

G-9 Griffith

THE ECOLOGY OF RAINBOW TROUT IN STALKER AND GROVE CREEKS

A RESEARCH PROPOSAL
TO
THE NATURE CONSERVANCY

J. S. Griffith
Department of Biology
Idaho State University

May 15, 1979

INTRODUCTION

Stalker and Grove Creeks are the major tributaries of Silver Creek, and much insight into the ecology of that aquatic ecosystem can be gained by comparing and contrasting conditions between the two. In 1978, discharge from both was similar in the spring season (about 2-2.5 m³/sec), but Grove Creek maintained that flow year-round, while Stalker Creek's flow dropped following spring runoff to less than 1 m³/sec. Chara, supplemented by Veronica and Potamogeton, dominates the aquatic vegetation of both streams. Watercress (Rorippa) is present also in the headwaters, especially in Grove Creek. Grove Creek provides an interesting contrast to Stalker in that the former transports only a fraction of the suspended sediment carried by the latter. This is in part due to the fact that Grove Creek maintains a more extensive aquatic macrophyte biomass throughout the year, whereas vegetation is largely purged from Stalker Creek in fall and winter.

Both tributaries have traditionally been the major spawning areas for the rainbow trout of Silver Creek. Spawning runs into Stalker Creek appear to have dwindled, and that portion of the stream that is now a part of the Silver Creek Preserve is not used by spawning trout. Use of upper Stalker Creek, as well as Grove Creek in its entirety, by spawning trout is largely unknown at the present time, but appears to be minimal. In addition, lower Stalker Creek sustains only a very limited trout population throughout the year.

This study is designed to make use of these contrasts between the two tributaries to gain a better understanding of relationships that exist among sediment, macrophytes, invertebrates, and trout that may then be applied to the entire Silver Creek watershed. Stalker Creek has the highest probability of habitat restoration by the re-creation of a headwater marsh, a decrease in sediment input, and removal of existing sediment by suction pumping. By

examining the specific hypotheses listed below, it will be possible to evaluate whether such an apparent improvement in habitat quality will indeed result in an increase in trout production in Stalker Creek and ultimately in Silver Creek as a whole.

OBJECTIVES AND METHODS

The following hypotheses have been formulated and will be tested during the study:

A. Sediment - macrophyte - invertebrate relationships:

1. The removal of instream sediment leads to a shift in macrophytes, most likely from Potamogeton and/or Chara to Veronica and/or watercress. To test this, 9 study sites will be selected in both Stalker and Grove Creeks; 100%, 50%, and 0% of the existing sediment will be removed in early summer 1979 from each of 3 different water depths (shallow, < 0.3m; moderate, 0.3-0.6m; and deep, > 0.6m). Macrophyte biomass by species will be monitored before sediment removal and through 1980.
2. As opposed to Potamogeton and Chara, Veronica and watercress provide a greater biomass of aquatic invertebrates, more of those invertebrate taxa that are selected by rainbow trout, and better cover for the trout. To test this, 8 pairs of drift nets will be set during 1979 and 1980 in each of the creeks, two pairs associated with each type of vegetation. Of each pair, one net will be a "blocking" net to exclude drift originating from above the stand of vegetation being examined, and the downstream net will collect drift originating from that vegetation only. All nets will be set in sites having equivalent water depths and velocities. Some data on the selection of invertebrates by trout is available from

Francis' report; the stomachs of about 100 trout in the immediate vicinity of the study sites will be checked by stomach flushing. Trout will be collected by electrofishing and then will be released alive. The value of macrophytes as cover will be assessed by four snorkeling surveys in spring, summer, fall and winter each of 1979 and 1980. Fish size, distance to cover, and type of cover will be recorded.

B. A lack of cover limits the year-round use of Silver Creek by adult rainbow trout. Cover may exist in the form of water depth, association with vegetation, or association with a velocity "blanket". A recent synopsis of use criteria for rainbow trout (see attached material) suggests that avoidance occurs of depths shallower than 45 cm (1.5 ft). Silver Creek offers an excellent opportunity to examine this concept. There are two possible tests. One is when macrophytes are purged from Stalker Creek each year, but not from Grove Creek. If an exodus of trout occurs at that time from Stalker Creek but not from Grove, it would support the hypothesis that those trout were reacting to a loss in cover. Drift sampling, as mentioned above, will be also conducted at that time to assess possible changes in food availability. The second test is to monitor the microhabitats of a number (200+) of adult trout of all sizes and to examine the correlation between body length and depth of water selected. This will be done as part of the snorkeling surveys described above.

C. For spring spawners, sediment levels in Stalker Creek are presently resulting in a very low incidence of spawning with a suboptimal hatching success. To examine this, the number of spawning trout in the Stalker drainage will be determined and

compared with historical accounts. Hatching survival in a number of redds that are found will be monitored with enclosures, and results will be compared with literature values.

D. Trout are being blocked from upstream migration by the Purdy Dam. This can be checked by maintaining a fish trap at the Purdy Dam at strategic times throughout the year. Project personnel would assist TNC/ Fish & Game staff in constructing and maintaining such a trap, and it could be used to prevent less desirable fish from moving upstream.

In addition to addressing the above hypotheses, baseline data on a number of parameters important to the health of the Silver Creek ecosystem will be gathered. These include:

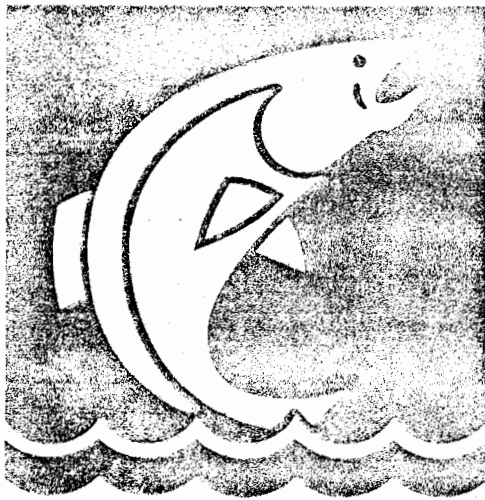
1. determination of the suspended solid load carried by both Grove and Stalker Creeks during spring runoff in 1980.
2. quarterly measurement of sediment depth along 6-10 transects in each of Grove and Stalker Creeks.
3. documentation of the number of trout redds constructed in Grove and Stalker Creeks in spring and fall of 1979 and 1980.
4. calculation of the percentage of fine particles in a sample of redds of spring-spawning rainbow trout in Grove and Stalker Creeks in 1979 and 1980.

The study would extend from May, 1979 through December, 1980. An interim report and a final report would be supplied to the TNC by 31 December, 1979 and 31 December, 1980. Field work in 1979 will be done by J.S. Griffith and an assistant and in 1980 will be done by a graduate student and Griffith.

BUDGET

<u>Salaries</u>	<u>1979</u>	<u>1980</u>
J.S. Griffith	\$2200	\$1500
Research Assistant	2000	400
Graduate Student	--	4000
	<u>4200</u>	<u>5900</u>
 <u>Benefits</u>		
J.S. Griffith	348	237
Research Assistant	134	27
Graduate Student	--	268
	<u>482</u>	<u>532</u>
 <u>Travel</u>	1150	1500
 <u>Equipment and Supplies</u>		
Dry Suit	200	--
Waders	80	80
Velocity Meters	100	--
Redd Enclosures	200	--
Drift Nets and Collection Materials	300	300
Miscellaneous	200	200
Report Preparation	50	200
	<u>1130</u>	<u>780</u>
 <u>Indirect Expense</u>		
20% On Campus (@ 41.2% of Salaries)	347	487
80% Off Campus (@ 11.2% of Salaries)	377	529
	<u>724</u>	<u>1016</u>
 TOTAL	7686	9728

JACK GRIFFITH

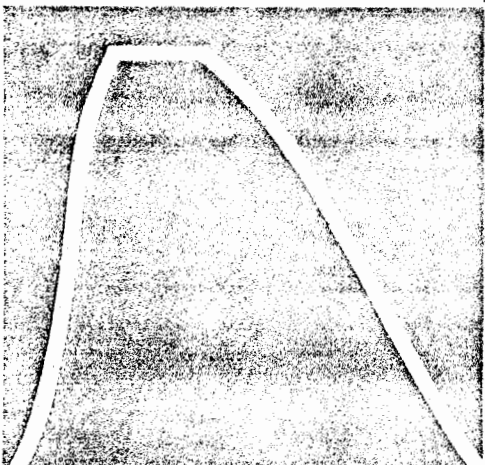
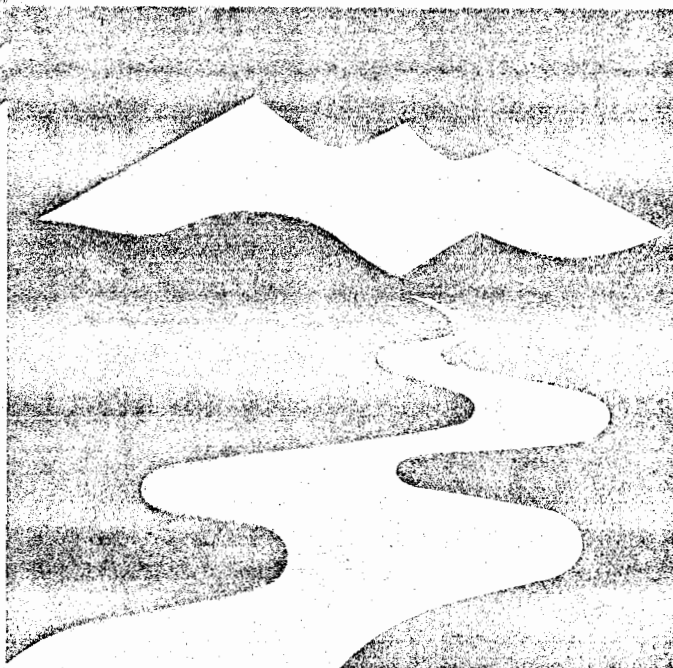


Probability Of Use Criteria For The Family Salmonidae.

COOPERATIVE
INSTREAM FLOW
SERVICE GROUP

INSTREAM
FLOW
INFORMATION
PAPER: NO. 4

FWS/OBS-78/07
JANUARY 1978



Cooperating Agencies:

Fish and Wildlife Service
Environmental Protection Agency
Heritage Conservation and Recreation Service
Bureau of Reclamation