

Gila Trout (*Oncorhynchus gilae*)

Data: Gila Trout Recovery Plan-2003

**Partners: Arizona Game and Fish Department, New Mexico
Department of Game and Fish, U.S. Fish and Wildlife
Service, U.S. Forest Service**

Gila Trout Species Status review:

The Gila Trout was originally recognized as endangered under the Federal Endangered Species Preservation Act of 1966 (U.S. Fish and Wildlife Service, 1967). Federal-designated status of the fish as endangered was continued under the Endangered Species Act of 1973 (U.S. Fish and Wildlife Service, 1975) until 2006 when the species was down-listed to threatened (U.S. Fish and Wildlife Service, 2006). The Gila Trout was listed as endangered by the New Mexico Department of Game and Fish in 1975 under the Wildlife Conservation Act and was down-listed to threatened in 1988, and remains listed as threatened by New Mexico Department of Game and Fish. Gila Trout are considered a Species of Concern by the Arizona Game and Fish Department.

Sportfishing Status of the Gila Trout:

Fishing for Gila Trout was once restricted under its status as an endangered species. The down-listing to threatened in 2006 includes a special provision that allows the states of New Mexico and Arizona to manage the species as a sportfish in select areas for the first time in almost 50 years. Guidelines have been developed to allow for limited sport fishing in specific waters where stocking of non-native trout was replaced by stocking of Gila Trout. Most restoration streams continue to be protected from angling. However, allowing for limited angling for a unique native species can increase public knowledge and support for its conservation. Such support may come from both sport fishing enthusiasts and private landowners that might benefit from allowing access to fishing on their property. Involvement from the general public and

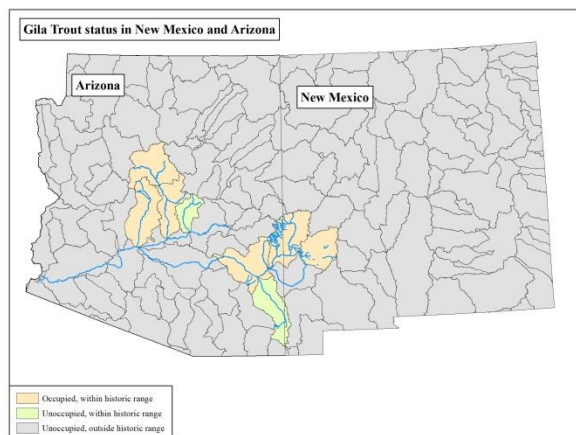
landowners provides opportunity for increased Gila Trout restoration and should result in a conservation benefit to the species. The U.S. Fish and Wildlife Service and the State wildlife and fisheries management agencies responsible for establishing fishing regulations work to ensure that angling pressure does not prevent, but enhances, progress toward full recovery. Gila Trout angling will continue to be managed by the States as long as the population remains above the recovery threshold.

Distribution of Gila Trout: The extent of the historical distribution of the Gila Trout is not known with certainty. It is known to be native to higher elevation streams in portions of the Gila River drainage in New Mexico, San Francisco River drainage in Arizona and New Mexico, and tributaries to the Gila River in Arizona. Currently, there are 12 populations of Gila Trout in the wild. Additionally, the Mora National Fish Health and Technology Center (U.S. Fish and Wildlife Service) maintains captive populations of all four Gila Trout lineages.

Range of the Gila Trout:

Three of the four relict populations are self-sustaining in the wild; the relict population in Spruce Creek was eliminated following the Whitewater-Baldy Fire in 2012. With the exception of the Spruce Creek lineage, all other lineages have been replicated in a sufficient number of drainages to minimize potential loss of any lineage from a natural or human-caused event. The Main Diamond

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Creek population was restored to its original habitat following its loss in the wild from the 1989 Divide Fire. Replicates of the Main Diamond Creek population persist in Sheep Corral Canyon, lower Little Creek, and Black Canyon. Main Diamond lineage Gila Trout were recently stocked in upper Langstroth Creek but success of this replication has not yet been documented. Similarly, the South Diamond Creek population was restored to its original habitat following its loss in the wild from the 1995 Bonner Fire. The South Diamond Creek population is replicated in Grapevine Creek, Frye Creek, Willow Creek, and the Mogollon Creek drainage, which includes a portion of the main stem of Mogollon Creek, Trail Canyon, Woodrow Canyon, and South Fork Mogollon Creek. The Whiskey Creek relict population was eliminated by the 2012 Whitewater Baldy Fire, but has been replicated in McKenna Creek and upper White Creek. The Spruce Creek population was also eliminated by the 2012 Whitewater Baldy Fire but is replicated in Big Dry Creek. Mixed lineage populations were established in Dude Creek and Ash Creek in 2015, recruitment has yet to be documented. The total population size of Gila Trout in the wild was estimated to be approximately

37,000 in 1998 and current estimates are unavailable.

Gila Trout Habitat Requirements:

Habitat of Gila Trout consists of perennial montane streams ranging from 1,660 m (5,400 ft) to over 2,800 m (9,200 ft) elevation. Suitable stream habitat within the range of the species is situated between about 33° to near 35° north latitude and 107° 45' to near 112° 15' west longitude. Streams with suitable habitat for Gila Trout are found in coniferous and mixed woodland, montane coniferous forest, and sub-alpine coniferous forest. Stream flow is characterized by a snowmelt-dominated hydrograph in most years and snowmelt runoff typically begins in February, peaks in March, and gradually decreases through May. Base flow conditions prevail in June and into July. Mean monthly discharge characteristically increases in July through September coinciding with runoff from convectional summer thunderstorms. Sporadic periods of runoff from winter rains or mid-season snowmelt often results in flows slightly elevated above base levels in December and January. Gila Trout require water temperatures below 25°C (77°F), clean gravel substrate for spawning, continuous stream flow of sufficient quantity to maintain adequate water depth and temperature, and pool habitat that provides refuge during low flow conditions and periods of thermal extremes. Abundant invertebrate prey, cover, and water free from contaminants are also required. Cover typically consists of undercut banks, boulder alcoves, large woody debris, deep pools, exposed root masses of trees at water's edge, and overhanging vegetation.

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Concerns, Issues, or Obstacles relative to the Conservation and Improvement of the status of Gila Trout:

Water Condition Concerns

High stream discharge variability is a defining characteristic of the environment to which Gila Trout has adapted. During low-flow years, marginal habitats may become too warm to support trout or surface flow may cease and stream segments may dry. Pool depth may diminish to the extent that winter mortality of trout is greatly increased. Large magnitude flood events during high flow years may scour stream channels and eliminate year classes of trout. These frequent, recurring extremes in flow conditions are a basic element of the relatively harsh environment that distinguishes habitat of Gila Trout from the typical trout streams of more northern latitudes. Wildfire impacts and drought in recent years have exacerbated the impacts of flow variability.

Non-native Sportfish Concerns

Stocking and naturalization of non-native trout within the range of Gila trout and ensuing hybridization, predation, and competition are major causes for the imperiled status of the species. Rainbow Trout and Brown Trout have become naturalized and are widespread within the historical range of Gila Trout. Current stocking of Rainbow Trout is conducted only in stream segments not inhabited by Gila Trout, however, hybridization with Rainbow Trout remains a prominent threat to Gila Trout. A vital component of recovery and long-term survival of Gila Trout is removal of non-native trout through

chemical piscicide treatments and electrofishing.

Land use and management issues

Forest management includes activities that directly or indirectly affect species composition, density, and vertical structure of vegetation. Changes in these forest variables may affect watershed characteristics such as infiltration, runoff, and erosion, and stream habitat characteristics such as sediment transport, nutrient cycling, physical habitat features, and water temperature. Forest management includes silvicultural treatments (e.g., timber harvest, thinning, prescribed burning) and wildfire control. Although much of the habitat of Gila Trout is within designated wilderness where timber harvest is not allowed, historical logging activities likely caused major changes in watershed characteristics and stream morphology. Poorly managed livestock grazing can degrade watershed condition, stream habitat and riparian environments, resulting in decreased production of salmonids. Historically, widespread, uncontrolled livestock grazing likely contributed to habitat degradation modifications cited as a cause for the decline of Gila Trout. Severe forest fires capable of extirpating or decimating fish populations are relatively recent phenomena, resulting from the cumulative effects of historical or ongoing overgrazing by domestic livestock and fire suppression.

Natural disturbances

Over the last decade, large scale wildfires have occurred on a more regular frequency than historically observed. These fires have eliminated several populations of Gila Trout

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and drastically altered the hydrology in many watersheds. Views of the geographic replication of Gila Trout have changed as a result of these fires, and the recovery team is considering alternative methods for recovery actions.

Population viability concerns

Hybridization with Rainbow Trout is a major cause for the historical decline and continued imperilment of Gila Trout. Stocking of Rainbow Trout within the historical range of Gila Trout began in the early 1900's. Although current stocking of Rainbow Trout occurs only in locations considerable distance from extant Gila Trout populations, Rainbow Trout have become naturalized throughout the range of Gila Trout. Hybridization remains a prominent threat, as evidenced by loss of previously presumed pure populations (Iron Creek and McKenna Creek) and detection of introgression of Rainbow Trout genes in the Mogollon Creek population. Resolution of the Mogollon Creek hybridization included capture, genetic characterization, and spawning of Gila Trout from Mogollon Creek and restocking after a piscicide treatment to remove all remaining trout. In addition, effective barriers continue to play an important role in the protection of pure Gila Trout populations. A waterfall barrier on the upper West Fork Gila River was thought to be sufficient for protection of Gila Trout upstream; however, Rainbow and Brown trout were able to pass the waterfall during high flow events and resulted in hybridization of the Gila Trout population. Augmentation of the waterfall or a new, constructed barrier will be necessary to protect Gila Trout in the upper West Fork Gila River. Hybridization is a threat to Gila Trout because it results in the loss of the

unique genetic identity of the species, which represents its evolutionary history and local adaptation to the environments it inhabits. Continuous monitoring of the genetic structure of pure Gila Trout populations is necessary to ensure maintenance of the genetic purity of recovery populations by rapidly identifying compromised populations. Genetic diversity has been found to be low in the Spruce Creek lineage, and discussions have been ongoing to determine a strategy to preserve and ideally recover some of the genetic diversity in the lineage. This may result in mixing multiple lineages both in the wild and at Mora National Fish Hatchery.

Opportunities To Improve the Status of Gila Trout

Gila Trout were once widespread in the upper Gila River Basin, but have declined because of hybridization with Rainbow Trout, predation by and competition with Brown and Brook trout, and habitat degradation. The current distribution of Gila Trout consists of 12 populations in headwater stream habitats in New Mexico and Arizona. Recovery efforts are intended to ameliorate the five main threats that have and continue to contribute to the imperiled status of the Gila Trout. These efforts will restore the species to drainages within its historical range and ensure long-term survival of the species, as represented by each of the four known, genetically pure lineages. Recovery of Gila Trout will serve to maintain biological diversity and restore a native faunal component of the Gila River drainage in New Mexico and Arizona. Conservation of a species that has evolved and adapted over thousands of years will be

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accomplished by recovery of Gila Trout. Restoration streams for repatriating Gila Trout are largely on lands managed by the U.S. Forest Service. Many of the potential restoration streams are located within Federally-designated wilderness areas. Proposed actions to reach recovery and protect and secure long-term population viability include 4 priorities:

- Repatriate Gila Trout to streams and complex drainages within its historical range;
- Conserve habitat of Gila Trout through protection, restoration, and maintenance;
- Continue to investigate aspects of the biology, ecology, life history, habitat, and genetics of the species that are important for conservation of Gila Trout; and
- Engage the public in discussions regarding the status of recovery actions and issues associated with recovery of Gila Trout.

Population manipulations

The strategy is to establish and maintain self-sustaining populations of Gila Trout. A population will be considered established when it sustains itself by natural reproduction and recruitment, is capable of persisting under the range of variation in habitat conditions that occur in the restoration stream, and when the population is protected from invasion by non-native trout.

Key actions include:

- Survey and manage existing Gila Trout populations.
- Re-establish populations with genetically appropriate fish in renovated streams.

- Continue to utilize Gila Trout broodstock management plan for hatchery propagation of fishes for repatriation to the wild.
- Prevent reinvasion of non-natives by maintaining or establishing in-stream barriers as needed.

Maintenance of quality habitat

Recovery streams that are subject to multiple land-use practices, such as timber harvest or thinning, prescribed fire, livestock grazing, and intensive recreation, should be managed to maintain healthy riparian corridors that promote sufficient habitat conditions for all Gila Trout life functions. Occupied streams that have unstable or declining conditions should be the focus of remedial actions. Routine monitoring should be used to assess stream conditions.

Key actions include:

- Determine baseline habitat conditions using a standard protocol.
- Complete habitat improvement or protection on a priority basis.
- Develop BMPs, AMPs or FPs for land use activities in Gila Trout drainages to reduce impacts.
- Manage human impacts through appropriate regulations.

Assessment of appropriate regulatory functions and mechanisms

Gila Trout recovery depends, in part, on adequate regulatory mechanisms and management programs remaining in existence to ensure that all populations of Gila Trout and their habitats are maintained.

Key actions include:

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- Identify regulatory mechanisms, laws, and policies that are insufficient to fulfill all recovery objectives and protect Gila Trout
- Monitor, prevent, and control disease and/or causative agents, parasites, and pathogens.
- Implement appropriate laws and regulations to allow Gila Trout populations to persist in light of commercial, scientific, and recreational uses.

Highest Priority Actions for Gila Trout protection and de-listing:

1. Gila, San Francisco and Verde River Watersheds

- Construct new and maintain existing stream barriers.
- Eliminate non-native trout from as much of historical range as possible.
- Identify, select, and evaluate restoration streams in drainage complexes.
- Complete NEPA documentation for stream piscicide treatments.
- Conduct piscicide treatments to remove nonnative trout and establish Gila Trout populations.
- Monitor populations and habitat.
- Support research programs to acquire needed information

Estimated 5-year need

- Establish Populations \$750,000
- Protect Populations and Habitat \$565,000
- Investigate Conservation Issues \$80,000

Estimated 10-yr need

- Establish Populations \$310,000

- Protect Populations and Habitat \$605,000
- Investigate Conservation Issues \$159,000

On-going partnerships and joint ventures

Recovery Activities-New Mexico Dept. of Game and Fish, Arizona Dept. of Game and Fish, U.S. Fish and Wildlife Service, U.S. Forest Service.

Genetics-University of New Mexico, New Mexico Dept. of Game and Fish, U.S. Fish and Wildlife Service.

Hatchery-U.S. Fish and Wildlife Service Mora National Fish Hatchery and Technology Center.

WNTI Completed or Ongoing Projects:

Black Canyon Barrier Renovation (2007) - \$94,775
Haigler Creek Renovation (2010) - \$30,000
Wallow Fire Habitat Assessment (2012) - \$40,000
Whitewater-Baldy Fire Habitat Assessments (2013) - \$53,000 (2014) - \$53,000
Willow Creek Fish Barrier (2015) - \$70,000

References:

1. U.S. Fish and Wildlife Service. 2003. Gila Trout Recovery Plan (third revision). Albuquerque, New Mexico.

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