Creek is one of a few streams in Arizona that sustains a healthy population of Gila Trout. After being highly impacted by two large wildfires, the Arizona Game and Fish Department (AGFD) is working to stop habitat degradation, soil, and substrate loss in the stream caused by these two fires. Work has already begun to address one headcut, and this funding is to address a second headcut and associated stream miles for restoration. Incised banks will be addressed, and pools and cover will be added to provide habitat for Gila trout and native invertebrates, as well as provide thermal refugia during periods of low flows.

Problem the Project Addresses: This project aims to address habitat degradation associated with a headcut caused by two catastrophic wildfires in the watershed. The first of these fires, the Dude Fire, burned the drainage in 1990, and the associated flooding and ash flows eliminated the non-native Rainbow Trout (*Oncorhynchus mykiss*) and Brook Trout (*Salvelinus fontinalis*) populations in the creek. The creek was fishless until 1999 when it was stocked with 128 Spruce Creek lineage Gila Trout. Another 22 Spruce Creek lineage fish were stocked in 2000, and the population persisted, albeit at low densities, until 2004 or 2005. Multiple flood events and the Rim Fire in 2007 further impacted the habitat in Dude Creek. Dude Creek remained fishless until 2015, when habitat recovered enough to support trout. It was stocked that year with a mixture of Main Diamond and South Diamond Creek lineage fish, followed by augmentations in 2016 and 2017 that consisted of a mixture of Main Diamond, South Diamond, Whiskey, and Spruce x Whiskey Creek lineage Gila Trout. After successive years of recruitment, the population was deemed stable enough to open to catch-and-release angling in 2020, and sufficient numbers of adult fish were observed. Currently, there is approximately 1.75 miles of perennial water on Dude Creek, starting at a spring head and flowing until it turns subterranean around 1.25 miles upstream of a Forest Service road crossing. Habitat has recovered substantially since the Rim Fire, and the stream supports a healthy population of Gila Trout. However, there is still a great deal of habitat degradation from years of high water flows over unstable, post-fire soil. The most concerning result of this degradation is a headcut that formed approximately 0.5 miles upstream of the lowest section of perennial water. Downstream of this headcut, the stream has eroded down to underlying bedrock and is largely scoured of usable habitat features. Furthermore, erosion from seasonal flooding has caused the headcut to slowly migrate upstream, threatening trout habitat higher in the watershed where the bulk of the population occurs. In 2020, a two-phase project design was funded by the Tonto National Forest to: Phase 1) build a log dam structure to halt the upstream progress of the headcut and; Phase 2) place structures to restore the degraded habitat downstream of the headcut. Phase 1 of this project was funded and implemented by the AGFD in the fall of 2023, but while installing the log dam, crews discovered a second headcut forming above the construction site. This discovery meant Phase 2 was not implemented, as no habitat restoration could occur until the second headcut was addressed.

A new design for the second headcut has been commissioned by Trout Unlimited and will be finalized in March of 2024 to implement the project in the fall of 2024 or spring of 2025. This proposal is seeking funds for Phase 2 of the overall restoration project. Approximately 0.5 miles of stream has been degraded by the effects of the headcut, and this project would restore habitat and remediate erosion and scouring throughout that reach. Below the headcut, the stream habitat is characterized by a linear, incised channel with steep banks. The substrate is dominated by bedrock with little complexity or holding areas, and average water depth is very low, with little pool habitat for trout. Because of this, mean water temperature can rise to unsafe levels for trout (Keister and Beard, 2022), and there is little to no cover for fish to seek thermal refuge or avoid predators. The homogeneity of the stream bed is also not ideal for invertebrates, so food for trout is lacking in this reach. Installation of multiple log structures in this reach will manipulate water flow to induce meandering, expand the floodplain, and cause deposition of other habitat features such as gravel bars that will benefit both Gila Trout and the aquatic invertebrates they feed on. The logs will also force the stream to flow into a tighter channel area, increasing mean depth. Furthermore, water will back up behind log structures, forming pool habitat that trout prefer. Beyond channel engineering, the log structures will serve as habitat for trout and provide attachment substrate for aquatic invertebrates such as mayflies and caddisflies.

Objectives:

- Utilizing a contractor, install multiple log structures in the stream, securing them with rocks and soil anchors following the provided design from Natural Channel Design.
- Monitor after high water events to ensure structural integrity and function of the emplacements after the work is completed.
- Collect Baseline habitat information such as stream temperatures, percent pool habitat, and mean width in the reach prior to implementing restoration.
- After restoration is complete, track changes to the habitat over the next 10 years and assess the success of the log structures from both phases in creating stream meanders, pool habitat, and increasing floodplain accessibility in the restored reach.
- Monitor water temperatures with temperature loggers to assess whether stream temperatures are suitable for trout in the restored reach.
- Conduct annual visual surveys to assess Gila Trout usage of the restored reach and demonstrate use in the reach by all life stages of trout.

Partners:

- Arizona Game and Fish Department
- Trout Unlimited
- Natural Channel Design Inc.
- U.S. Forest Service, Tonto National Forest
- U.S. Fish and Wildlife Service
- Western Native Trout Initiative

Project Monitoring: Both long and short-term monitoring will occur on the restored reach to ensure structures are functioning as intended as well as to track the change in the stream over time. Monitoring will be structured as follows: Prior to implementation - Department staff will place temperature loggers throughout the proposed reach to collect pre-restoration temperature data. Some photo point sites will be selected as well as photographs taken of both phase one headcut structures. Potential locations for Phase 2 structures will be identified. During Implementation - Department staff will provide support during placement of log jam structures and note locations of each structure. Each structure will be added to the photo point survey. Upstream and downstream photos will be taken of every structure after it is installed. Additional temperature loggers will be placed near some of the structures to track stream temperatures near these features. In the first year after implementation - visual inspections will be conducted after any significant flood events to ensure that the structures are still intact and functioning. Initial photos will be taken for photo point survey analysis in the fall of 2025. Visual surveys for Gila Trout will also occur in the fall to track Gila Trout use. Seasonal temperature data will be compared to pre-restoration data, as well as to temperature data from upstream of the headcut. Subsequent years after implementation - Photo point surveys will be conducted annually in conjunction with Gila Trout population monitoring activities for the next 10 years. At that point, photos will be assessed to determine if the structures and stream have stabilized or whether another 10-year monitoring period is warranted. Temperature will continue to be monitored, and fish use will be assessed while conducting both visual and electrofishing surveys on Dude Creek.

Funding Source(s): National Fish Habitat Action Plan

Project cost: \$33,000 WNTI funds, Total project cost \$66,000

Start Date: 05/01/2025 **Completion Date:** 11/30/2025

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