An evaluation of the brown trout population in Upper Silver Creek, Idaho, and an evaluation of their effects on that fish community

A progress report to:

The Nature Conservancy, Idaho Field Office

From:

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March 1993

Species composition and abundance

Five sites in Upper Silver Creek were electrofished in fall 1992 to obtain data for estimation of species abundance and composition. The sites were electrofished during the period 3 October through 15 November. A seven- to ten-day "resting period" was allotted between electrofishing runs to limit electrofishing bias in population estimates. Length and weight were recorded for game fish. Nongame fish were enumerated and lengths were recorded for samples of each species. Using multiple mark-recapture data collected from each site, population estimates of fish larger than 150 mm were calculated using the Chapman modification of the Schnabel estimate for brown trout (Salmo trutta), rainbow trout (Oncorhynchus mykiss), and brook trout (Salvelinus fontinalis).

Fall 1992 rainbow trout abundance estimates (number of fish per site) were consistently higher than brown trout numbers except in the Martin Bridge site, downstream from the Preserve (Table 1). Species composition of electrofishing samples from the five sites (Table 2) reveals that rainbow trout comprised 74%, 78%, and 82% of the sample in the Upper Stalker Creek, Cabin, and Kilpatrick sites, respectively. The Lower Stalker Creek site sample was also predominantly rainbow trout, but brown trout comprised a larger proportion of the sample (37%) than in the other three rainbow dominated sites. The Martin Bridge site was the only site in which brown trout made up a higher percentage of the sample by number (68%) than rainbow trout (32%). Interestingly, in the Upper Stalker Creek site brook

trout (14%) comprised a slightly larger percentage of the sample than did brown trout (12%).

Estimates of biomass for the five sites indicate that in the Lower Stalker Creek and Martin Bridge sites brown trout biomass was two to four times that of rainbow trout (Table 3). In the Upper Stalker Creek, Cabin, and Kilpatrick sites, rainbow trout biomass estimates are higher than brown trout estimates.

Brown trout larger than 450 mm captured in electrofishing samples were tagged with a visible implant tag. The 1 mm x 3 mm biocompatible plastic tag was injected near the posterior margin of the fish's eye in the clear adipose tissue. Tagged fish were also adipose fin-clipped for easier researcher and angler identification. Additionally, the location of capture, length, weight, and sex were recorded for all tagged fish.

Redd counts

Where possible, in conjunction with other project activities, observations of the distribution of brown trout, brook trout, and fall-spawning rainbow trout redds in Silver Creek and some of its tributaries were made in fall 1992. Redds were observed from the bank and by floating in a rubber raft during fish abundance sampling. While floating in the raft, observers standing on the raft frame were able to see redds clearly and would likely have been able to enumerate them. However, there was some uncertainty as to which species an individual redd belonged, given that the three species mentioned were spawning at nearly the same time.

Before fall 1993, the feasibility of gathering accurate species redd counts and the utility of these data will be evaluated. Because of our interest in brown trout reproduction in Silver Creek, the reproductive states of adult brown captured while electrofishing in fall 1992 were recorded. These data might provide some insight into the extent of brown trout reproduction, assuming that spawning habitat is not a limiting factor.

Diet of large brown trout

During fall 1992 population estimation, several techniques for collecting stomach contents of large brown trout were tested. Stomach pumping and use of copper sulfate emetic, as we tested them, were found to be inadequate in one respect or another. Using forceps or "mechanical fingers" to remove larger items from the gut of large brown trout was found to be an effective technique and may be useful for quantitative analysis of the diet of large brown trout if combined with the gastric lavage procedure.

Stomach contents assessment by use of x-ray was evaluated in a laboratory setting in winter 1992-1993 at Idaho State University. Frozen hatchery rainbow trout of various lengths (range = 50-210 mm) were inserted into the stomachs of dead, previously frozen lake trout (Salvelinus namaycush) (range = 300-350 mm). The lake trout were x-rayed at various tube voltages (kVP) and current (mAS) settings to try to obtain an x-ray that would reveal the small fish in the gut. We were not able to

produce x-rays of the lake trout that would allow us to accurately count or identify small fish in the gut. The thickness of the lateral muscles of the lake trout appears to be sufficient to attenuate the image of the skeleton of the smaller fish in the gut. Additionally, the degree of calcification of the skeleton of the young fish may also influence the resolution of the x-ray. Results of these tests indicate that x-ray may not provide the resolution necessary to accurately count and identify fish species in the gut.

The use of a bone key to aid in identification of partially digested fish prey species will be investigated as a possible technique to be used in conjunction with the gastric lavage procedure to analyze the diet of large brown trout in Silver Creek. A bone key for potential prey species in Silver Creek will be constructed by collecting prey species and measuring bones that have been found to persist during digestion. The key can be used to identify prey species in the gut of a predator and to back-calculate their original lengths. Bone keys have been used successfully for identification to the species level in several other predation studies where the number of prey species was three to four times the number in Silver Creek.

Interaction of age-0 brown and rainbow trout

An extensive literature search has been conducted on interactions between brown and rainbow trout to determine possible field techniques for examining the effects, if any, of these interactions at the population level. It appears that very

few studies have examined age-0 brown and rainbow trout interactions in a natural setting, and fewer yet have addressed mechanisms of competition and population level effects.

Table 1. Fall (3 Oct - 15 Nov) 1992 population estimates for rainbow, brown, and brook trout (number of fish ≥ 150-mm per site) in Stalker and Silver Creek study sites using the Chapman modification of the Schnabel estimate. Values in parentheses are 95% confidence intervals.

Site	Rainbow	Brown	Brook
Upper Stalker	772 (594-1002)	84 (50-149)	146 (81-292)
Lower Stalker	1682 (1264-2289)	995 (743-1364)	238 (127-486)
Cabin	1707 (1237-2429)	410 (227-821)	106 (62-200)
Kilpatrick	3150 (1861-5687)	402 (233-755)	3
Martin Bridge	429 (254-775)	933 (650-1390)	0

Table 2. Species composition (percent of trout collected in each site) in Stalker and Silver Creek from electrofishing samples collected during fall (3 Oct - 15 Nov) 1992.

Site	Rainbow	Brown	Brook	Sample Size
Upper Stalker	74	12	14	489
Lower Stalker	55	37	8	956
Cabin	78	15	7	665
Kilpatrick	82	18	0	669
Martin Bridge	32	68	0	381
Total	66	28	6	3160

Table 3. Estimates of biomass (kg/hectare) based on densities for rainbow, brown, and brook trout in Stalker Creek and Silver Creek sites for fall (3 Oct - 15 Nov) 1992. Values in parentheses are 95% confidence limits.

Site	Rainbow	Brown	Brook
Upper Stalker	199(153-259)	62(38-110)	30(17-60)
Lower Stalker	251(189-342)	729(544-999)	36(19-73)
Cabin	242(176-345)	105(58-210)	9(6-18)
Kilpatrick	202(120-366)	58(34-110)	-
Martin Bridge	77(46-140)	297(207-443)	-