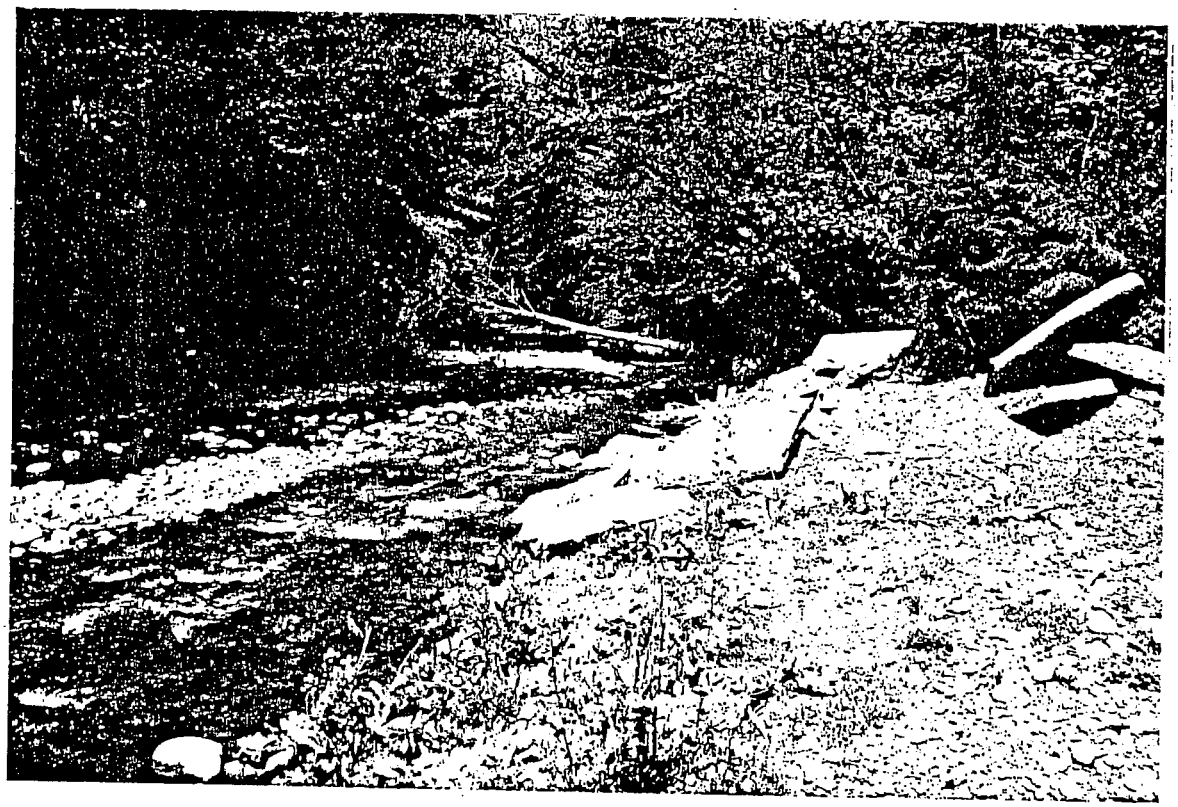


Figure 6. Sampling station #5, Red Rock, below the bridge crossing of route 314, in the riffle below the concrete slabs.

4. Lower Batten, the riffle and pool opposite the Ed Metzgar residence.

5. Red Rock, below the bridge crossing of route 314, in the riffle below the slabs of concrete.

METHODS

The same procedures were employed in this study as in the 1985 Benthic Invertebrates of the Brodhead, Paradise and Swiftwater Creeks. Macroinvertebrates were sampled with a kick screen device of 571µ nitex screen fastened to wooden dowels. The screen measured 2½ feet wide and 2 feet 2 inches high. At each station, two samples were taken from fast riffle areas and one was taken from an area of moderate current. The substrate in an area of approximately one square meter was disturbed by hand and with a four pronged cultivator tool for each sample. Rocks were also randomly chosen to be cleaned by hand to dislodge organisms that were firmly attached.

Contents of all screen samples were washed down on the screen to consolidate them, placed in ethanol, and later sorted and identified to species wherever practicable. Individual organisms of each taxon were enumerated for each station (Appendix A), and diversity and equitability were calculated according to the same sources used in the previous study.

RESULTS AND DISCUSSION

A total of 2487 benthic invertebrates were collected and identified from the five Swiftwater stations in May of 1986. Fourty-six taxa were represented. At each station three kick samples produced well over the 100 invertebrates necessary for reliable statistical analysis of benthic communities (Table 1). The greatest number of taxa were collected at the Indian Run station #1. Though samples were not quantitative, the most individual organisms were

Table 1. Numbers of taxa and organisms, diversity and equitability of benthic invertebrate samples from five sampling stations on Swiftwater Creek, May 13, 1986.

Stations	Number of taxa	Number of organisms	Diversity	Equitability
#1. Indian Run	30	428	3.92	.701
#2. Burritt	26	640	3.35	.523
#3. Woodling	19	220	2.55	.370
#4. Lower Batten	25	881	3.31	.528
#5. Red Rock	23	318	3.22	.533

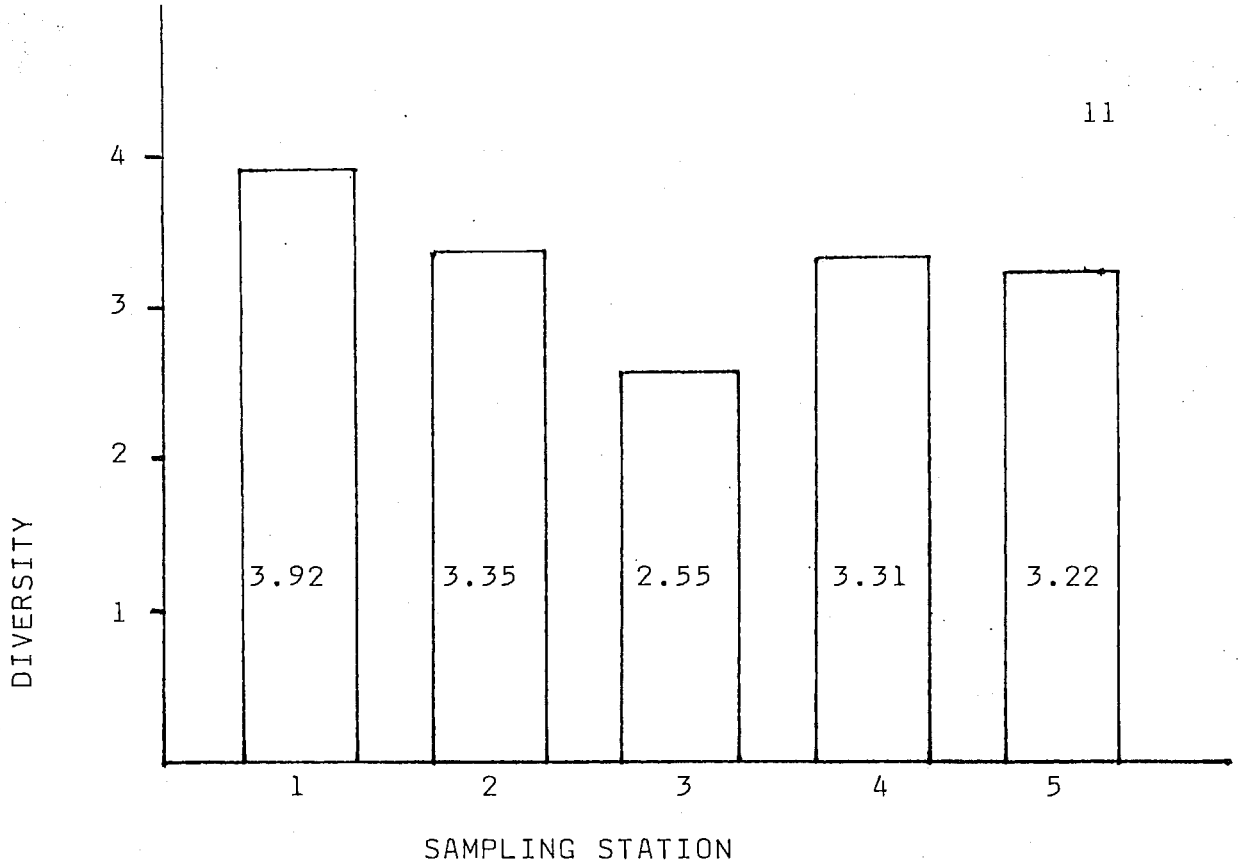
collected at the Lower Batten station #4. The lowest numbers of taxa and individual organisms were collected at the Woodling station#3 (Table 1).

Diversity values in unpolluted waters generally range from 3 to 4; in polluted waters they are often less than 1. However, diversity values have been found not to be sensitive to moderate pollution. Equitability values have proven to be quite sensitive to even slight degradation - generally ranging from 0.6 to 0.8 in clean water and falling below 0.5 as a result of even slight degradation.

Table 1 and Figure 7 show that samples from all Swiftwater stations except Woodling #3 exhibited the type of community structure expected in clean streams. Diversity values fell between 3.0 and 4.0 except at the Woodling station where diversity was 2.55. Equitability values fell above 0.5 except at Woodling where the value was 0.37. A comparison of the Smith station samples from May of 1985 with the Woodling sample of 1986 suggests a slight improvement in diversity from 2.126 in 1985 to 2.55 in 1986 (Table 2).

This study corroborates the findings of the 1985 study of the Brodhead, Paradise and Swiftwater Creeks that the Smith-Woodling area of the Swiftwater Creek has suffered degradation of habitat for aquatic invertebrates. At the same time, this area appears to be gradually recovering. The silt which blanketed the substrate in this area in the fall of 1985 was cleaned from the substrate in May of 1986 except along the edge where there is negligible current (Figure 8). There was slightly more silt in (though not on) the substrate at the Woodling station than at other Swiftwater sampling stations. During a recent fall 1986 visit to this area, the substrate was observed to be clean of silt.

Fortunately, degradation in the Smith-Woodling area is not severe. Invertebrate populations should continue to recover barring further erosion and sedimentation from



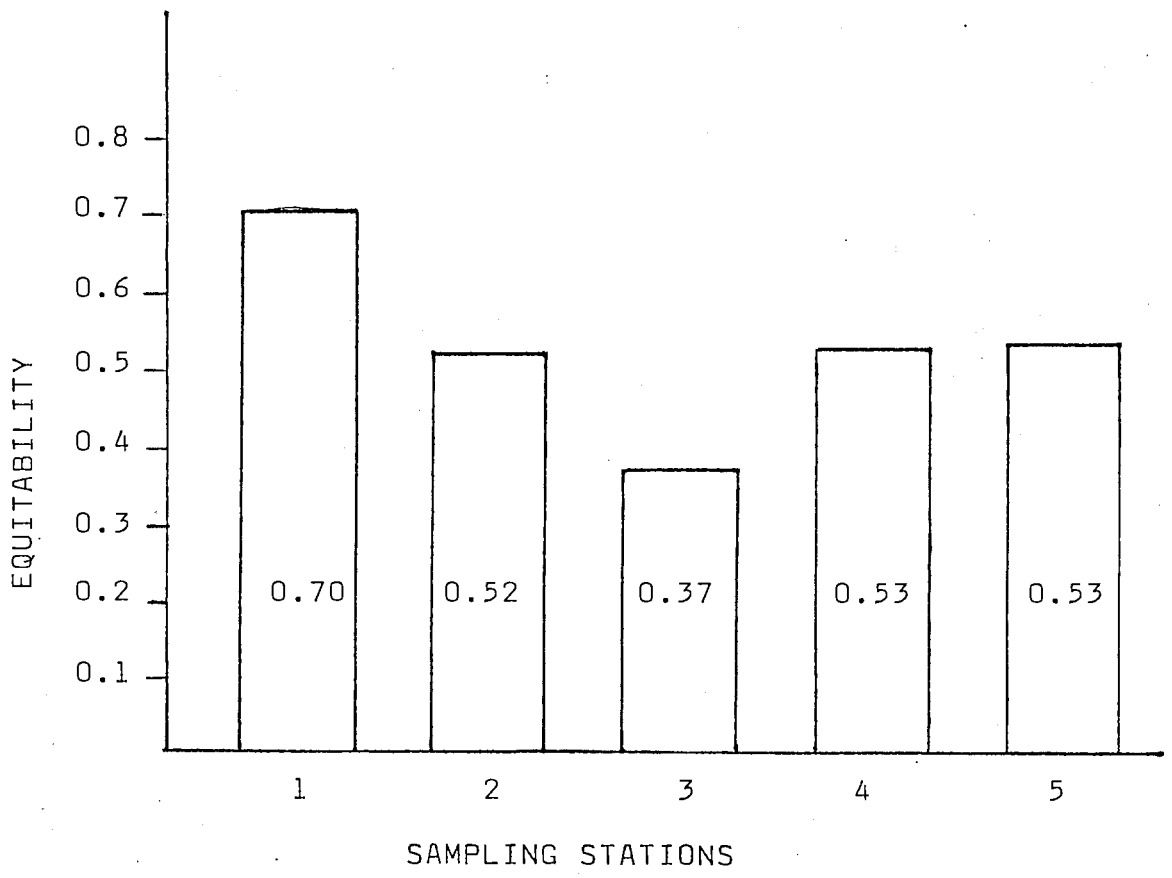


Figure 7. Diversity and equitability values for the five Swiftwater stations, May 13, 1986.

Table 2. Comparison of numbers of taxa and organisms, diversity and equitability of benthic invertebrate samples in the Smith-Woodling area of Swiftwater Creek, May 5 and September 8, 1985 and May 13, 1986.

Station and Date	Number of Taxa	Number of Organisms	Diversity	Equitability
Smith, May 1985	17	275	2.126	0.341
Smith, September 1985	18	175	2.448	0.431
Woodling, May 1986	19	220	2.551	0.370

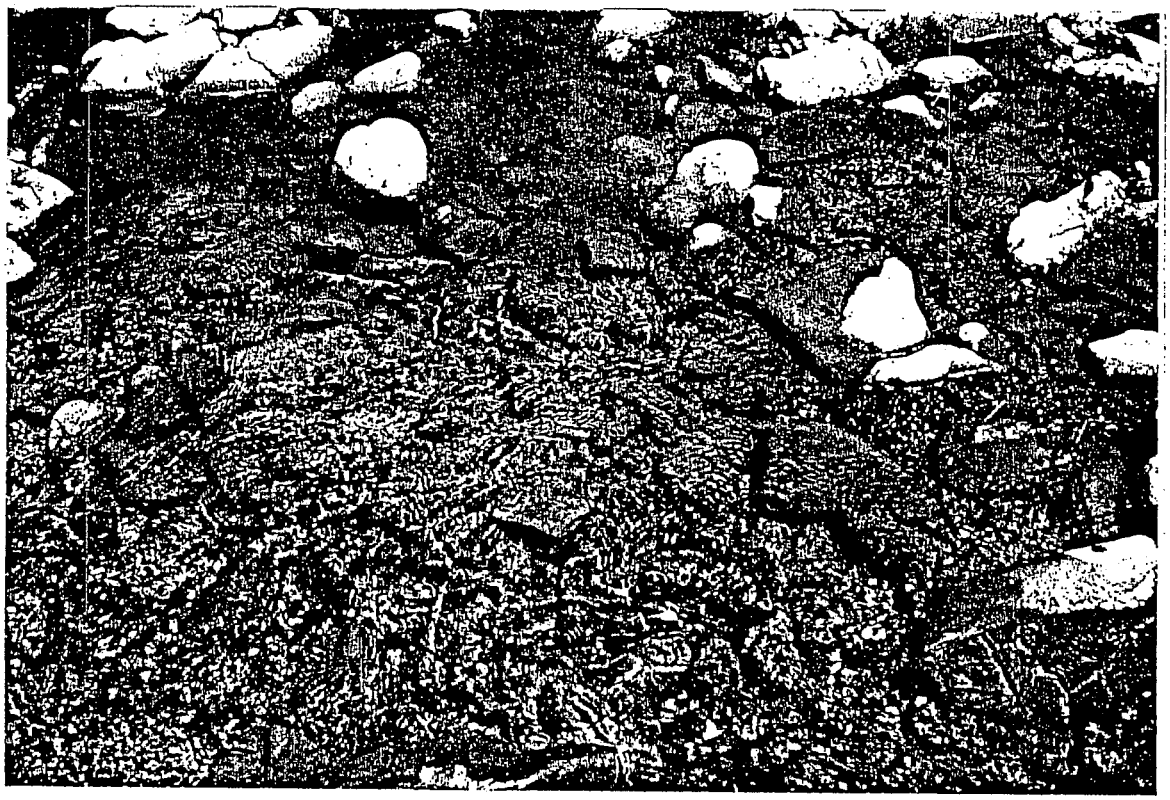


Figure 8. Substrate in Smith section of Swiftwater showing silt that formerly blanketed the stream bed-restricted to the edges of the stream bed in May 1986.

upstream and assuming no future pollution from point sources such as the drain entering the stream in the vicinity of the laboratory. Siltation was at least a partial cause of the degradation which occurred in this area, but there may have been synergism between the toxic run-off that caused a fish-kill in 1984 and subsequent siltation.

A second point of interest in the data resulted from inclusion of the upper station on Indian Run in this study. Although samples from all stations other than Woodling #3 yielded statistics indicative of clean water, numbers of taxa and diversity and equitability values were considerably higher at the Indian Run station #1 than at other Swiftwater stations (Table 1 & Fig.7). The significance of this difference is difficult to evaluate without past baseline data. The fact that the two branches, Swiftwater and Indian Run, are close in proximity and probably drain similar soils and geologic formations and are both small headwater streams suggests that they should be more similar in invertebrate populations. The lower diversity and equitability below the confluence than in Indian Run may be due to development and resultant disturbance on the Swiftwater branch.

In summary, the results of May 1986 invertebrate samples suggest that the water quality of Swiftwater Creek is generally quite good, with the exception of the Smith-Woodling area which appears slightly improved over 1985 samples but which remains degraded in comparison to other stations. The Indian Run sample indicated excellent water quality in that branch. The 1986 samples should serve well as a baseline of present conditions on Swiftwater Creek.

RECOMMENDATIONS

1. The Woodling station should be sampled again in May of 1987 to see if continued recovery of the invertebrate population occurs.

2. Electrofishing surveys should be carried out in fall of 1987 on at least two stations on Swiftwater Creek (Smith-Woodling and at least one other area) to document wild trout populations. In November of 1986, I observed spawning redds in the riffle entering the pool pictured in Figure 4 on the Woodling stretch. Since this is the general area of silt deposition in the past, the effects on the trout population balance would be a concern.

3. Any development or disturbance on the Swiftwater watershed should be monitored carefully by someone with the club's interests in mind to insure minimal impact on Swiftwater Creek.

4. At some time, the Swiftwater Club may wish to have a habitat survey conducted on areas such as Misertown and Red Rock to provide recommendations for trout habitat management and development where members feel habitat is a concern. A habitat survey by ARC involves visual inspection, the taking of several measurements such as gradient and width-depth ratio to categorize a stream hydrologically, recommendations and specifications for habitat devices best suited to stream type, and site specific suggestions with photographic documentation.

Appendix A. Taxa and numbers of benthic invertebrates collected from five stations on Swiftwater Creek on May 13, 1986.

Taxa	Stations 1	2	3	4	5
Ephemeroptera					
Epeorus sp.	49	159	4	7	1
Stenonema vicarium				1	3
S. ithaca				3	4
S. pudicum				1	
Ephemerella dorothea	4	123	14	193	81
E. invaria or rotunda	7	18	4	139	28
E. cornuta	32	24	5	62	29
E. sp.					2
Paraleptophlebia sp. 1	9	27	2	92	17
P. sp. 2	9	15	6		
Isonychia sp.					2
Baetis (probably tricaudatus)	20	44	20	20	8
Pseudocloeon dubium or carolina		1	6	104	38
Cinygmula subaequalis	5	2			
Trichoptera					
Brachycentrus numerosus	1				1
Dolophilodes sp.	6	7		44	9

Appendix A. Continued.

Hydropsyche sparna			5	9	1
H. slossonae	1	7		16	2
Diplectrona sp.				1	
Rhyacophila fuscula	2	7	1	7	1
R. acutiloba		1	1		
R. manistee	20	2	1		
R. nigrita	1				
Lepidostoma sp.	9	4			
Neophylax nacatus	7				
N. aniqua	1				
Polycentropus sp.	1		1	5	
Triaenodes sp.				1	
Plecoptera					
Allonarcys scotti	8	3			
Yugus bulbosus	3	4			
Peltoperla sp.	6				
Amphinemura sp	6	1			
Diploperla duplicata		3			
Chloroperlidae	99	80	1		1
Leuctridae	17				
Phasgonophora capitata			1	1	
Isoperla sp.	2	1			

Appendix A. Continued

Diptera					
Chironomidae	59	79	120	141	73
Hexatoma sp.	17	18	5	10	8
Simulium sp.				6	6
Dicranota sp.	7	8	22	10	2
Antocha sp.	15			2	
Cryptolabus sp.		1			
Ceratopogonidae sp.				1	
Mollusca					
Physa sp.					1
Amphipoda					
Gammarus sp.			1		

COMMONWEALTH OF PENNSYLVANIA
Department of Environmental Protection
Northeast Regional Office
Water Management Program
October 25, 2000
570-826-5415

SUBJECT: Phosphorus Criteria
Swiftwater Creek
Monroe County, PA

TO: Kate Crowley
Program Manager

FROM: Sherrill R. Wills SRW 10/25/00
Water Pollution Biologist

THROUGH: Thomas E. Stauffer
Water Pollution Biologist

George M. Fetchko
Monitoring and Compliance Manager

I have completed identifying and counting the macroinvertebrate samples collected from Swiftwater Creek on August 9, 2000. Water chemistry samples have been summarized in Table I, macrobenthic samples in Table II, and the metrics in Table III (attached). The final memo for the results will be completed in the near future.

In summary, the water chemistry and macrobenthic results do not indicate any impairment of Swiftwater Creek.

I have prepared a new SERA based on the water chemistry, actual measured stream flow, macrobenthic data and habitat assessments from the August 9, 2000 stream investigation. I have included three stations in the SERA scoring: Station 1, upstream of the Pocono Manor discharge; Station 5, upstream of the Pocono Mountain School District discharge; and Station 8, upstream of the SR314 bridge, site of the June 6, 2000 SERA report.

The SERA scoring gives a score of 9 for Station 1, 13 for Station 5, and 7 for Station 8. High quality streams with a score <10 are considered low risk, with no point source phosphorus controls needed, moderate risk score is between 11 and 20 points, and high risk score is greater than 20 (Pa. DEP Doc. ID: 391-2000-018). Controls are required for moderate or high risk high quality streams.

1

Using this guidance, the Stations 1 and 8 do not require P limits. Station 5 is a moderate risk site, requiring a minimum P control of 2.0 mg/l to be required. Station 5 could also be applied to the Aventis permit, requiring the imposition of a 2.0 mg/l P limit.

cc: K. Crowley/G. Fetchko
P. Swerdon/J. Scolere
S. Wills/T. Stauffer
J. Cigan
File