

Gila Trout (*Oncorhynchus gilae*)

Data: Gila Trout Recovery Plan-2003

Partners: AZ, NM, FWS, FS, Tribes

Status of the Gila Trout: Gila trout (GT) was recognized as endangered under the Federal Endangered Species Preservation Act of 1966 (U.S. Fish and Wildlife Service [USFWS], 1967). Federal 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 (USFWS 2006). 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 NMDGF. Gila trout is considered a Species of Concern by the Arizona Game and Fish Department.

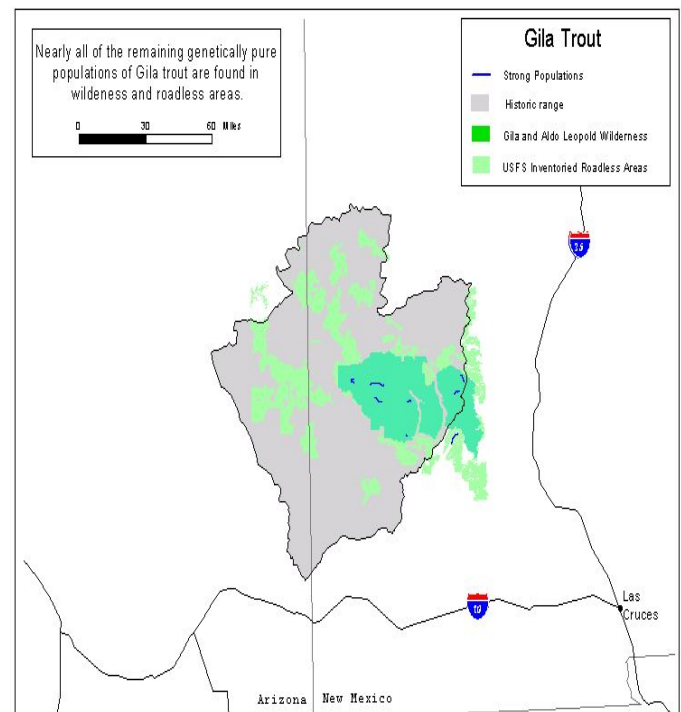
Sportfishing Status of the Gila Trout:

Fishing for Gila trout was precluded by its status as a federally-listed endangered species. The recent rule down-listing Gila trout to threatened included a provision that allows the states of New Mexico and Arizona to manage selected populations of the species as a sportfish for the first time in over 50 years. Regulations have been adopted that allow for limited sport fishing in specific waters. Each remnant Gila trout population remains closed to angling. In addition, hatchery-produced Gila trout that are surplus to recovery needs will be stocked in habitats that normally receive nonnative trout. Limited angling for a unique native species can increase public knowledge, interest, and support for its conservation. Such support may come from sports fishing enthusiasts, conservationists, as well as private economic interests. Involvement of the general public and special-interests provides opportunity for increased awareness and appreciation of Gila trout restoration and should yield conservation benefits to the species. State wildlife and fisheries management agencies and USFWS will work

to ensure that angling does not prevent, but enhances, progress towards full recovery of the species. Once delisted, Gila trout will be managed by the States as long as species populations remain above the recovery threshold defined in a post-listing management and conservation plan..

Distribution of Gila Trout: The historical range of Gila trout is not known with certainty. It was native to higher elevation (>1,500 m) streams in portions of the Gila River drainage in New Mexico, Gila River tributaries in Arizona, and San Francisco River drainage in Arizona and New Mexico. Currently, there are 14 populations of Gila trout in the wild. Additionally, the Mora National Fish Health and Technology Center (USFWS) maintains captive populations of the Main and South Diamond lineages.

Figure 1. Range of the Gila Trout:



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All relict populations (n = 4) are self-sustaining in the wild and all lineages, except the Whiskey Creek lineage, have been replicated in a sufficient number of drainages to make loss of any lineage from a natural or human-caused event unlikely. The Main Diamond Creek lineage was restored to its original habitat following its elimination by the 1989 Divide Fire. Replicates of the Main Diamond Creek population are in McKnight, lower Little, and upper White creeks and Black Canyon. Drought-modified habitat was responsible for loss of Sheep Corral Canyon population. Similarly, the South Diamond Creek lineage was restored to its original habitat following its loss in the wild by the 1995 Bonner Fire. The South Diamond Creek lineage is replicated in Mogollon Creek drainage (including Trail and Woodrow canyons and South Fork Mogollon Creek), Individuals from Whiskey Creek lineage were stocked in Langstroth Canyon in 2006, but success of this replication has not been documented. The Spruce Creek lineage is replicated in Big Dry, Dude, and Raspberry creeks. The total population size of Gila trout in the wild was estimated to be about 37,000 in 1998.

Habitat Requirements of the Gila Trout:

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, and sub-alpine coniferous forests. 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 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 less than 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 macroinvertebrate 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 waters edge, and overhanging vegetation.

Current obstacles, issues and concerns related to the continued improvement in the status of the Gila trout:

Water condition concerns:

High stream discharge variability is a defining characteristic of the environment to which Gila trout adapted. During low-flow years, marginal habitats may become too warm to support trout or surface flow may cease and stream segments 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.

Use of non-native sportfish concerns:

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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. Stocking of rainbow trout currently occurs only in habitats removed from Gila trout populations. Nonetheless, 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 renovations, mechanical removal, and relaxed angling regulations.

Land use and management issues:

Forest management includes activities that directly or indirectly affect species occurrence, density, and structure of vegetative communities. Changes in these forest variables may affect watershed characteristics such as infiltration runoff, and erosion and stream 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 degraded watershed condition, stream habitats and riparian environments, resulting in reduced habitat suitability for salmonids. Historically, widespread and uncontrolled livestock grazing contributed to habitat modifications and ultimately to decline of Gila trout. Severe forest fires capable of extirpating or greatly diminishing fish populations are relatively recent phenomena, resulting from the cumulative effects of historical or ongoing

overgrazing by domestic livestock and fire suppression.

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 1900s. Although current stocking of rainbow trout occurs only in locations a 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 and McKenna creeks) and detection of recent 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 renovation to remove all remaining trout. Hybridization is a threat to Gila trout because it results in 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.

Fish Disease Considerations:

The carrier of Bacterial Kidney Disease (BKD), the gram-positive bacterium *Renibacterium salmoninarum*, has been detected in very low levels in the Whiskey Creek population of Gila trout, (J. Landye, U.S. Fish and Wildlife Service, pers. comm.). Although the carrier is present (an indication that the population was exposed to BKD sometime within its recent history), there is no evidence of the disease in the Whiskey population. Whirling disease is

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not present in any wild or hatchery population of Gila trout.

Opportunities to Improve the Status of Gila Trout

Gila trout was once widespread in the upper Gila River drainage, but declined because of hybridization with rainbow trout, predation by and competition with brown trout, and habitat Degradation and loss. Currently, Gila trout persists as 14 populations in headwater 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 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 conserve a native faunal component of the Gila River drainage in New Mexico and Arizona. Conservation of this species that has evolved and adapted over thousands of years to the highly variable habitats of the mountain southwest will be accomplished by implementing recommendations of the Gila Trout Recovery Plan (USFWS 2003). Restoration streams for repatriating Gila trout are largely on lands managed by the U.S. Forest Service. Many potential restoration streams are located within Federally-designated wilderness.

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

- involve 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:

Monitor and manage existing Gila trout populations
Restore populations with genetically appropriate fish in renovated streams
Continue to utilize GT 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 dispersed 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
Regularly monitor habitat of each occupied

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stream and asses in comparison to baseline conditions

Complete needed habitat improvement or provide protection (e.g., stream closure)

Develop BMPs, AMPs or FPs for land use activities in GT drainages to reduce impacts to aquatic habitats

Manage and reduce 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 in place to ensure that all populations of Gila Trout and their habitats are protected and maintained.

Key actions include:

Enforce and, if necessary, promulgate regulations, laws, and policies that protect extant populations and contribute to fulfilling recovery objectives for Gila trout

Implement appropriate laws and regulations to enable Gila trout populations to persist and sustain limited commercial, scientific, and recreational uses.

Highest Priority Actions for GT protection and de-listing:

- 1. Gila, San Francisco and Verde River Watersheds**
 - a. Construct new and maintain existing stream barriers.**
 - b. Eliminate non-native trout from as much of historical range as possible.**
 - c. Identify, select, and evaluate restoration streams in drainage complexes.**
 - d. Complete NEPA documentation for stream renovations.**

- e. Renovate streams and establish additional Gila trout populations.**
- f. Monitor all populations and habitat.**
- g. Support research to acquire information needed to restore and conserve Gila trout**

Estimated 5-year need (thousands of dollars)

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

Estimated 10-yr need (thousands of dollars)

- Establish Populations \$310**
- Protect Populations and Habitat \$605**
- Investigate Conservation Issues \$159**

References:

- 1. U.S. Fish and Wildlife Service. 2003. Gila Trout Recovery Plan (third revision). Albuquerque, New Mexico. i-vii + 78 pp.**

On-going partnerships and joint ventures

Recovery Activities-NM Department of Game and Fish, U.S. Fish and Wildlife Service, U.S. Forest Service, Arizona Game and Fish Department, Trout Unlimited

Genetics-University of New Mexico Dr. Thomas Turner, NMDGF, USFWS.

Hatchery-USFWS Mora National Fish Hatchery and Technology Center.