Trappers Lake

Resurrecting a native conservation population of Colorado River cutthroat trout

By

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Introduction

The Colorado Division of Wildlife is currently engaged in the implementation of the Colorado River Cutthroat Trout Conservation Agreement and Strategy. The primary goal of that document is to assure the long-term prosperity of the sub-species. Trappers Lake has always been a key element in the management of Colorado cutthroat trout, for its historically robust native cutthroat trout population located in the center of the range of the subspecies. This lake was home to Colorado's premier wild Colorado River cutthroat trout fishery and one of the last fisheries in Colorado to be sustained entirely by natural reproduction (Babcock 1971). Unfortunately, a variety of factors have served to decimate the current population as well as marginalize the value of the current fishery due to introgression with Yellowstone cutthroat trout. Brook trout have been implicated in the demise of the current population, but little information exists regarding current population structure. Recent genetic surveys have revealed hybridization of 50% in the remaining cutthroat trout, precluding their inclusion in our recovery goals. Because we have a repository of original Trappers Lake (pre-hybridization) stock in Lake Nanita as a brood source, reestablishing a population of cutthroat trout following reclamation would be straightforward. The sheer size of the lake and surrounding drainage however may make traditional reclamation efforts difficult. Non-traditional methods may need to be explored to improve the genetic structure of the cutthroat trout population in the lake, and for resurrecting the fishery.

History

Trappers Lake lies about 50 miles east of Meeker in the headwaters of the North Fork of the White River. The lake is surrounded by the White River National Forest and the Flattops Wilderness at an elevation of 9600 ft. The lake covers 287 surface acres and has a maximum depth of 170 feet. Three tributaries feed the lake, but the vast majority of the cutthroat trout are produced in Cabin Creek (McAfee 1996). Fish managers took advantage of this readily available source of cutthroat trout eggs by building a hatchery on Cabin Creek. The first egg take occurred in 1914, and by the 1920s over two million eggs a year were being taken from the Cabin Creek run while maintaining a robust population of native cutthroat trout in the lake. In the 1930s, progeny were moved to the

fishless Lake Nanita in Rocky Mountain National Park as well as the Williamson Lakes in California. Both populations now support wild populations of cutthroat trout seventy years later, and provide a source of original Trappers Lake fish. In 1937 the cutthroat trout population in Trappers Lake crashed. This crash was attributed to Gyrodactylus, and only 100,000 eggs were taken that year causing the Division of Wildlife to suspend the egg take operation. In an effort to rebuild the population, readily available Yellowstone cutthroat trout were stocked in to Trappers Lake over a period of eight years from 1943-1950. By 1954, spawn operations resumed, and up to three millions eggs per year were taken from the lake. Brook trout were discovered in Trappers Lake in the early 1980s, and declines in the run of cutthroat trout were apparent by the mid 1990s. With the development of a Lake Nanita Colorado River cutthroat trout broodstock at the Glenwood Hatchery, the demand for hybrid cutthroat trout from Trappers Lake was diminished. Spawning operations were therefore again suspended in 2000.

Objectives

1. To include the Trappers Lake system as a conservation population in our recovery plan by enhancing the purity of the current population
2. To ameliorate the threat of brook trout to the fishery
3. To monitor whirling disease infection in the system

Overview

Once baseline information has been established, the purity of the resident cutthroat trout population will be elevated by restricting access to spawning streams by resident hybrid cutthroat trout with temporary barriers and fish traps. Wild recruitment will be replaced with pure Trappers Lake strain fingerling trout from Lake Nanita to be stocked on an annual basis. Though these fish can be separated from hybrid residents with standard molecular techniques, they will be given an adipose clip prior to stocking to facilitate rapid inexpensive identification. Once these pure fish achieve adult size, removal of hybrid fish (those with adipose fins) can be implemented physically during spring trapping, and/or by relaxing the angling regulations to include harvest of all cutthroat trout with adipose fins. Extensive stream and lake surveys in waters that feed

Trappers Lake will be used to assess the viability of reclamation in those waters to reduce their contribution of hybrid genetics to the system. When adult fish with adipose fins are eliminated from the lake, the existing population of fish will be allowed to resume spawning naturally. Wild recruitment from those matings will be tested to evaluate genetic purity.

An attempt to reduce brook trout competition will be initiated following the determination of population size. Mature brook trout will be captured each fall during the spawning run with trap nets set on the east shore of the lake and euthanized. Response in the brook trout population to removal efforts will be monitored with the methods discussed earlier with emphasis on summer shoreline fry electrofishing. If a decline in the number of brook trout fry the following year is not documented, then physical removal of fry may also be implemented.

Sampling efforts will facilitate the collection of fish required to test for the presence and severity of whirling disease in the system. Gill net mortalities will be used to assess levels of infection in the adult populations of brook and cutthroat trout, while young of the year fish obtained from fry surveys will be analyzed with PCR. Levels of infection will be closely monitored to determine if the disease poses a threat to natural recruitment.

Approach

Early phases of this project will establish baseline information on both brook and cutthroat trout populations through standardized gill netting and shoreline electrofishing surveys. Shoreline fry surveys will allow estimation of brook and cutthroat trout fry production. Determination of population structure and size will be enhanced with a mark-recapture population estimation program and side-scanning sonar technology. Work will be conducted during the week to minimize exposure to other Wilderness users.

Introgression

The propagation of hybrid genetics will be restricted by resurrecting the barrier on Cabin Creek, preventing hybridized adult cutthroat trout from finding appropriate spawning habitat. Limiting reproduction of resident hybrid cutthroat trout will require at least a barrier on Cabin Creek where 80% of the natural reproduction historically

occurred (McAfee 1996). We are concerned if spawning up Cabin Creek is restricted, that fish will alternative spawning gravels up Fraser and Heberton Creeks. Spawning in those two tributaries will need to be evaluated when Cabin Creek is blocked to evaluate the need for additional barriers. Temporary barriers would be deployed either in June (to restrict entry of spawning adults) or August (to trap emerging fry). Adult barriers would be constructed from hardware cloth (Heberton and Fraser Creek) or bar screens (Cabin Creek). Fry barriers would be simple weirs constructed with much smaller mesh cloth. Materials would be stored in the DOW cabin during the remainder of the year. These barriers would only be deployed until the pure Trappers Lake cutthroat trout currently being stocked out are old enough to spawn naturally (in three years).

Stocking will play a critical roll in elevating the genetic purity of the resident cutthroat population. While natural reproduction of the resident hybrid cutthroat population is restricted, natural recruitment will be replaced with pure fish developed from the Glenwood Springs hatchery broodstock. These broodfish were raised from fertilized eggs obtained at Lake Nanita in Rocky Mountain National Park. This population was founded from eggs taken at Trappers Lake in 1933 prior to the introduction of Yellowstone cutthroat trout or rainbow trout in to the system. As such, they are the most appropriate stock for resurrecting the Trappers Lake population. A small percentage of these fry display short opercles that have been attributed to a genetic bottleneck. However, this malady, as well as other forms of asymmetry, have been shown to also develop in hatchery settings as a result of nutrient deficiencies or water quality (Allenbach et al. 1999). While additional research is being conducted to resolve this concern, it is comforting to know that the original founding population that was used for Lake Nanita was derived from 30,000 fertilized eggs. An average female at the time produced 675 eggs (Snyder 1960), so we might assume that at least 45 mothers were represented in the population. Since fertilized eggs taken on a given day are generally pooled prior to shipment to the hatchery, it is likely that more mothers were used. Additionally, despite handling over 250 fish in the last wild spawn operation at Lake Nanita, no short opercles were detected.

Much debate was given to the densities to be stocked. Since the objective is to swamp out the resident hybrid genetics, higher than normal stocking densities will be

used. However, since density dependent effects might preclude recruitment of any fish at extremely high densities, we settled on doubling the normal numbers recommended by CDOW stocking protocol (Nelson 1987), recognizing that as we are stocking larger fish (4 inch average), these densities are still quite liberal. All fingerlings will be given an adipose clip prior to stocking to facilitate future identification. In addition, year-class identification will be enhanced by feeding tetracycline on odd years during the rearing process. Banding patterns laid down on the otoliths by the tetracycline will help ensure that future aging efforts are accurate. Fish will be stocked directly in to the lake in the most efficient way possible.

Regulations will also play a key role in improving the genetic structure of the lake. Special regulations were first implemented at Trappers Lake in 1964. Regulations have changed several times since then and finally settled in on a daily bag limit of two cutthroat trout with a maximum size limit of 11 inches in 1993 and no bag limit on brook trout. This regulation was intended to protect the diminishing adult population of cutthroat trout in hopes of exerting some predation pressure on the growing brook trout population while protecting spawning size fish. With the stocking of pure fish that have had their adipose fins removed, we envision relaxing this regulation in the short term to facilitate removal of hybrid cutthroat trout. Anglers would be allowed to take fish with adipose fins until the stocked pure fish are large enough to reproduce naturally and stocking is terminated. If angler harvest is deemed inadequate to remove the bulk of the hybrid cutthroat population, physical removal of these fish (those with adipose fins) at the Cabin Creek trap during the spawning run may also be implemented.

While reclamation of the entire system would be difficult with traditional methods, it may be possible to reclaim the nine (Coffin, Little Trappers, Surprise, Parvin, Jewell, Wall, Star, Scotts, and Crescent) headwater lakes and 12 miles of tributary streams that flow in to the system. These lakes are fairly small, making removal of the current population with rotenone a realistic option. In fact, recent surveys indicate that several of these waters are either fishless or already contain pure native cutthroat trout. The remaining waters will be surveyed to evaluate the potential viability of small-scale reclamation efforts. Temporary barriers would then be placed in these drainages before they flow into Trappers Lake. This would allow the emigration of pure rather than hybrid

fish in to the main lake and allow development of several conservation populations (Cabin Creek drainage, Fraser Creek drainage, and Heberton Creek drainage).

Brook trout

Standardized gill netting in 2003 revealed that the brook trout now comprise over 30% of the trout population in Trappers Lake (Figure 1). Earlier work has determined that this is primarily a lake spawning population of brook trout (McAfee 1996). A variety of methods were employed in the late 1980's and early 1990's in an attempt to curb the brook trout invasion. These methods ranged from fry shocking and antimycin treatments to pop nets, spear fishing, and short-term gill net sets to control the adults. It appeared that the gill nets were most successful at acquiring large numbers of adult brook trout, but they unfortunately killed a large number of cutthroat trout as well. In an attempt to isolate a gear that would offer more selectivity, we deployed two Fyke nets during the spawning run in 2003 and captured over 100 adult brook trout in a single night. These nets offer the advantage of keeping their quarry alive so the cutthroat trout captured inadvertently (only 5% of the catch) can be returned to the lake unharmed.

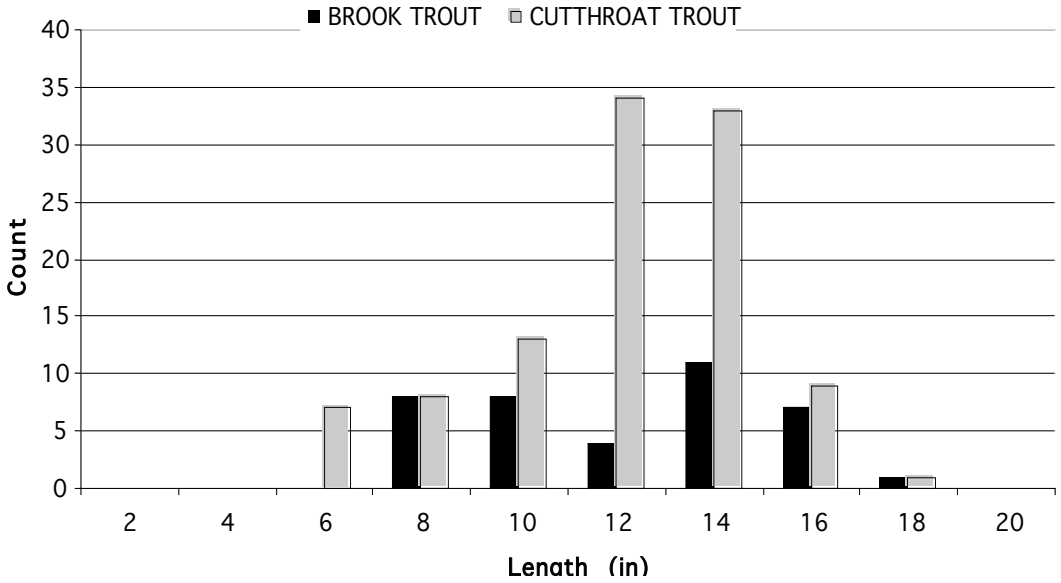

Figure 1: Standardized experimental gill net catch by species obtained in July 2003 from Trappers Lake, CO.

Baseline fry densities have been established with shoreline electrofishing and two-pass removal estimators. Efficacy of adult spawner removals will be evaluated in part by declines in fry densities. Fry densities will also be estimated in Little Trappers Lake to serve as a control. Direct declines in the adult brook trout population will be evaluated with mark-recapture surveys using Floy tags and adipose fin clips. These adult fish will be captured in six Fyke nets set on the eastern shore of the lake in October, targeting adult fish entering the shallows to spawn. These fish were marked and released in 2004. Removal efforts will begin in 2005. In addition, alternative methods such as side-scanning sonar and line-transect sampling with digital video will be explored to supplement the mark-recapture numbers, and help us evaluate our removal efforts. These twice annual surveys would be conducted midweek with a silent trolling motor to prevent any adverse experience with other Wilderness users. Should survival of YOY brook trout prove compensatory, and removal of adults ineffective, direct removal of fry with electrofishing may also be implemented.

Whirling disease

At this point whirling disease, while present, does not seem to pose a problem for future recruitment of cutthroat trout. Examination of heads from various age classes of fish indicate that the disease probably showed up in 1998 (Figure 2). Since that time, the prevalence of infection has remained approximately 50%, and infection does not exceed 50,000 spores per head. Generally we do not start to see population level declines unless spore loads are substantially higher. We are concerned that if successful in resurrecting the cutthroat population to its former abundance, that an increased number of adult cutthroat trout in the spawning run will also elevate infection. As such, prevalence and severity of whirling disease infection will be monitored closely.

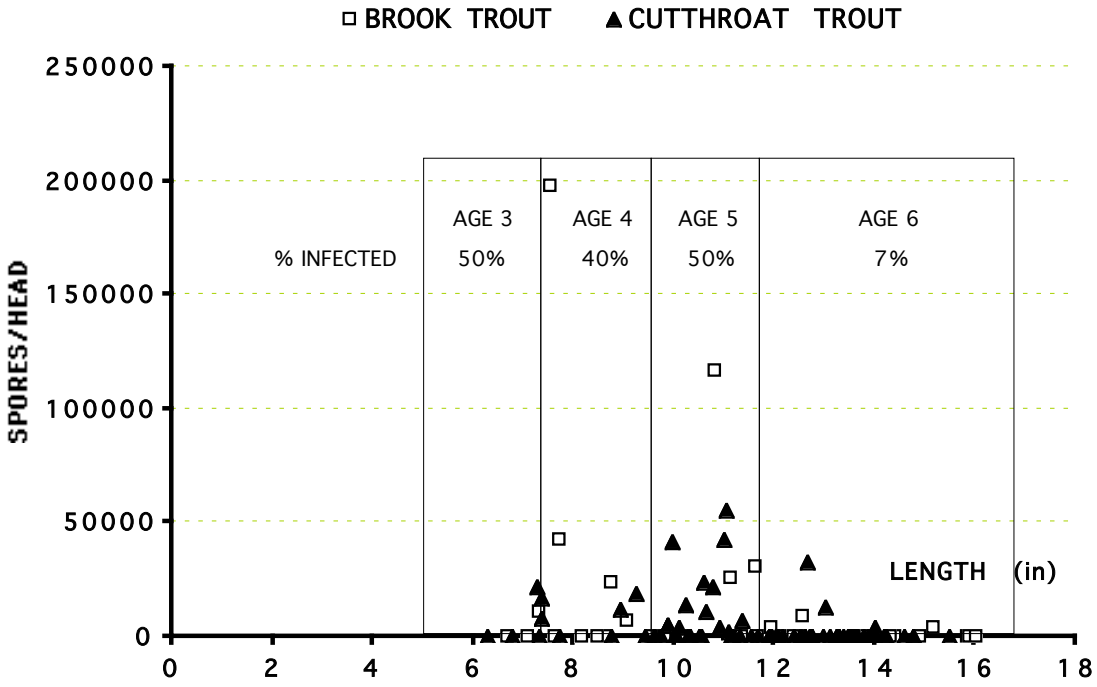

Figure 2: Whirling disease infection in brook and cutthroat trout from Trappers Lake as determined by the Pepsin-Trypsin digest method (PTD). Length at age evaluated from otoliths (McAfee 1996).

Timeline for activities

2002

- Stock 26,000 pure Nanita strain fish in anticipation of improving genetic integrity

2003

- Stocked 44,000 pure Nanita strain fish to work toward improving the genetic integrity of the resident cutthroat population. Pack plants were made into the three tributary streams (Heberton, Fraser, and Cabin Creeks), as well as, Coffin and Little Trapper Lakes.
- Established standardized gill netting stations
- Assessed levels of whirling disease infection via Polymerase Chain Reaction (PCR) test or the Pepsin-Trypsin Digest (PTD) method
- Assess viability of trap nets as a method for brook trout removal

2004

- Evaluate Heberton and Fraser Creeks for feasibility of creating temporary spawning blocks.
- Stock 40,000 pure Nanita strain fish with adipose clips to facilitate future identification. These fish will be larger than in previous years (4 inch average) to enhance survival
- Survey headwater lakes to determine feasibility of reclamation effort
- Run standardized gill net surveys for population monitoring; Collect heads for whirling disease sampling (PTD)
- Establish standardized fry electrofishing stations to evaluate recruitment of brook trout (July)
- Repeat standardized fry electrofishing stations to evaluate recruitment of cutthroat trout (September); collect samples for evaluation of whirling disease infection via PCR

- Acquire tissue samples from Williamson Lake, CA and Bench Lake, CO to assess viability of additional potential founding populations

- Initiate tagging study with fall Fyke net operation. Run six traps on the east side of the lake where spawning aggregations have been documented (McAfee 1996)

2005

- Run trap at Cabin Creek and strip eggs from hybrid females; remove fish with apparent rainbow trout morphometry

- Establish need for temporary spawning blocks in Heberton and Fraser Creeks

- Stock 40,000 pure Nanita strain fish with adipose clips to facilitate future identification. These fish will be larger than in previous years (4 inch average) to enhance survival

- Survey remaining headwater lakes and streams to determine feasibility of reclamation effort

- Run standardized gill net surveys for population monitoring; Collect heads for whirling disease sampling (PTD)

- Conduct standardized fry electrofishing to evaluate recruitment of brook trout (July)

- Repeat standardized fry electrofishing to evaluate recruitment of cutthroat trout (September); collect samples for evaluation of whirling disease infection via PCR

- Evaluate population size with sonar

- Develop line-transect monitoring to establish feasibility for establishing fish population size by species

- Continue brook trout tagging study with fall Fyke net operation and begin removal of adult brook trout.

2006

- Run trap at Cabin Creek and strip eggs from hybrid females; remove fish with apparent rainbow trout morphometry

- Stock 40,000 pure Nanita strain fish with adipose clips to facilitate future identification. These fish will be larger than in previous years (4 inch average) to enhance survival

- Conduct standardized gill net surveys to monitor population and evaluate stocking success; Collect heads for whirling disease sampling (PTD)

- Conduct standardized fry electrofishing to evaluate recruitment of brook trout (July)

- Repeat standardized fry electrofishing to evaluate recruitment of cutthroat trout (September); collect samples for evaluation of whirling disease infection via PCR

- Evaluate population size with sonar and line-transect sampling (if feasible)

- Continue brook trout tagging and removal study with fall Fyke net operation.

2007

- If mature cutthroat trout lacking adipose fins begin to show up in the spawning run in significant numbers (and strong year class of adult fish documented in 2006 standardized gill nets), begin to remove all adults with adipose fins; allow those without adipose fins to spawn naturally

- Relax angling regulations to allow for the harvest of cutthroat trout at Trappers Lake providing above conditions are met

- Stock 40,000 pure Nanita strain fish with adipose clips to facilitate future identification. These fish will be larger than in previous years (4 inch average) to enhance survival

- Conduct standardized gill net surveys to monitor population and evaluate stocking success; Collect heads for whirling disease sampling (PTD)

- Conduct standardized fry electrofishing to evaluate recruitment of brook trout (July)

- Repeat standardized fry electrofishing to evaluate recruitment of cutthroat trout (September); collect samples for evaluation of whirling disease infection via PCR

- Evaluate population size with sonar and line-transect sampling (if feasible)

- Continue brook trout tagging and removal study with fall Fyke net operation.

2008

- Continue to operate the trap at Cabin Creek while removing spawning cutthroat trout that have adipose fins
- Stock adipose clipped pure Nanita strain fish if necessary, with numbers adjusted to reflect contribution from wild recruitment
- Conduct standardized gill net surveys to monitor population and evaluate stocking success; Collect heads for whirling disease sampling (PTD)
- Conduct standardized fry electrofishing to evaluate recruitment of brook trout (July)
- Repeat standardized fry electrofishing to evaluate recruitment of cutthroat trout (September); collect samples for evaluation of whirling disease infection via PCR
- Evaluate population size with sonar and line-transect sampling (if feasible)
- Continue brook trout tagging and removal study with fall Fyke net operation.

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