

*Crater Lake National Park
Bull Trout Restoration Program*

STATUS REVIEW AND STUDY PLAN

2000

Prepared for: U.S. Fish and Wildlife Service, Klamath Falls Office

Prepared by: Mark Buktenica
Title/Position: Aquatic Ecologist
Division: Resource Preservation and Research
Organization or Park: Crater Lake National Park
Address: P.O. Box 7
Crater Lake, OR 97604
Phone #: (541) 594-2211 ext. 610
FAX #: (541) 594-2261
email: mark_buktenica@nps.gov

Abstract

Bull trout are the only native fish in Crater Lake National Park. In 1989, biologists discovered that bull trout had been drastically reduced, and restricted to a small section of one creek in the park because of the introduction of non-native brook trout. The bull trout's survival in the park was jeopardized due to competition and hybridization with the introduced brook trout. To ensure their survival, a bull trout restoration plan was written and reviewed by a panel of national experts in October 1991. The long-term goals of the plan were to: 1) restore the remnant population of bull trout to historic numbers and distribution in Sun Creek; 2) eradicate brook trout, and 3) prevent re-invasion of non-native fish. Restoration fieldwork began in 1992. Barriers were constructed to prevent re-invasion of non-native fish. Biologists used a combination of techniques to remove brook trout, including electroshocking, snorkel diving, trap nets, and the fish toxin Antimycin. Because of these efforts, bull trout populations increased from approximately 200 individuals in 1992 to 600 in 1999, and they have reclaimed approximately 7 miles of the creek. Complete brook trout removal from Sun Creek, with Antimycin, will be attempted in 2000.

Introduction

Bull trout (*Salvelinus confluentus*) are the only native fish known to inhabit Crater Lake National Park today, and Sun Creek was the only stream known to contain bull trout (Buktenica 1997). Bull trout were once distributed throughout Sun Creek starting below Sun Falls, a natural waterfall 3 km below the headwaters, and continuing downstream across the park boundary (Figure 1.) (Wallis 1948). Between 1926 and 1971, 275,000 brook trout (*S. fontinalis*) were introduced into Sun Creek, in Sun Meadow (above Sun Falls), and outside the park boundary (Dambacher et. al. 1992). By 1989, bull trout abundance declined to 100 to 300 adult fish, and their distribution was restricted to a 1.9-km stream reach. Brook trout inhabited the entire creek, and bull trout - brook trout hybrids were also found. Hybridization and competition with non-native brook trout threatened the Sun Creek bull trout population with a high risk of extinction. Because of the alarming reduction in distribution and abundance of bull trout in Sun Creek, a bull trout restoration plan was drafted and reviewed by a peer panel in October 1991. The long-term goals of the plan were to: 1) restore the remnant population of bull trout to historic numbers and distribution in Sun Creek within the park; 2) eradicate brook trout, and; 3) prevent re-invasion of non-native fish. The short-term objectives were to remove brook trout upstream and downstream of the area occupied by bull trout, and to stabilize and eventually increase bull trout abundance before stream-wide brook trout eradication was attempted. The restoration program was implemented in 1992.

Bull trout were listed as threatened under the Endangered Species Act in June 1998. In anticipation of the listing the park submitted a Supplemental Environmental and Biological Assessment to the U.S. Fish and Wildlife Service (USFWS) in January 1998. A USFWS Biological Opinion concluded that the actions outlined in the Crater Lake National Park Bull Trout Restoration Plan were beneficial to the long-term perpetuation of bull trout in the park and in the greater Klamath Basin Watershed. The Crater Lake National Park Bull Trout Restoration Program continues to receive widespread interest from State and Federal Agencies, Universities, and private landowners, with interests in trout restoration and methods development.

Results

Fish Immigration Barriers: Two log and rock fish immigration barriers were constructed near the park boundary to prevent upstream re-invasion of non-native fish (Figure 1).

Bull Trout Reach and Lower Reach: Brook trout were removed from the creek using a combination of techniques, including electroshocking, snorkel diving, trap nets, and the fish toxin Antimycin. Bull trout population estimates have increased from approximately 200 bull trout in 1992 to 600 bull trout in 1999 (Figure 2), and bull trout distribution has increased significantly (Figure 1). The estimated ratio of bull trout to brook trout, for all study reaches, was increased from roughly 1:13 to 3:1 between 1992 and 1999 (Figure 3). Brook trout were successfully removed downstream of the area occupied by bull trout with the fish poison Antimycin in 1992. Subsequent increases in trout abundance in the Lower Reach are presumably due to the downstream movement of fish.

A new in-stream trap net and electroshocking protocol was designed and implemented in 1999, fish were herded downstream into the trapnet with electroshockers. This protocol appeared to reduce the potential injury to fish from electroshocking and increase collection efficiency.

Sun Meadow Reach and Lost Creek: Brook trout were successfully removed from Sun Creek upstream of the area occupied by bull trout with electroshockers from 1992 to 1997. Brook trout were eradicated from nearby Lost Creek with Antimycin treatments in 1996 and 1997. Forty-four bull trout were introduced into Lost Creek in 1997 to serve as a refugia during subsequent Antimycin treatments to Sun Creek and to extend bull trout distribution, thereby reducing the risk of local extinction from a stochastic event.

In 1998, Sun Meadow was treated with Antimycin to make absolutely certain no brook trout remained. Although the Antimycin killed brook trout placed in live cars, no brook trout were found in the creek. During this treatment 197 bull trout were held in a streamside raceway (123) and in Lost Creek (74) in case the treatment impacted downstream bull trout. The Antimycin was detoxified one kilometer upstream of the nearest bull trout and upstream of four waterfalls and several tributaries that doubled the instream flow. Brook trout held in live cars within the bull trout area showed no signs of stress and no mortality occurred one week after the treatment.

Bull trout were held in the streamside raceway between July 28 to September 3, 1998. The maximum length of time a bull trout was held was 37 days. No mortality occurred in the raceway. One week after the Antimycin treatment bull trout held in the raceway were introduced into Sun Meadow and Lost Creek. Prior to the introduction of bull trout into Lost Creek in 1998, fish surveys were conducted to confirm survival of bull trout from the 1997 introduction. Macroinvertebrate collections were made in Sun Meadow before and after the Antimycin treatment and prior to introduction of bull trout to evaluate the impact of Antimycin to invertebrates and to make sure that an adequate abundance of invertebrates existed to support bull trout.

A fish screen was operated in Sun Meadow to prohibit bull trout from moving downstream, 19 bull trout attempted to move past the fish screen in 1998. Eight bull trout were found dead in Sun Meadow, no bull trout were found dead in Lost Creek. Dead bull trout were shipped to the Oregon Department of Fish and Wildlife (ODFW) Fish Disease Laboratory in Corvallis, Oregon for analysis. After subtracting known mortalities the total

number of bull trout introduced into Sun Meadow and Lost Creek was 70 and 119 respectively.

Hatchery rearing: Immature trout (young-of-the-year) are small and the physical characteristics used to identify brook trout and bull trout are poorly developed. Because of this we are working with the Oregon Department of Fish and Wildlife, Klamath Hatchery to develop techniques for rearing young trout from Sun Creek to a size at which they can be reliably identified to species. Fourteen young-of-the-year trout from Sun Creek were transported to the Klamath Hatchery for rearing in 1999. Initial results indicated that hatchery growth was rapid and some of the fish were large enough to reliably identify to species by October.

1999 Antimycin Treatment: Due to an above average snow pack and late snow melt in 1999 the planned Antimycin treatment was not feasible. The late snowmelt delayed the start of fieldwork until August, and increased summer base flow. Because of the late start there was insufficient time to collect bull trout prior to chemical treatment. Chemical treatment must be completed by early September in order to remove brook trout prior to spawning. The abnormally high summer base flow increased the amount of Antimycin required, and increased the complexity of the mechanical application of the chemical, raising the potential for an unsuccessful treatment.

2000 Restoration Plan

In 2000, bull trout will be removed from Sun Creek, below Sun Meadow, with barbless angling techniques, trapping, and electroshocking. Adult and juvenile bull trout will be held in a streamside raceway. Young-of-the-year bull trout and brook trout will be collected and held in an Oregon State Fish Hatchery until brook trout and bull trout can be reliably identified and separated. Sun Creek, below Sun Meadow to the park boundary, will be treated with Antimycin to remove the remaining brook trout. The Antimycin will be detoxified with potassium permanganate near the park boundary.

Macroinvertebrate collections will be made before and after the Antimycin treatment to evaluate impact to invertebrates and to insure adequate invertebrate abundance before bull trout are returned to the stream. Adult and juvenile bull trout will be returned to the stream one week following the Antimycin treatment. Young-of-the-year bull trout collected in 2000 will be returned to Sun Creek in the fall of 2000 or summer 2001.

Federal and State permits associated with the use of Antimycin, and the temporary water diversion through the raceway will be renewed in 2000. All monitoring requirements associated with these permits will be complied with.

Literature Cited

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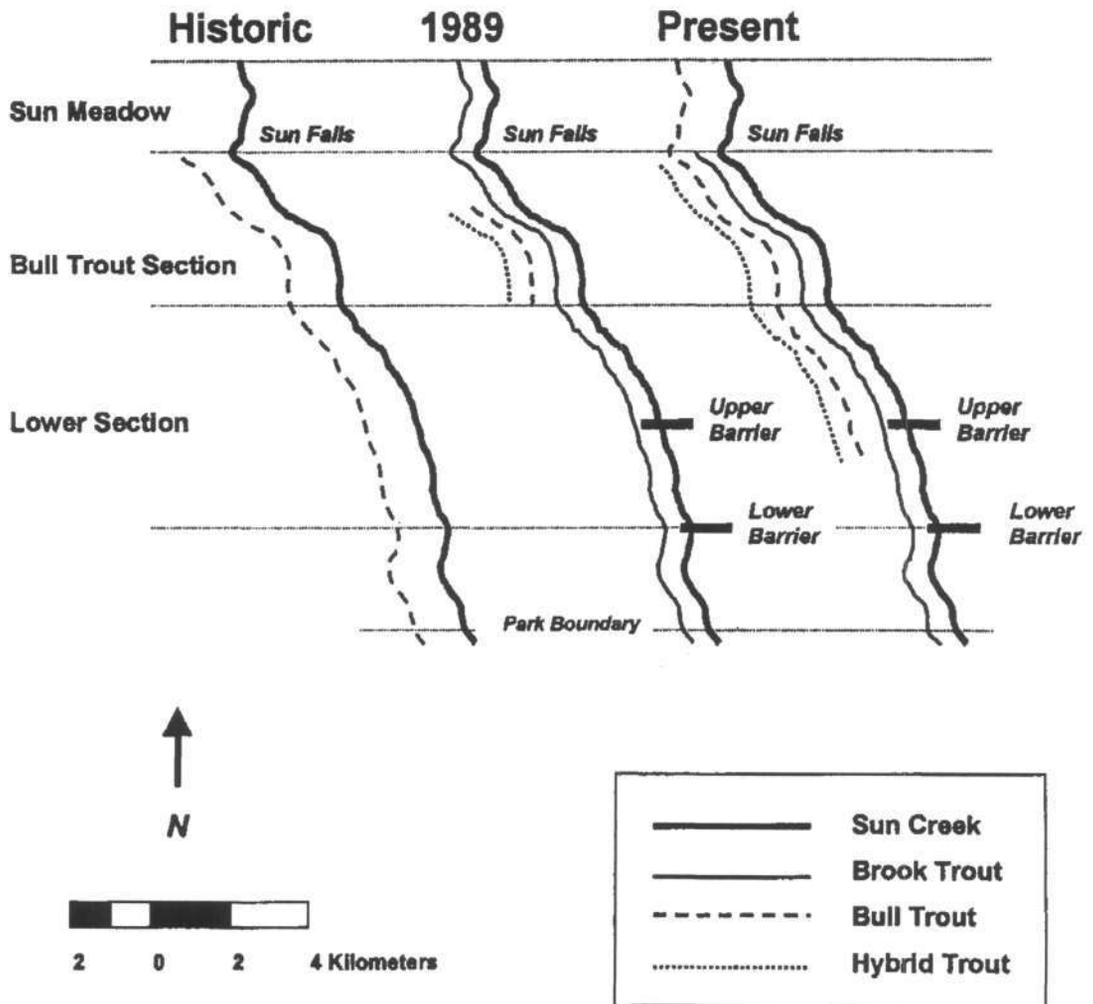


Figure 1. Past and present fish distribution maps for bull trout, brook trout, and hybrid trout in the Sun Meadow, Bull Trout, and Lower Study Reaches of Sun Creek.

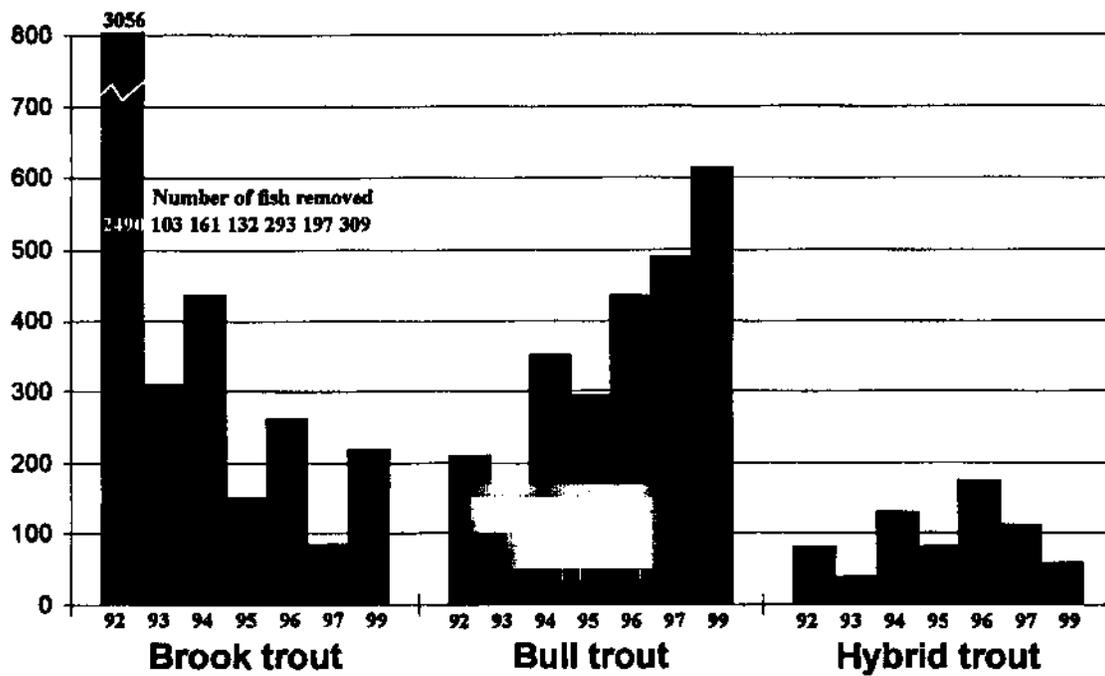
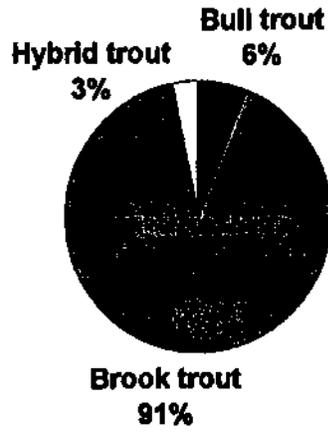


Figure 2. Population estimates of brook trout, bull trout, and hybrid trout, and the number of brook trout removed in Sun Creek, from 1992 to 1999. No census information was available for 1998.

1992



1999

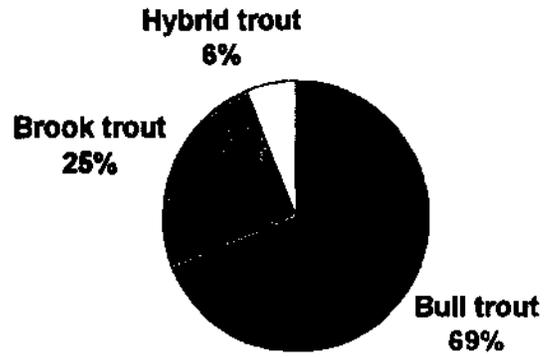


Figure 3. Percent brook trout, bull trout, and hybrid trout in Sun Creek, 1992 and 1999.