State of California
The Resources Agency
Department of Fish and Wildlife

Burnside Lake Broodstock / Catchable Trout Stocking Evaluation

Alpine County, California

A collaborative evaluation between Fisheries Branch and the North Central Region

Michael Mamola
Environmental Scientist
Trout Stocking Evaluations

Ben Ewing
Environmental Scientist
Alpine, Amador, Calaveras, Lake County

15 September 2017

This project was funded in part by the Federal Aid in Sport Fish Restoration Act
F17AF00346

Burnside Lake Broodstock / Catchable Trout Stocking Evaluation

Introduction

Burnside Lake (Figure 1 & 2) sits at an elevation of 8,185 feet above mean sea level and has a surface area of 125 acres. The littoral zone habitat consists primarily of silt, submerged rock substrate, and aquatic vegetation. Burnside Lake drains into Hot Springs Creek, which drains to Markleeville Creek, and ultimately to the Carson River. The terrestrial habitat consists of mixed conifer forest dominated by Ponderosa Pine *Pinus ponderosa*. The lake offers tent camping and day use free of charge. Burnside Lake experiences heavy recreational use and is one the geographically closest "fishable" lakes to the town of Markleeville.

Figure 1. Burnside Lake's regional location in California

Figure 2. Burnside Lake, Alpine County

History

Historic records for Burnside Lake indicate that Brook Trout *Salvelinus fontinalis*, Golden Trout *Oncorhynchus mykiss aquabonita* and Rainbow Trout *Onchorynchus mykiss* (RT) were historically stocked into the lake, and that a self-sustaining population of Tui Chub *Gila bicolor* (TC) are currently present.

Evaluation Objective

The objective of the broodstock / catchable trout stocking evaluation was to determine if Burnside Lake would be an environmentally appropriate body of water to enhance trophy trout angling opportunities for more urbanized populations; utilizing existing broodstock Lahontan Cutthroat Trout *Oncorhynchus clarkia henshawi* (LCT) in a zero-limit, special regulation fishery.

Methods

To determine habitat suitability for broodstock LCT, CDFW staff conducted two individual sampling events over the 2017 season. These two sampling events collected data related to fish composition present in the lake, invertebrate assemblages, invasive species, habitat present at the lake, and water quality. The sampling methods were as follows:

Fishes

On July 12, 2017, an angler survey was conducted at Burnside Lake utilizing CDFW staff and volunteers. The purpose of the survey was to determine if any fish were present from prior CDFW stocking events, collect data on total length, and determine the assemblage of fish present.

Invertebrates

Invertebrate sampling occurred in Burnside Lake on July 12, 2017. A dip net was used at multiple sampling locations at both sites to collect invertebrates present. A total of 10 one square foot scoops with the dip net were taken from the vegetated bank, 4 scoops from areas with woody debris, 3 scoops from the silt bottom, and 3 scoops from any rock or gravel substrate present. Invertebrates were then preserved in 70% alcohol and were identified to suborder. Abundance of each suborder was recorded and used to determine a benthic macroinvertebrate index indicating diversity of a potential food base, as well as water quality.

Invasive Species

New Zealand mud snail presence / absence surveys were conducted on July 12, 2017 utilizing a standard operating procedure provided by the Regional Invasive Species Coordinator.

Habitat

Habitat data was collected on July 12, 2017 and September 14, 2017. Data collected included substrate composition, bank vegetation composition, aquatic plant growth, algae growth, surface water appearance, and barriers to fish passage.

Water Quality

Water quality data was collected on July 12, 2017 and September 14, 2017 . Depth, temperature, and dissolved oxygen were taken at multiple locations on Burnside Lake.

Results

Fishes

An angler survey was conducted on July 12, 2017 by CDFW staff and volunteers. A total of nine anglers fished for a combined 44.75 hours. A total of three RT and eight TC were caught that ranged in length from 96 mm to 292 mm (Table 1).

Table 1. - Fish assemblage collected on July 12, 2017.

Species	Length (mm)
TC	101
TC	112
TC	96
TC	105
TC	118
TC	145
TC	98
TC	103
RT	292
RT	270
RT	280

Invertebrates

Representatives of multiple suborders of aquatic invertebrates were collected during one sampling event on Burnside Lake in 2017. The primary invertebrates represented in the sampling events were those suborders which included caddisflies, dragonflies, and damselflies (Table 2).

Table 2. Invertebrate assemblage collected on July 12, 2017

Metrics (estimated encountered)	Inlet	Outlet	Dam	Tributary	Shoreline
Stonefly					
Caddisfly		100	50		20
Mayfly		10	10		1
Dragonfly/Damselfly		15	50		27
Fishfly/Alderfly					
Midge					100
True Fly Larvae					
Crustacea					
Clams					
Snails					
Aquatic Worms					
Leeches					

Invasive Species

Zero New Zealand mud snails were detected in Burnside Lake during both survey events.

Physical Habitat

Aquatic, semi-aquatic, and terrestrial habitat and cover on Burnside Lake was identified and is rated as adequate for fish utilization. The primary terrestrial form of vegetation are pines (varying species), and the primary submerged and semi-emergent vegetation was comprised of emergent grasses. The primary substrate at Burnside Lake is silt with minimal cobble found at the entrance to Hot Spring Creek. (Table 3).

Table 3. Results of the Physical Habitat Assessment conducted on July 12, 2017 and September 14, 2017.

Metrics	Inlet	Outlet	Dam	Tributary	Shoreline
Dominant trees, brush, grasses----------		Trees: 100%	Trees: 100%		G,T,B: 100%
Habitat type (riffle, flatwater, pool)----------		Riffle	Flatwater		Flatwater
Shoreline cover (excellent, good, fair, poor)----------		Excellent	Good		Excellent
Aquatic cover (vegetation, boulders, woody debris)------		Boulder, Wood	Boulder		Fair
Substrate (bedrock, silt, sand, gravel, cobble, boulder)--		Gravel, Cobble	Gravel, Cobble		Silt

Water Quality

Dissolved oxygen ranged from 6.87 mg/l to 7.42 mg/l at various locations throughout Burnside Lake during the July sampling period. Dissolved oxygen levels rose to between 7.19 mg/l and 7.62 mg/l in the September sampling period. Surface water temperatures during the July sampling period ranged from 65.0 °F to 65.1°F. Surface water temperatures during the September sampling period dropped to between 61.5 °F to 62°F.

Discussion

Environmental quality surveys on Burnside Lake were designed to assess the viability of creating a special regulation broodstock LCT fishery, with a management objective aimed at creating a vehicle accessible, special regulation trophy fishery within a body of water near a population center. Optimal physical habitat, adequate dissolved oxygen, an above average food base, and proximity to the population centers of South Lake Tahoe and Markleeville make Burnside Lake an ideal location for the creation of a special regulation broodstock LCT fishery, as there is an adequate natural food supply to sustain LCT survival, and easy access for single day anglers. To determine over-winter survival rates of released broodstock LCT, gill netting Burnside Lake during the summer prior to the second year's allotment will be the most appropriate method of sampling (Bonar et al., 2009). Given the small size of Burnside Lake, a single gill net will be placed on the bottom to assess LCT abundance in the benthic zone (Bonar et al., 2009). Placement of a single gill net will occur over a 2 hour, short duration daylight set as described by Hubert (1996). If previous allotment LCT are found, an abundance estimate will need to be made to guide allotment frequency and size as to avoid generating an overabundance of fish. If LCT are not found to over-winter in Burnside Lake, a standard allotment should be developed and scheduled on a yearly basis, subject to availability, to provide a trophy recreational fishery.

References

Bonar, S.A., W.A. Hubert, and D.W. Willis, editors. 2009. *Standard methods for sampling North American freshwater fishes*. American Fisheries Society, Bethesda, Maryland.

Hubert, W.A. 1996. *Passive capture techniques*. Pages 157-181 *in* B.R. Murphy and D.W. Willis, editors. Fisheries techniques, 2nd edition. American Fisheries Society, Bethesda, Maryland.