

California Golden trout (*Oncorhynchus mykiss aguabonita*)

Data: 2004 Conservation Assessment and Strategy for the California Golden Trout

Partners: CDFG, FWS, FS, Trout Unlimited, Patagonia Inc.

California Golden Trout Status: California golden trout was designated by the U. S. Fish and Wildlife Service (USFWS) in 1991 as a Category 2 Candidate Species until deletion of that category in 1996. It is now designated as a Species of Concern. The U.S. Forest Service Region 5 has recently added California golden trout to its Sensitive Species List and the California Department of Fish and Game (CDFG) has designated it as a Species of Special Concern. It was petitioned for Federal listing as Endangered by Trout Unlimited in 2000 (Trout Unlimited 2000). After completing the initial review of the listing package, called a 90-day finding, the USFWS determined that substantial evidence exists to support the petitioned action. The USFWS is in the process of a 12-month review to decide whether or not to propose the California golden trout for listing pursuant to the Endangered Species Act of 1973, as amended. At the end of this review period, the USFWS will determine whether listing is “not warranted,” “warranted” or “warranted but precluded” due to the precedence of higher priority listing actions.

Sportfishing Importance of the CGT:

The brilliant coloration of CGT has made them a favorite of Sierra anglers for over 130 years. California’s legislature acknowledged their importance by designating the CGT as the State Fish in 1947. Out-of-basin populations established in the Cottonwood Creek drainage, a tributary of the Owens River, provided the source for sportfish stocking of CGT in much of the Sierra. In 1891, 50 fish were transplanted from the creek into Cottonwood Lakes. These fish have served as the broodstock for the CDFG’s CGT backcountry lake stocking program since 1918. Several hundred lakes in the central and southern Sierra have CGT from this source as well as waters in several other western states.

Anglers continue to enjoy fishing for CGT in the High Sierra lakes and streams as well as the streams of the original range on the Kern Plateau. Anglers are targeting the CGT in the SFKR and GTC drainages as part of an angler recognition program that promotes fishing opportunities for California native trout, the California Heritage Trout Challenge.

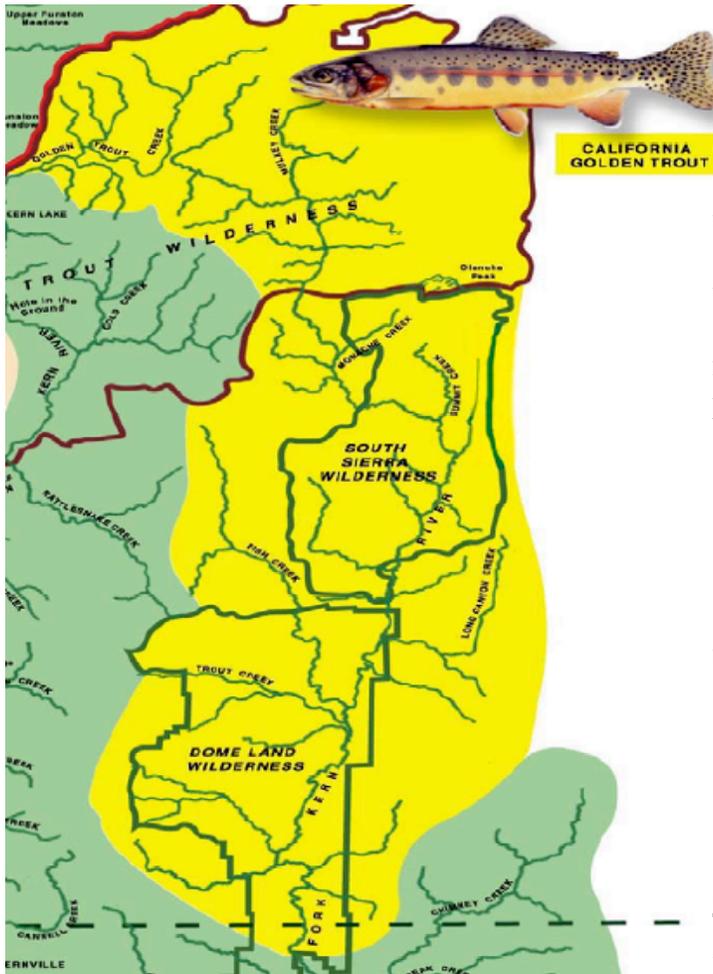
Distribution of the California Golden Trout:

The historic range of California golden trout (CGT) includes two watersheds draining the Kern Plateau of the southern Sierra Nevada Mountain Range in California. CGT are native to Golden Trout Creek (GTC) and the South Fork of the Kern River (SFKR), an area encompassing approximately 593 square miles (1,536 sq. km). They historically occupied GTC from the headwaters, with the possible exception of the upper reaches of some tributary streams and headwater lakes, downstream to a series of waterfalls near the mouth. In the SFKR, CGT were present from the headwaters downstream at least to the southern

end of the present-day Dome Land Wilderness (Figure 1) and perhaps downstream of Lake Isabella. They may also be found in several populations outside of their original range established from transplants from GTC about 100 years ago. Many populations outside the original range are established from stocking of hatchery produced fingerlings from the Cottonwood Lakes brood stock, which were discovered in the 1990’s to be hybridized with rainbow trout. These are found primarily in the Sierra Nevada between Yosemite and Sequoia/Kings Canyon National Parks.

California Golden Trout (*Oncorhynchus mykiss aguabonita*)

Figure 1. Range of the California golden trout, located on the Kern Plateau, southern Sierra Nevada.



gradients. Annual precipitation ranges from 15 to 40 inches (38-102 cm) at higher elevations to 10 to 30 inches (25-76 cm) at low elevations (NOAA 1973).

The GTC watershed covers 60 square miles (155-sq. km). Elevations range from 10,800 feet (3,294 m) at Rocky Basin Lakes to less than 7,000 feet (2,135 m) at the confluence of GTC and the Kern River. The GTC watershed varies from large, high-elevation meadows with grass/sedge vegetation and low gradients, to narrow, steep canyons and waterfalls. Annual precipitation ranges from 15 to 40 inches (38-102 cm).

Originally found in the streams of the interconnected meadows and in the steep gradient sections of the Kern Plateau transplanted and stocked CGT have also adapted to a variety of the high elevation lakes of the central and southern Sierra Nevada.

Obstacles, Concerns and Threats to the continued expansion and recovery of California Golden Trout:

Genetic Concerns:

Founder Effect is defined as random genetic changes caused when a population is established from another, using only a few individuals. This usually results in a loss of genetic variation and is referred to as a genetic bottleneck. In 1876, 12 CGT transplanted from either GTC or SFKR (the source is unclear) into the Cottonwood Creek watershed (i.e., small founding population) were the source for the 1891 transplant to Cottonwood Lakes. From this transplant history and the electrophoretic evaluation of 62 protein-coding loci of various CGT samples, Leary and Allendorf (1993) offered an important conclusion. They identified a loss of genetic variation in association with the small founding populations. Moreover, they concluded that the more generations away from the donor

Habitat Requirements of the CGT: The SFKR watershed covers 533 square miles (1,380-sq. km). Its headwaters are in the eastern section of the Kern Plateau in the Golden Trout Wilderness, starting at South Fork and Mulkey Meadows (headwaters of Mulkey Creek). Stream elevations range from 10,400 feet (3,172 m) above mean sea level near the headwaters to approximately 2,605 feet (795 m) at Lake Isabella. The river habitat and surrounding vegetation varies from large, high-elevation, low-gradient meadows with sedges (*Carex* spp.), rushes (*Juncus* spp), willows (*Salix* spp), sagebrush (*Artemisia* spp.), and grasses (various genera), to reaches with narrow, rocky, steep-walled canyons and steep

Western Native Trout Status report

California Golden Trout (*Oncorhynchus mykiss aguabonita*)

population the new population was, the greater the reduction of genetic diversity.

Because only a few trout were likely used to establish most of the out-of-basin populations of CGT, there has probably been a successive reduction of genetic diversity in each newly established population. Therefore, when considering specific populations as a source for restoration purposes, not all CGT populations may be of equal value, especially those established using relatively few adult trout.

Non-native Fish Concerns:

It is recognized now, by far the greatest threat to the continued existence of CGT is from hybridization and introgression with non-native rainbow trout. CGT readily hybridize with other subspecies of rainbow and cutthroat trout (*O. clarki* spp.). Hybridization with close relatives such as rainbow trout dilutes the fundamental genetic character of CGT, resulting in a significant loss to the native gene pool over time.

The CDFG maintains a catchable trout stocking program at Kennedy Meadows, upstream of Fish Creek in the SFKR drainage (Fig. 1). They are currently using catchable-size triploid rainbow trout to avoid further introgression.

Three man-made barriers to upstream fish movement have been constructed on the SFKR in recent years to prevent further invasion of the headwaters by non-native trout. There is the uppermost Ramshaw barrier, the middle Templeton barrier and downstream Schaeffer Barrier. The barriers are fairly evenly spaced, with the lowermost Schaeffer barrier upstream of Olancho Peak (Fig. 1). Self-sustaining populations of brown, rainbow and golden x rainbow trout hybrids exist in the SFKR downstream of Templeton Barrier. The reproduction of stocked rainbow trout with CGT exacerbates the problem of hybridization and is the likely cause of the high levels of introgression (88%) that have been documented

in the lower reaches of occupied CGT habitat in the SFKR. Predation by non-native brown trout can devastate CGT populations and therefore is a conservation issue. Brown trout are present in over 300 miles (778 km) of historic CGT habitat on the SFKR. They occupy habitat in the river, and many tributary streams downstream of Templeton Barrier. Brown trout prey on all life stages of golden trout. They compete with CGT for resources, which may be limited, such as food and space, particularly in the few deep pool habitats.

Illegal transplanting of trout is a real and continuing threat to the continued existence of CGT.

Habitat degradation concerns:

Due to the remoteness of most of the Kern Plateau, the diversity of land uses is limited. The use with the highest impact and that which has caused most of the habitat degradation is grazing of domestic livestock. There are four major grazing allotments that have historically impacted meadow and riparian habitat. It is important to note that these grazing impacts affect most meadow and riparian dependent species, not just fish. The impacts of grazing to CGT habitats include the loss of pool habitat, sedimentation, reduced instream cover, riparian cover loss, loss of undercut streambanks, stream channels becoming wider and shallower, the resultant inability of the system to buffer temperature extremes (increased summer water temperatures and threat of icing in colder months), loss of quality spawning habitat and reduction of instream and riparian area food production. Riparian and meadow habitat degradation is common to both the SFKR and GTC watersheds in many areas where cattle-grazing is permitted. Recreational use can have a similar negative impact on streambanks, but the damage is limited to a few sections of the SFKR.

Fire and drought can cause catastrophic impacts to CGT habitat. Past fire suppression

California Golden Trout (*Oncorhynchus mykiss aguabonita*)

efforts have increased level of fuel loading which appears to have increased the severity and duration of recent fires. New wildland fire management programs may help reduce future fire intensity.

While these impacts may not lead to the extinction of the CGT, habitat degradation is having an impact on the size, numbers, physical condition, and structure of CGT populations (Knapp and Matthews 1996; Knapp and Dudley 1990).

Opportunities for Improvement of the status of California Golden Trout:

The conservation, recovery and enhancement of CGT will depend on approaches that address the threats to their habitat and dealing with the threats posed by non-native trout. The specific approaches that are described in the Conservation Assessment and Strategy Report will need to be prioritized and implemented within GTC and the upper SFKR watersheds.

Beginning in 2000, Inyo National Forest, the government agency responsible for land management on most of the Kern Plateau, decided to rest from grazing for ten years two of the four grazing allotments. The Templeton and Whitney allotments covered most of the GTC and upper SFKR watersheds. Studies are being conducted to document the recovery of meadow and stream habitat in the absence of grazing. It is possible that cattle could be put back onto these two allotments, so the collection of physical and biological data is critical to future management decisions. This information will be useful when the other two allotments come up for NEPA review in 2008.

Typically the actions fall within these categories:

- fish population surveys and analysis
- genetic analysis

- fish population manipulation (non-native removal, re-introduction, reducing hatchery impacts)
- habitat manipulation (barrier placement or removal, in-stream structure enhancement, flows, restoring riparian habitat)
- regulatory actions (fishing regulations, water use, land management)

Population Surveys, genetic analyses, and fish population manipulation:

Key actions will include:

Locate and assess CGT populations
Conduct standardized surveys and genetic analyses and long-term monitoring
Expand CGT populations through reintroductions, reducing impacts of stocked fish, protective fishing regulations
Maintain and improve the genetic integrity, population structure and ecosystem structure and ecosystem elements of CGT. Develop a genetics management plan which will lay out the options and consequences of management decisions.

CGT Habitat Manipulations:

Restoration of golden trout habitat will have to address both habitat quality issues and issues of spatial limitations. Current efforts to manage CGT have been directed toward improving in-stream and meadow conditions and restoring limited stream fragments.

Primary Habitat Actions to be addressed:

Improve riparian and instream habitat for the restoration of CGT populations.

Restore and improve altered channel beds and riparian zone habitats

California Golden Trout (*Oncorhynchus mykiss aguabonita*)

Restore and enhance water flow , quality and sediment regimes
Address public and private land ,management practices to improve habitat
Monitor and evaluate natural catastrophe impacts like fire and drought
Document the recovery of meadow and stream habitat on the Whitney and Templeton grazing allotments in the absence of grazing.

Expand Education and Outreach programs to garner public support for CGT:

Priority Actions to be addressed:

Expand public education efforts regarding CGT restoration efforts
Enforcement of State Fish & Game laws to protect CGT

Highest priority Actions for CGT:

- **Develop a CGT genetics management plan.**
- **Monitor stream and meadow habitat and bioassessment of species in two rested grazing allotments. Compare these results to the two allotments that continue to be grazed.**
- **Continue to coordinate and use volunteers to accomplish some of the field work**
- **Conduct baseline genetic analysis of trout populations. Monitor these populations every five years for changes in levels of introgression.**
- **Monitor fish populations (numbers, size, condition)**
- **Monitor integrity and effectiveness of the three fish barriers on the SFKR.**
 - **Resolve the non-native trout stocking**

- **Review and update Implementation Plan (work plan) annually.**
- **Continue public outreach efforts, including the consequences of illegal fish transplantation.**
- **Continue enforcement of Fish and Game regulations, including efforts to prevent illegal trout transplantation.**

1. Golden Trout Creek Watershed

- **Remove source of introgressed trout in headwater lakes: Johnson, Rocky Basin and Chicken Springs (accomplished)**
- **Conduct baseline genetic analysis to determine current levels of hybridization**
- **Monitor levels of hybridization every five years and note trends in levels.**
- **Evaluate the CGT population in Volcano Creek, a tributary to GTC.**
- **Establish refuges within and outside the native range for CGT based on criteria to be developed.**
- **Look for out-of-basin CGT populations that may have restoration value. Do not reintroduce any of these fish into GTC or headwater lakes.**

1. South Fork of the Kern River Watershed

- **Monitor effectiveness and integrity of the three barriers to upstream fish movement.**
 - **Eliminate brown and rainbow trout that are downstream from Templeton Barrier as appropriate.**
 - **Consider the need for additional downstream barriers in remote locations of the SFKR.**
- issue at Kennedy Meadows.**

California Golden Trout (*Oncorhynchus mykiss aguabonita*)

the Wildlife and Sport Fish Restoration Program of the U.S. Fish and Wildlife Service and jointly managed with the Association of Fish and Wildlife Agencies, 2006-9.

Completed Projects

1. CGT data collections and habitat assessments – 2008

References:

Conservation Assessment and Strategy for the California Golden Trout (*Oncorhynchus mykiss aguabonita*) 2004.

Knapp, R.A. and K.R. Matthews 1996. Livestock grazing, golden trout, and streams in the Golden Trout Wilderness, California: impacts and management implications. North American Journal of Fisheries Management 16: 805-820.

Knapp, R.A. and T.L. Dudley 1990. Growth and longevity of golden trout, *Oncorhynchus aguabonita*, in their native streams. California Fish and Game 76: 161-173.

Leary, R.F. and F.W. Allendorf 1993. California golden trout, founder effects, and lost genetic diversity. Division of Biological Sciences, Univ. of Montana, Missoula, MT, Wild Trout and Salmon Genetics Laboratory Report 93/2. 18pp.

NOAA 1973. Precipitation-frequency of the western United States, Volume XI-California. National Oceanic and Atmospheric Administration, Silver Springs, MD.

Trout Unlimited, Oct. 13, 2000. Petition to list the California Golden Trout (*Oncorhynchus mykiss aguabonita*) as an Endangered Species under the Federal Endangered Species Act.



This publication was funded (or partially funded) by Federal Aid to Sportfish Restoration Funds through the Multistate Conservation Grant Program (Grant WY M-8-P), a program supported with funds from

Western Native Trout Status report