

Appendix A:

Benthic Macroinvertebrates

BENTHIC MACROINVERTEBRATES

Aquatic macroinvertebrates are animals that are large enough to be seen by the unaided eye and live at least part of their life cycles within or upon available substrates in a body of water or water transport system. These include insects such as mayflies, annelids, mollusks, flatworms, roundworms, and crustaceans. The samples collected allow for a detailed analysis of the aquatic community. A brief explanation of these factors is offered to enable the reader to understand the importance of measuring the relative stability of the aquatic community.

The sampling technique is a standard kick sample format using a 500 micron mesh size, 1 meter x 1 meter seine net. Normally one sample (one square meter of substrate) is taken from a riffle in the stream and one sample (one square meter of substrate) is taken from a run. The entire sample is taken to the Monroe County Conservation District office where it is subsampled. A minimum subsample of 100 organisms is desired for a valid analysis.

The following are the metrics used for the macroinvertebrate analysis. Metrics are the various counts, indexes, and ratios computed from the results of the subsamples as described above. Different metrics convey different types of information about the macroinvertebrate community. For example, taxa richness is an index of diversity and the Hilsenhoff Biotic Index measures pollution tolerance. By using a set of metrics that measures multiple aspects of the macroinvertebrate community, a complete picture of a community can be attained.

Total Individuals is the actual number of macroinvertebrates collected.

Total Taxa (Species richness) is a measure of the variety of taxa (total number of species) present. This generally increases with increasing water quality or habitat. In some situations, organic enrichment may also result in an increase in the number of taxa.

Percent Contribution of Dominant Taxa gives an indication of the balance in the community. A community dominated by relatively few species would indicate environmental stress. An even distribution of all taxa (preferably sensitive species) is more desirable.

Percent Noninsects gives an indication of the balance in the community. Noninsects are generally tolerant species. A community dominated by noninsects would be an indication of environmental stress. An even distribution of all taxa (preferably sensitive species) is more desirable.

Modified Hilsenhoff Biotic Index (HBI) is a ranking based on pollution tolerance to organic sources values. These values range from 0-10, increasing as water quality decreases. The Biotic Index is an average of tolerance values for all individuals collected from a site.

The following demonstrates the range for Biotic Index:

0.00-3.75	Excellent
3.76-4.25	Very Good
4.26-5.00	Good
5.01-5.75	Fair
5.76-6.50	Fairly Poor
6.51-7.25	Poor
7.26-10.0	Very Poor

EPT Index is a measure of the total number of distinct taxa within the orders of Ephemeroptera, Plecoptera and Trichoptera. This summarizes the taxa richness within the insect orders that are generally sensitive to pollution. The EPT Index generally increases with increasing water quality.

Percent Intolerant Taxa gives an indication of the balance in the community. Intolerant organisms are usually not found associated with organic contaminants and are generally intolerant of even moderate reductions in dissolved oxygen. Intolerant organisms are indicators of clean water only.

The Ratio of Shredders to the Total Number of Insects uses the relative abundance of shredders as an indication of the dominant food or energy source in a small watershed. Shredders are insects that shred coarse particulate detritus for feeding. Shredders represent a distinct functional feeding group that is found predominantly in watersheds less than 10 square miles in size where the primary energy source in the stream is derived from leaf litter and similar detritus entering the watercourse. Shredders should become less abundant as the stream width increases and the canopy cover opens and photosynthesis becomes the primary energy source in the stream.

Scoring Schemes

Scoring schemes have been completed for the entire County. The EPA conducted the majority of the statistical analysis needed to determine the metrics that are used for the Pocono Plateau and Low Pocono subcoregions. The metrics were selected because of their accuracy in detecting impairment. The County completed the work for the remaining subcoregions in the County, but without the help of the EPA this work would have been much more difficult.

A simple process was used to develop the reference conditions for the different stream classes. Within each stream class, minimally impaired reference sites were sampled. Descriptive statistics for each metric were calculated from a group of similar candidate reference sites. Only the candidate reference sites with optimal habitat and intact benthic macroinvertebrate communities were included in the reference condition. Test sites, or sites thought to be impaired, were not used in the development of reference conditions. Thresholds for optimal, slightly to moderately impaired and severely impaired categories were developed for each metric. The data from each metric was compiled and ranked. If a metric increases with impact (HBI for example), the 75th percentile of the reference condition is used as the threshold for the optimal category. The remaining range between that value and the maximum value obtainable for that metric was halved to provide two more ranges for scoring the slightly to moderately impaired and severely impaired categories.

If the metric value decreases with impact (taxa richness for example), the 25th percentile of the reference condition is used as the threshold for the optimal category. The remaining range between that value and the minimum value was halved to provide two more ranges for scoring the slightly to moderately impaired and severely impaired categories. For some metrics, this may result in somewhat insensitive scoring. For percent noninsects, for example, the maximum possible is 100%. However, 25% was the maximum encountered in the severely impacted sites for the Pocono Plateau / Glide Pool subcoregion. The scoring was adjusted to reflect the values of that metric generally encountered in impacted streams for this subcoregion, in order to make the scoring for that metric more sensitive.

All candidate reference sites were scored using the scoring scheme for that stream classification. These scores were then ranked. The lower 25th percentile was used to define the lower range of the optimal category. The remaining range between that value and the minimum possible optimal score was bisected to define two more ranges for the slightly to moderately impaired and severely impaired categories for the total scores.

The County identified all organisms collected to the family level and all the calculations were performed using family level identifications. The family level of identification was chosen to make data sharing both easier and faster. Identification of macroinvertebrates to the family is easier to perform and yields results that are suitable for our purposes. Another reason for choosing this level of identification was the interest of local watershed groups in performing macroinvertebrate sampling. For these groups genus level identification would be too difficult and time consuming. In order for the County to accept their data, however, the identifier would have to pass a quality assurance program established by the County.

The following are tables for the scoring schemes.

Pocono Plateau, Riffle / Run < 10 square miles

Samples from Keiper Run, Beaver Creek, Cross Keys Run, Frame Cabin Run and Tripup Run were used to develop the reference condition.

**Resulting scoring scheme for the reference condition
for the Pocono Plateau, Riffle / Run < 10 square miles**

Score Assigned →→→→	5 (Optimal)	3 (slightly to moderately impaired)	1 (Severely impaired)
Metric			
Total Taxa	> = 15	14 - 8	7 - 0
EPT Taxa	> = 8	7 - 4	3 - 0
HBI	< = 5.4	5.5 - 7.7	7.8 - 10
% Intolerant Taxa	> = 35.3	35.2 - 17.7	17.6 - 0
% Noninsect	< = 2.0	2.1 - 25.0	25.1 - 100
Shredders / Total	> = 0.02	0.019 - 0.01	0.009 - 0

The reference sites were all scored using this scoring scheme. The lower 25th percentile of the reference site scores represents the lower threshold for the "optimal" category. The 25th percentile of the reference scores is 26. The range 25 - 16 will be the slightly to moderately impaired category, and any site with a total score of less than 16 will be considered severely impaired.

Pocono Plateau, Riffle / Run > 10 square miles

Samples collected from Tunkhannock Creek and Tobyhanna Creek were used to develop a reference condition for the larger streams on the plateau. Descriptive statistics for the metrics at these two sites were calculated and the resulting scoring scheme was developed as described previously. The scoring scheme for the larger streams is shown in the following table.

**Resulting scoring scheme for the reference condition
for the Pocono Plateau, Riffle / Run > 10 square miles**

Score Assigned →→→→	5 (Optimal)	3 (slightly to moderately impaired)	1 (Severely impaired)
Metric			
Total Taxa	> = 15	14 - 8	7 - 0
EPT Taxa	> = 8	7 - 4	3 - 0
HBI	< = 5.7	5.8 - 7.9	8.0 - 10
% Intolerant Taxa	> = 39.3	39.2 - 19.7	19.6 - 0
% Noninsect	< = 3.6	3.7 - 25.0	25.1 - 100
Shredders / Total	> = 0.003	0.0029 - 0.0015	0.0014 - 0

The reference sites were all scored using this scoring scheme. The 25th percentile of the reference scores is 26. The range 25 - 16 will be the slightly to moderately impaired category, and any site with a total score of less than 16 will be considered severely impaired.

Pocono Plateau, Glide / Pool

Samples collected from Tunkhannock Creek were used to develop a reference condition for the glide pool streams found in the Long Pond area. Descriptive statistics for the metrics at these sites were calculated and the resulting scoring scheme was developed as described previously. The scoring scheme for the glide pool streams is shown in the following table.

Resulting scoring scheme for the reference condition for the Pocono Plateau, Glide / Pool

Score Assigned →→→→	5 (Optimal)	3 (slightly to moderately impaired)	1 (Severely impaired)
Metric			
Total Taxa	≥ 15	14 - 8	7 - 0
EPT Taxa	≥ 6	5 - 3	2 - 0
HBI	≤ 5.5	5.6 - 7.8	7.9 - 10
% Intolerant Taxa	≥ 26.7	26.6 - 13.4	13.3 - 0
% Noninsect	0	>0 - 25.0	25.1
Shredders / Total	≥ 0.01	0.009 - 0.005	0.0049 - 0

The reference sites were all scored using this scoring scheme. The lower 25th percentile of the reference site scores represents the lower threshold for the "optimal" category. The 25th percentile of the reference scores is 28. The range 27 - 17 will be the slightly to moderately impaired category, and any site with a total score of less than 17 will be considered severely impaired.

Low Pocono, Riffle / Run < 10 square miles

Samples from Spruce Cabin Run and Buck Hill, Rattlesnake, Mill, Poplar Run, Devils Hole, Fall, Poplar and Swiftwater Creeks were used in developing a scoring scheme for this region. Descriptive statistics for the metrics at these sites were calculated, and the resulting scoring scheme was developed as described earlier. The main difference between the metrics from the Pocono Plateau and Low Pocono subcoregions is the inclusion of the percent dominant family for the Low Pocono.

**Resulting scoring scheme for the reference condition
for the Low Pocono, Riffle / Run < 10 square miles**

Score Assigned →→→→	5 (Optimal)	3 (slightly to moderately impaired)	1 (Severely impaired)
Metric			
Total Taxa	> = 16	15 - 8	7 - 0
EPT Taxa	> = 11	10 - 6	5 - 0
HBI	< = 4.5	4.6 - 7.3	7.4 - 10
% Dominant Family	< = 42.6	42.7 - 71.3	71.4 - 100
% Intolerant Taxa	> = 55.6	55.5 - 27.8	27.7 - 0
% Noninsect	< = 0	0 - 25.0	25.1 - 100
Shredders / Total	> = 0.11	0.10 - 0.06	0.05 - 0

The reference sites were all scored using this scoring scheme. The 25th percentile of the reference sites scores is 31. The range 30 - 19 will be the slightly to moderately impaired category, and any site with a total score less than 19 will be considered severely impaired.

Low Pocono, Riffle / Run > 10 square miles

Samples collected from the Bushkill, McMichael, Brodhead, Paradise, and Pocono Creeks were calculated and the resulting scoring scheme was developed.

**Resulting scoring scheme for the reference condition
for the Low Pocono, Riffle / Run > 10 square miles**

Score Assigned →→→→	5 (Optimal)	3 (slightly to moderately impaired)	1 (Severely impaired)
Metric			
Total Taxa	> = 17	16 - 9	8 - 0
EPT Taxa	> = 10	9 - 5	4 - 0
HBI	< = 5.6	5.7 - 7.8	7.9 - 10
% Dominant Family	< = 46.3	46.4 - 73.2	73.3 - 100
% Intolerant Taxa	> = 35.7	35.6 - 17.9	17.8 - 0
% Noninsect	< = 9.6	9.7 - 25.0	25.1 - 100
Shredders / Total	> = 0.03	0.029 - 0.015	0.014 - 0

The reference sites were all scored using this scoring scheme. The 25th percentile of the reference scores is 29. The range 28 - 18 will be the slightly to moderately impaired category, and any site with a total score of less than 18 will be considered severely impaired.

Northern Shale Valleys and Slopes, Riffle / Run < 10 square miles

Samples collected from the Princess, Ross Common, and Cherry Creeks were calculated and the resulting scoring scheme was developed. This scoring scheme follows the work that has been completed for the Low Pocono subcoregions in that it also includes the percent dominant family metric.

**Resulting scoring scheme for the reference condition
for the Northern Shale Valleys and Slopes, Riffle / Run < 10 square miles**

Score Assigned →→→→	5 (Optimal)	3 (slightly to moderately impaired)	1 (Severely impaired)
Metric			
Total Taxa	> = 18	17 - 9	8 - 0
EPT Taxa	> = 9	8 - 4	3 - 0
HBI	< = 5.0	5.1 - 7.5	7.6 - 10
% Dominant Family	< = 34.9	35.0 - 71.4	71.5 - 100
% Intolerant Taxa	> = 26.1	26.2 - 13.0	12.9 - 0
% Noninsect	< = 5.6	5.7 - 25.0	25.1 - 100
Shredders / Total	> = 0.14	0.139 - 0.070	0.069 - 0

The reference sites were all scored using this scoring scheme. The 25th percentile of the reference scores is 31. The range 30 - 18 will be the slightly to moderately impaired category, and any site with a total score of less than 18 will be considered severely impaired. It should be noted that only six sites were used in creating this scoring scheme. It will be adjusted after further studies have provided more data.

Northern Shale Valleys and Slopes, Riffle / Run > 10 square miles

Samples collected from the McMichael, Pohopoco, Aquashicola, and Buckwha Creeks were calculated and the resulting scoring scheme was developed.

**Resulting scoring scheme for the reference condition
for the Northern Shale Valleys and Slopes, Riffle / Run > 10 square miles**

Score Assigned →→→→	5 (Optimal)	3 (slightly to moderately impaired)	1 (Severely impaired)
Metric			
Total Taxa	> = 19	18 - 10	9 - 0
EPT Taxa	> = 11	10 - 6	5 - 0
HBI	< = 5.1	5.2 - 7.6	7.7 - 10
% Dominant Family	< = 42.6	42.7 - 71.4	71.5 - 100
% Intolerant Taxa	> = 28.6	28.5 - 14.3	14.2 - 0
% Noninsect	< = 3.9	4.0 - 25.0	25.1 - 100
Shredders / Total	> = 0.02	0.019 - 0.009	0.008 - 0

The reference sites were all scored using this scoring scheme. The 25th percentile of the reference scores is 31. The range 30 - 18 will be the slightly to moderately impaired category, and any site with a total score of less than 18 will be considered severely impaired.

Northern Sandstone Ridges, Riffle / Run

Samples collected from the Poplar, Caledonia and Ross Common Creeks were calculated and the resulting scoring scheme was developed.

Resulting scoring scheme for the reference condition for the Northern Sandstone Ridges, Riffle / Run

Score Assigned →→→→	5 (Optimal)	3 (slightly to moderately impaired)	1 (Severely impaired)
Metric			
Total Taxa	> = 16	15 - 8	7 - 0
EPT Taxa	> = 10	9 - 5	4 - 0
HBI	< = 3.9	4.0 - 7.0	7.1 - 10
% Dominant Family	< = 24.1	24.2 - 62.1	62.2 - 100
% Intolerant Taxa	> = 37.5	37.4 - 18.8	18.7 - 0
% Noninsect	< = 2.2	2.3 - 51.2	51.3 - 100
Shredders / Total	> = 0.09	0.089 - 0.045	0.044 - 0

The reference sites were all scored using this scoring scheme. The 25th percentile of the reference scores is 33. The range 32 - 17 will be the slightly to moderately impaired category, and any site with a total score of less than 16 will be considered severely impaired.

MACROINVERTEBRATE SUMMARY

The following tables show results for the Pocono Plateau, Low Pocono and Northern Shale Valleys and Slopes streams using the EPA/County scoring schemes.

Scores for samples for the Pocono Plateau, Riffle / Run < 10 square miles

Stream Name	Sample Number	Type of Site	Score	Condition
Red Run	REDRU03	Monitor	16	Moderately Impaired
Hawkey Run	HAWKRU01	Monitor	24	Slightly Impaired

The range 30 - 26 is considered optimal. The range 25 - 16 is the slightly to moderately impaired category, and any site with a total score of less than 16 is considered severely impaired.

Scores for samples for the Pocono Plateau, Riffle / Run > 10 square miles

Stream Name	Sample Number	Type of Site	Score	Condition
Tobyhanna Creek	TOBYCR01	Reference	26	Optimal
Tunkhannock Creek	TUNKCR03	Reference	30	Optimal
Tobyhanna Creek	TOBYCR14	Monitor	26	Optimal
Lehigh River	LEHIRI01	Monitor	26	Optimal
Lehigh River	LEHIRI02	Monitor	24	Slightly Impaired

The range 30 - 26 is considered optimal. The range 25 - 16 is the slightly to moderately impaired category, and any site with a total score of less than 16 is considered severely impaired.

Scores for samples for the Pocono Plateau, Glide Pool

Stream Name	Sample Number	Type of Site	Score	Condition
Tunkhannock Creek	TUNKCR07	New	26	Slightly Impaired

The range >28 is considered optimal. The range 27 - 17 is the slightly to moderately impaired category, and any site with a total score of less than 17 is considered severely impaired.

**Scores for samples for the Low Pocono,
Rifle / Run < 10 square miles**

Stream Name	Sample Number	Type of Site	Score	Condition
Butz Run	BUTZRU01	Monitor	23	Moderately Impaired
Cranberry Creek (Paradise Twp)	CRCRPA01	Monitor	31	Optimal
Paradise Creek	PARACR04	Monitor	31	Optimal
Devils Hole Creek	DEHOCR04	Monitor	33	Optimal
Cranberry Creek (Stroud Twp)	CRCRST02	Monitor	17	Severely Impaired
Forest Hills Run	FOHIRU01	Monitor	23	Moderately Impaired
Forest Hills Run	FOHIRU06	Monitor	17	Severely Impaired
Forest Hills Run	FOHIRU09	Monitor	17	Severely Impaired
Indian Run	INDIRU01	Monitor	33	Optimal
Swiftwater Creek	SWIFCR02	Monitor	25	Slightly Impaired
Swiftwater Creek	SWIFCR06	Monitor	21	Moderately Impaired
Swiftwater Creek	SWIFCR07	Monitor	25	Slightly Impaired
Swiftwater Creek	SWIFCR05	Monitor	31	Optimal
Swiftwater Creek	SWIFCR03	Monitor	29	Slightly Impaired
Pocono Creek	POCOCR16	Monitor	27	Slightly Impaired
Pocono Creek	POCOCR20	Monitor	29	Slightly Impaired
Pocono Creek	POCOCR17	Monitor	27	Slightly Impaired
Scotrun Creek	SCOTCR04-(A)	Monitor	25	Slightly Impaired
Scotrun Creek	SCOTCR04-(B)	Duplicate	21	Moderately Impaired
Pine Mt. Run	PINEMTRU01	New	29	Slightly Impaired
Middle Branch Creek	MIDDBR01	Monitor	27	Slightly Impaired
Jonas Creek	JONASCR01	Monitor	33	Optimal

The range 35 - 31 is considered optimal. The range 30 - 19 is the slightly to moderately impaired category, and any site with a total score of less than 19 is considered severely impaired.

**Scores for samples for the Low Pocono,
Riffle / Run > 10 square miles**

Stream Name	Sample Number	Type of Site	Score	Condition
Paradise Creek	PARACR03-(A)	Monitor	31	Optimal
Paradise Creek	PARACR03-(B)	Duplicate	31	Optimal
Paradise Creek	PARACR01	Monitor	29	Optimal
Pocono Creek	POCOCR15	Monitor	29	Optimal
Brodhead Creek	BRODCR01	Reference	35	Optimal
Brodhead Creek	BRODCR12	Monitor	27	Slightly Impaired
Bushkill Creek	BUSHCR07	Monitor / Reference	27	Slightly Impaired
Pohopoco Creek	POHOCR06	Monitor	31	Optimal

The range 35 - 29 is considered optimal. The range 28 - 18 is the slightly to moderately impaired category, and any site with a total score of less than 18 is considered severely impaired.

**Scores for samples for the Northern Shale Valleys and Slopes,
Riffle / Run < 10 square miles**

Stream Name	Sample Number	Type of Site	Score	Condition
Buckwha Creek	BUCKCR01	Monitor	27	Slightly Impaired
Aquashicola Creek	AQUACR09	Monitor	31	Optimal
Aquashicola Creek	AQUACR10	Monitor	29	Slightly Impaired
Shawnee Creek	SHAWCR05	New	35	Optimal
Weir Creek	WEIRCR02	Monitor	21	Moderately Impaired

The range 35 - 31 is considered optimal. The range 30 - 18 is the slightly to moderately impaired category, and any site with a total score of less than 18 is considered severely impaired.

**Scores for samples for the Northern Shale Valleys and Slopes,
Riffle / Run > 10 square miles**

Stream Name	Sample Number	Type of Site	Score	Condition
Pocono Creek	POCOCR18	Monitor	31	Optimal
Pocono Creek	POCOCR14	Monitor / Reference	27	Slightly Impaired
McMichaels Creek	MCMICR21	Monitor / Reference	29	Slightly Impaired
Marshalls Creek	MARSCR08	Monitor	31	Optimal
Marshalls Creek	MARSCR09	Monitor	29	Slightly Impaired
McMichael Creek	MCMICR30	Monitor	27	Slightly Impaired
Brodhead Creek	BRODCR14	Monitor	29	Slightly Impaired
Brodhead Creek	BRODCR15	Monitor	29	Slightly Impaired
Cherry Creek	CHERC11	Monitor	33	Optimal
Brodhead Creek	BRODCR13	Monitor	17	Severely Impaired
Pohopoco Creek	POHOOCR08	Monitor	33	Optimal

The range 35 - 31 is considered optimal. The range 30 - 18 is the slightly to moderately impaired category, and any site with a total score of less than 18 is considered severely impaired.

The following tables compare trending results of the EPA/County scoring schemes for repeat sites (2007-1995).

Site #	Site ID	Site Name	2007	2006	2005	2004	2003	2002	2001	2000	1999	1998	1997	1996	1995
1	PARACR03	Paradise Creek	31/31	27/25	35	33	31								
2	BUTZRU01	Butz Run	23	23	23	29	23								
3	CRCRPA01	Cranberry Creek	31	27	29	29									
4	DEHOCR04	Devils Hole Creek	33	31	33	31	31								
5	PARACR04	Paradise Creek	31	31	33	33	31								
6	INDIRU01	Indian Run	33	29	33		31								
7	FOHIRU01	Forest Hills Run	23	25	29	29	25								
8	SWIFCR06	Swiftwater Creek	21	23	25	21	23								
9	SWIFCR02	Swiftwater Creek	25	17	27	25	27								
10	PARACR01	Paradise Creek	29	25	33	29	29								
11	FOHIRU09	Forest Hills Run	17	15	21	15	17								
12	FOHIRU06	Forest Hills Run	17	19											
13	POCOCR18	Pocono Creek	31	25	28	33	33	31	31	27					
14	POCOCR15	Pocono Creek	29	31	33	35	29	31	35	31	27				
15	SCOTCR04	Scotrun Creek	21/25	17/23	23	27	27	31	29						
16	SWIFCR07	Swiftwater Creek	25	27	29	29	25	29	33						
17	SWIFCR05	Swiftwater Creek	31	25	33	33	23	25	29	27	25	29	21	25	
18	SWIFCR03	Swiftwater Creek	29	25	27	29	29	25	29	29	17	27	19	27	23
19	POCOCR20	Pocono Creek	29	27	35	27	23	29	27						
20	POCOCR16	Pocono Creek	27	27	27	27	25	31	23	29	29				
21	POCOCR17	Pocono Creek	27	19	31	21	23	33	29	33					
22	MIDDBR01	Middle Branch	27												
23	PINEMTRU01	Pine Mt. Run	29												
24	BRODCR01	Brodhead Creek	35	35	33	35	35/31	35	35	33	35	35	33		
25	REDRU03	Red Run	16	22	22	24	22	24							
26	HAWKRU01	Hawkey Run	24												

Site #	Site ID	Site Name	2007	2006	2005	2004	2003	2002	2001	2000	1999	1998	1997	1996	1995
27	TUNKCR07	Tunkhannock Creek	26												
28	TOBYCR14	Tobyhanna Creek	26	24	26										
29	TUNKCR03	Tunkhannock Creek	30	28	28	28	28	30	28	26	26	28	30	30	30
30	JONASCR01	Jonas Creek	33	29											
31	SHAWCR05	Shawnee Creek	35												
32	MARSCR08	Marshalls Creek	31	25	33	27	23	23	27	25	19	27	19		
33	MARSCR09	Marshalls Creek	29	25	25/25	25	23	31	29	25	31	25	21		
34	BRODCR14	Brodhead Creek	29	31											
35	BRODCR15	Brodhead Creek	29	29											
36	POCOCR14	Pocono Creek	27	25	29	23	27	29	25	21	29				
37	MCMICR21	McMichael Creek	29	25	23	25	25	31	33	25	29	27	25		
38	POHOCR08	Pohopoco Creek	33	31											
39	WEIRCR02	Weir Creek	21	21											
40	POHOCR06	Pohopoco Creek	31	31	31	33	35	33	31	33	33	33	31	33	
41	BUCKCR01	Buckwha Creek	27	31	31										
42	AQUACR09	Aquashicola Creek	31	33	35	29	27	29	33	31	33	29	35	35	
43	AQUACR10	Aquashicola Creek	29	33	33	33									
44	BRODCR12	Brodhead Creek	27	31	33	29	29	29	29	29	29	29	27	29	25
45	CRCRST02	Cranberry Creek	17	19											
46	BUSHCR07	Bushkill Creek	27	29	31	27	29	29	31	27	29	27	33		
47	BRODCR13	Brodhead Creek	17	15	19		23/25	29	27	21	29	27	27	11	
48	CHERCR11	Cherry Creek	33	31		29	33	31	29	33	27	29			
49	MCMICR30	McMichaels Creek	27	21	21	27									
50	LEHIRI01	Lehigh River	26	28											
51	LEHIRI02	Lehigh River	24	26											
52	TOBYCR01	Tobyhanna Creek	26	22	28	22	26	26	22	24	20	14	18		

Debris Sample Analysis - 2007

SITE #	10	10	20	20	30	30
SITE ID	PARACR01	PARACR01 - DS	POCOCR16	POCOCR16-DS	JONASCR01	JONASCR01-DS
Number of Organisms	383	428	296	336	175	195
Number of Taxa	20	21	15	16	20	20
HBI	4.99	5.01	4.54	4.60	4.04	4.08
EPT Index	12	13	11	11	15	15
% Contrib. of Dom. Taxa	28.2	25.7	24.0	22.6	19.4	19.5
% Intolerant Taxa (0-2 TV)	35.0	38.1	33.3	31.3	45.0	45.0
% Non-insects	4.96	4.91	1.69	1.49	0.00	0.00
Shredders/Total	0.013	0.012	0.091	0.080	0.149	0.133
SITE #	40	40	50	50		
SITE ID	POHOCR06	POHOCR06-DS	LEHIRI01	LEHIRI01-DS		
Number of Organisms	259	297	257	272		
Number of Taxa	18	18	24	24		
HBI	4.28	4.34	4.97	4.96		
EPT Index	11	11	12	12		
% Contrib. of Dom. Taxa	29.3	28.6	17.9	17.6		
% Intolerant Taxa (0-2 TV)	33.3	33.3	29.2	29.2		
% Non-insects	1.93	1.68	10.12	9.56		
Shredders/Total	0.004	0.003	0.004	0.004		

The Debris Sample (DS) column shows the composite of the original count + the debris sample count.

PARACR01 (Paradise Creek) was the first debris sample site. In the composite sample, PARACR01 - DS, 10.51% of the total number of organisms were found in the debris analysis. The debris sample for this site was comprised predominantly of Heptageniidae, which accounts for 5% of the total organisms identified.

The second composite sample was POCOCR16 (Pocono Creek) - DS, 11.90% of the organisms were found in the debris sample. The debris sample for this site was comprised predominantly of Hydropsychidae, which accounts for 5% of the total organisms that were identified.

JONASCR01 (Jonas Creek) was the third site tested to include a debris sample analysis. The debris sample comprised approximately 10.26% of the composite sample at this site. The two taxa that dominated the debris sample for this site were Baetidae (2.56%) and Hydropsychidae (2.56%) of the total number of organisms identified.

POHOCR06 (Pohopoco Creek) was the fourth site tested to include a debris sample analysis. The debris sample comprised approximately 12.79% of the composite sample at this site. The two taxa that dominated the debris sample for this site were Elmidae (4.71%) and Hydropsychidae (3.03%) of the total number of organisms identified.

The final site chosen for a debris sample was LEHIRI01 (Lehigh River). At this site, the debris sample comprised 5.51% of the composite sample. The debris sample for this site was composed predominantly of Baetidae (1.47%) and Hydropsychidae (1.47%) of the total number of organisms identified.

The method of debris sample analysis involved the naked eye and a 2x magnification lens. Due to the size of these creatures the debris samples were found primarily because of the use of the magnifying lens

In future studies work will continue to refine this method of quality assurance and control.