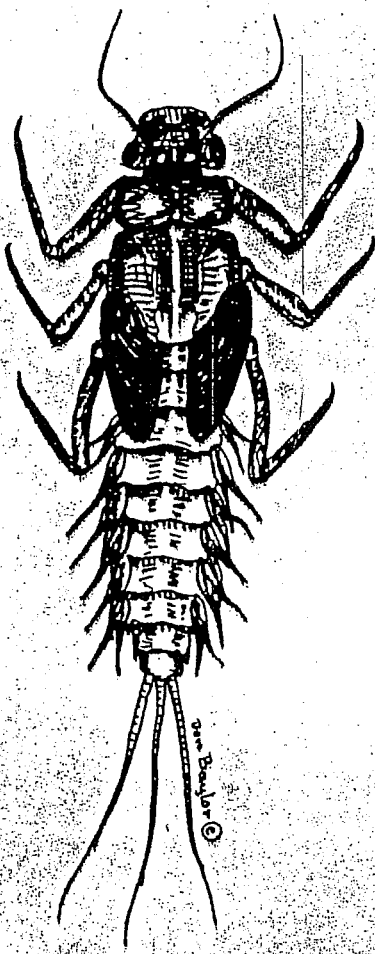
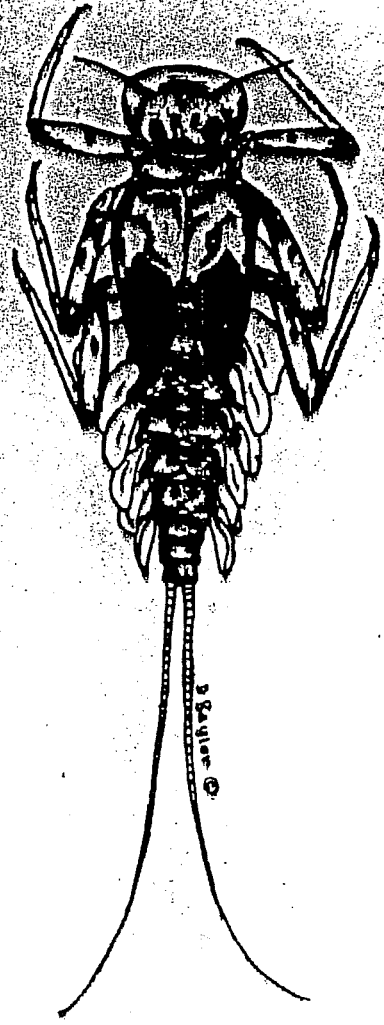


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BENTHIC MACROINVERTEBRATES
OF
SWIFTWATER CREEK
OCTOBER 30, 1997
FOR
LAKE SWIFTWATER ASSOCIATION



Submitted by
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BENTHIC MACROINVERTEBRATES OF SWIFTWATER CREEK, OCTOBER 30, 1997

INTRODUCTION

At the request of Lake Swiftwater Association, Aquatic Resource Consulting was authorized to sample benthic macroinvertebrates at four stations on Swiftwater Creek, Monroe County, PA. Authorization was given through F. X. Brown Associates, Inc. as an adjunct to a study of Swiftwater Lake. The purpose of this study was to evaluate water quality upstream from Swiftwater Lake and to compare results to those obtained at the same stations in a 1986 study for Swiftwater Preserve (Baylor, 1986).

BACKGROUND

Aquatic macroinvertebrates are preferred indicators of stream water quality because of their limited mobility, one to three year life cycles, and specific sensitivities to pollutants. Clean streams usually support numerous species of invertebrates, theoretically equal in numeric representation. Impairment may be indicated by low taxa richness, shifts in community balance toward dominance of pollution-tolerant forms, or overall scarcity of invertebrates. (Plafkin, et al. 1989): in order to assure an accurate assessment of environmental conditions, recent work in bio-monitoring has stressed the need to use several parameters, or metrics, to measure components of community structure.

Number of Taxa

Taxa richness (number of different kinds of organisms) measures the health of the benthic community through the variety of species present. Generally, number of species increases with improved water quality. Variability in natural habitat, however, affects this number.

EPT Index

The insect orders Ephemeroptera, Plecoptera, and Trichoptera (mayflies, stoneflies, and caddisflies), collectively referred to as EPT, are generally considered pollution sensitive (Plafkin et al. 1989). Thus the number of taxa within the EPT groups (EPT index) is used to evaluate health of the benthic community - the more EPT taxa present, the better the water quality indicated.

METHODS

Sampling methods followed those recommended by Hilsenhoff (1982) and the Environmental Protection Agency (Weber, 1973). At each station, a riffle area was sampled with a kick screen device of 521 micron nytex until more than 100 organisms were collected. The substrate was disturbed with a four pronged cultivator tool and by hand to dislodge organisms into the screen. Rocks were also randomly selected and cleaned by hand to dislodge organisms firmly attached. Organisms were picked from the debris in the field, composited for each station, and preserved in Kahle's solution for transport to the laboratory.

In the laboratory, organisms were identified to the lowest taxonomic level practicable, enumerated, and assigned a pollution tolerance value if known (Environmental Analysts, 1990). Species diversity, equitability, EPT and biotic indices were calculated for each station according to Hilsenhoff (1987), Weber (1973), and Plafkin et al. (1989).

SAMPLING STATIONS

Four stations were sampled on Swiftwater Creek above Swiftwater Lake (Figure 1). The stations were chosen to re-evaluate four of five stations sampled in 1986. In the 1997 sampling, Station 1 in the previous study on Indian Run tributary was omitted. Description of sampling stations follow:

Station 2 - upstream from Route 611 crossing in the Burrit section, approximately 60 meters downstream from the Route 314 crossing.

Station 3 - in the Woodling section, approximately 40 meters downstream from the Conneought property.

Station 4 - in the Lower Batten area, in the riffle below the pool adjacent to the former Ed Metzgar residence, now the headquarters of Swiftwater Preserve.

Station 5. - in the Red Rock section, approximately 50 meters downstream from the Route 314 crossing.

RESULTS AND DISCUSSION

1997 Data

A total of 40 species of benthic macroinvertebrates were collected from Swiftwater Creek on October 30, 1997 (Appendix A). Most were pollution sensitive taxa. At each station, all but a few taxa were from the EPT group (Table 2). Biotic index, diversity, and equitability values for all stations fell within clean stream ranges (Table 2 and Figures 3&4). Biotic index values ranged from 1.29 at Station 2 to 1.65 at Station 4 - all in the "Excellent" range, indicating little or no organic pollution. Station 2 had the best biotic index, diversity, and equitability values; but Station 4 had one more total taxon and EPT taxon. In October 1997, all stations were comparable in biotic index, diversity, and equitability; but Station 3 had somewhat fewer taxa and EPT taxa than other stations (Table 2).

The lower numbers of total taxa and EPT taxa at Station 3 in 1997, despite diversity and biotic index values similar to other stations, may be a result of slight environmental differences other than organic (oxygen demanding) impacts.

1997 Data Compared to 1986 Data

Metric values from October 1997 samplings were roughly equivalent to those from May 1986 at stations 2, 4, and 5, suggesting little change in water quality. The slight differences in biotic index and diversity between samplings at these three stations may reflect fall versus spring seasonal variations in benthic communities rather than changes in water quality.

Values from Station 3 indicated improved water quality from 1986 to 1997 (Figures 2&3). Specifically, in 1986 the biotic index value at Station 3 was notably higher (poorer) than at other stations, though not outside the clean stream range. In 1997, the biotic index value at Station 3 was closer to those from other stations (Figure 3). From 1986 to 1997 at Station 3, diversity improved from 2.55 (below the 3-4 clean stream range) to 3.43 (well within that range). Equitability at Station 3 also improved considerably from 1986 to 1997. In reading the tables and figures, note that for the biotic index, higher values are poorer; and for diversity and equitability, lower values are poorer.

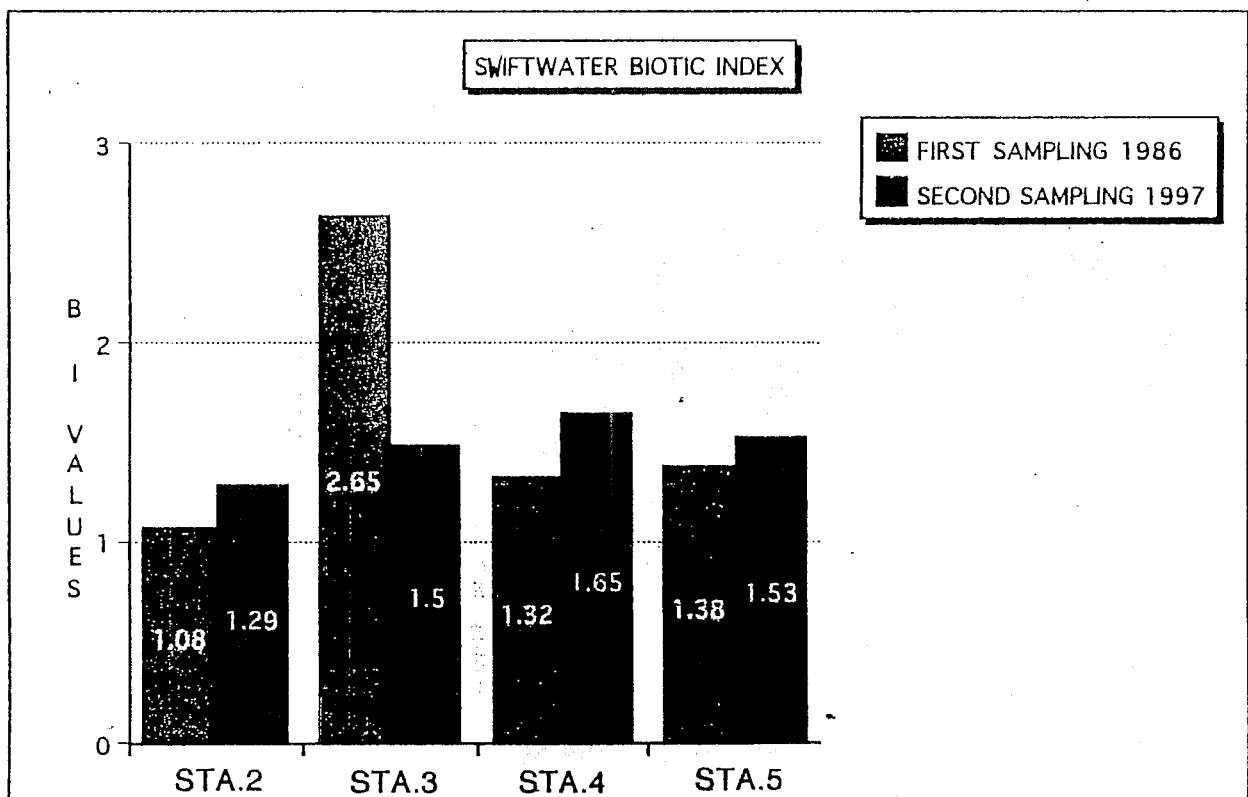


Figure 2. Biotic index values for benthic macroinvertebrate samples at four stations on Swiftwater Creek, May 13, 1986 and October 30, 1997.

Appendix A. Taxa, numbers, and biotic index (BI) value (0-10) of benthic macroinvertebrates from four stations on Swiftwater Creek, October 30, 1997.

TAXA	STATIONS				BI
	#2	#3	#4	#5	
EPHEMEROPTERA (Mayflies)					
<u>Epeorus pluralis</u>	2	-	1	-	0
<u>Ephemerella invaria/</u> <u>rotunda</u>	20	5	10	52	1
<u>E. subvaria</u>	-	-	1	3	1
<u>Stenonema ithaca</u>	-	1	26	1	3
<u>S. vicarium</u>	1	1	7	10	2
<u>S. mediopunctatum</u>	-	-	-	1	3
<u>Paraleptophlebia</u> sp.	7	13	41	41	2
<u>Baetis tricaudatus</u>	3	-	-	-	6
<u>Acentrela turbida</u>	-	-	1	-	-
TRICHOPTERA (caddisflies)					
<u>Apatania incerta</u>	-	-	-	1	3
<u>Brachycentrus solomoni</u>	17	10	6	9	1
<u>Rhyacophila fuscula</u>	10	11	1	4	0
<u>R. torva</u>	2	-	-	-	1
<u>R. manistee</u>	-	-	1	-	1
<u>Dolophilodes distinctus</u>	23	28	16	6	0
<u>Cheumatopsyche</u> sp.	6	2	1	2	5
<u>Ceratopsyche ventura</u>	1	6	-	-	-
<u>C. slossonae</u>	17	24	3	8	4
<u>C. sparna</u>	-	-	19	8	4
<u>C. morosa</u>	-	-	1	2	6
<u>C. sp.</u>	2	-	-	-	-
<u>Hydropsyche betteni</u>	-	-	1	-	6
<u>Polycentropus</u> sp.	1	-	-	1	4
<u>Lepidostoma</u> sp.	1	2	10	4	1
PLECOPTERA (stoneflies)					
<u>Pteronarcys scotti</u>	2	4	-	-	0
<u>Tallaperla</u> sp.	-	1	-	-	0
<u>Phasgonophora capitata</u>	3	1	1	2	2
<u>Isogenoides hansonii</u>	-	-	-	1	0
<u>Acroneuria abnormis</u>	-	-	1	-	0
<u>Cultus decisus</u>	3	-	1	2	2
<u>Sweltsa</u> sp.	22	7	10	6	0
<u>Isoperla decala</u>	-	1	-	-	2
<u>Leuctra</u> sp.	2	-	-	-	0

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