

**Biological Assessment of Stony Run
Springfield Township
Fayette County, Pennsylvania**

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Executive Summary

In February 2013 we assessed the physical, chemical, and biological condition of three sections of Stony Run in Springfield Township, Fayette County, Pennsylvania. Stony Run, a tributary of Indian Creek, has a designated use of CWF (cold water fishery). The purpose of this study was to determine whether Stony Run is a likely candidate for redesignation as a High Quality (HQ) or Exceptional Value (EV) watershed. We compared biological conditions in three sections of the “candidate” stream to a nearby EV reference stream using standard PA DEP protocols. We conclude that Stony Run appears to be eligible for redesignation from its current CWF (cold water fishes) designated use status to EV (exceptional value) existing use status.

Two of the three Stony Run sampling locations had a very high diversity of benthic macroinvertebrates, including a plethora of pollution-intolerant taxa. The macroinvertebrate community was well-balanced both structurally and functionally with less than 10% predators and a good representation of leaf shredders, fine particle collectors, and algal grazers. Stony Run study site SR2a exhibited excellent biological conditions and consistently scored better than 92% compared to the EV reference stream data. Stony Run study site SR3 scored better than 92% compared to 4 of 5 EV reference stream datasets, and scored just below (at 90%) on the fifth. Site SR2b only once scored high enough to suggest EV conditions (when compared with the 2010 Ryerson sampling), and twice scored close to HQ status (83%) when compared with 2011 Ryerson data (82.5%) and 2009 upper Ryerson section data (80%). The SR2b site had good habitat and was composed of macroinvertebrates that require good water quality conditions, but it was less representative of the Stony Run watershed than the other two samples.

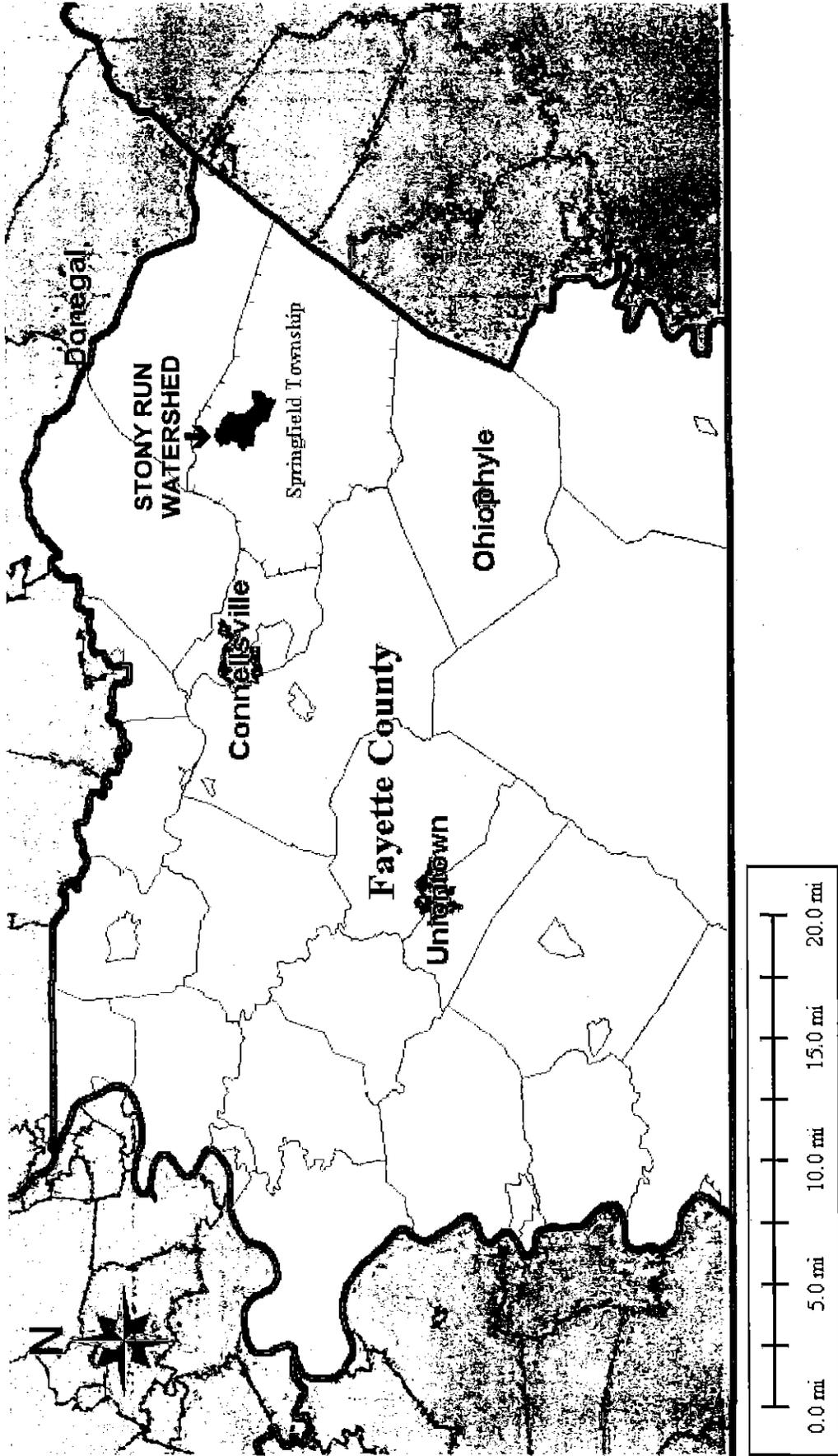
Introduction

In February 2013 we sampled the physical, chemical, and biological condition in three reaches of Stony Run of Indian Creek for comparison with a nearby EV reference stream. The Stony Run watershed is located in Springfield Township in northeastern Fayette County, Pennsylvania (Map1). The purpose of this study was to determine whether Stony Run is a reasonable candidate for redesignation as High Quality or Exceptional Value.

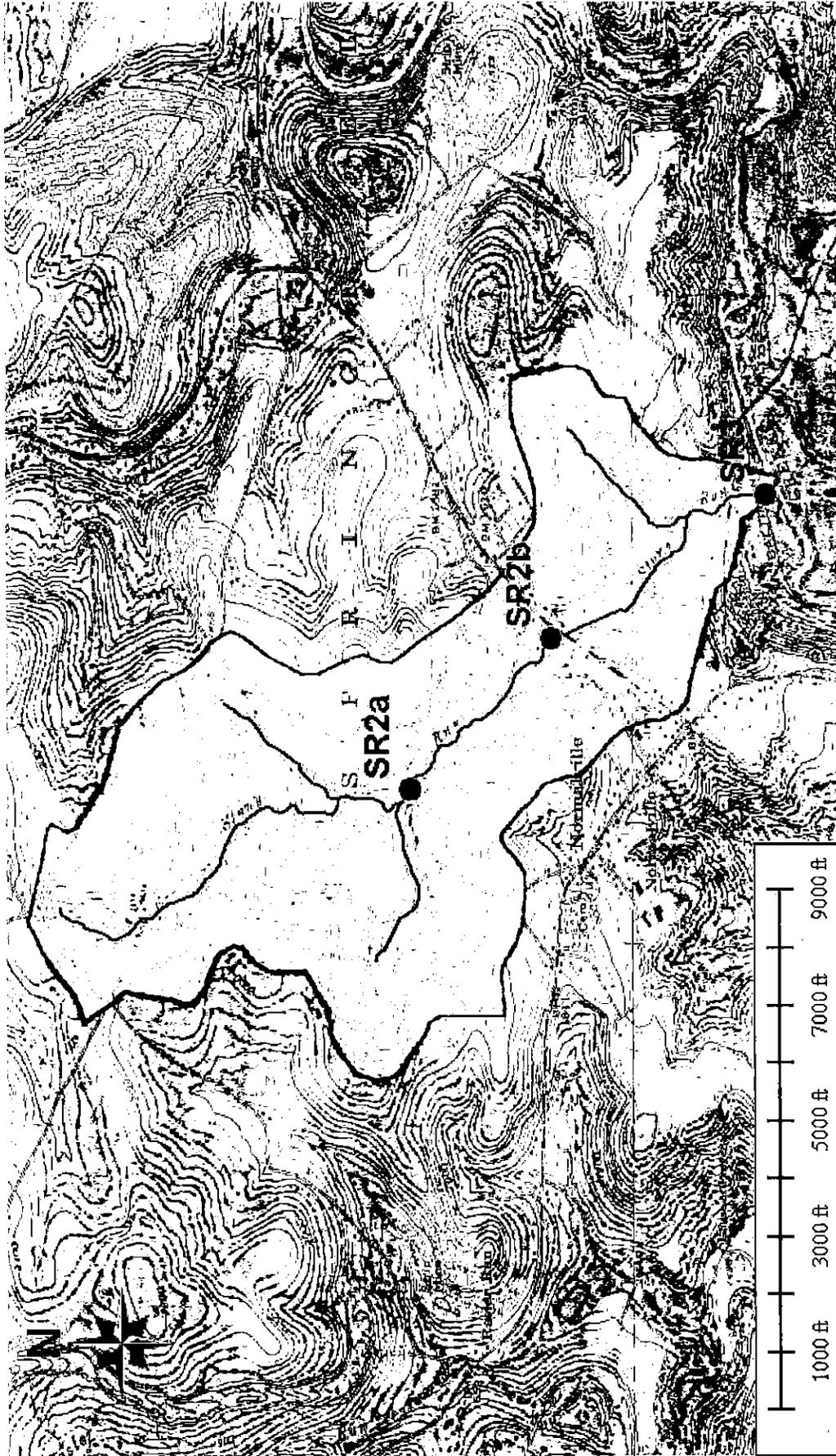
Methods

Project Design

Three sections of Stony Run (Map 2) were sampled on February 13, 2013. Originally, a nearby section of Middle Fork Laurel Run (EV), also in northeastern Fayette County and several miles to the southeast of Stony Run, was planned to be sampled as the EV reference stream against which the candidate streams would be assessed. We inadvertently sampled a section of Laurel Run (HQ-CWF) instead of Middle Fork Laurel Run. We later were told by PA DEP that Middle Fork Laurel Run would not have been the preferred nearby stream to use as a reference in any event; the best EV streams in Fayette County to use as reference streams would have been either Limestone Run or Elk Rock Run, both in the Dunbar Creek watershed in the central section of the County. For



MAP 1. Location of the Stony Run watershed (shaded blue at arrow) in Springfield Township, Fayette County, Pennsylvania.



MAP 2. Location of the three sampling sites (red dots) along Stony Run in Fayette County, PA, as depicted on the Donegal and Mill Run 7.5-minute topographic quadrangles (USGS 1995, 1993). The watershed of Stony Run (shaded light blue) encompasses 1.85 miles, has 4.39 miles of streams, has a mean basin elevation of 1,764.3 feet, is 80.5% forest-covered, is 8.8% urban land cover, and has 0.6% cover of impervious area according to Pennsylvania StreamStats (USGS 2013). <http://water.usgs.gov/osw/streamstats/pennsylvania.html>

various reasons we were unable to return to Fayette County to sample the more appropriate EV stream for use as a reference.

We had previously collected data from a stream often used by PA DEP as an EV reference stream in southwestern Pennsylvania, namely UNT North Fork Dunkard Fork in Ryerson Station State Park (Greene County). We had data from the Ryerson reference stream for July 5, 2008, March 29, 2009 (Stout 2009), April 18, 2010 (Stout 2010), and April 17, 2011 (Stout 2011). Map 3 shows the location of the Ryerson EV reference stream in relation to the Stony Run candidate streams. The distance between the streams is not significant, and the conditions of the watersheds are similar. PA DEP informed us that our use of the Ryerson data would be suitable for reference stream purposes, so we decided to use those data.

Samples collected in the streams were processed in the laboratory according to the gridded pan, gridcutter technique as described in the Pennsylvania Department of Environmental Protection methodology (PA DEP 2003; PA DEP 2009). Macroinvertebrates obtained were identified to the lowest practical taxonomic level, generally genus. Results of each macroinvertebrate sample were standardized to determine Biological Condition Scores which were then used to calculate Percent Attainment of the "candidate" stream sections to the previously sampled Exceptional Value Ryerson reference stream using Pennsylvania Department of Environmental Protection methodology (PA DEP 2003; PA DEP 2009).

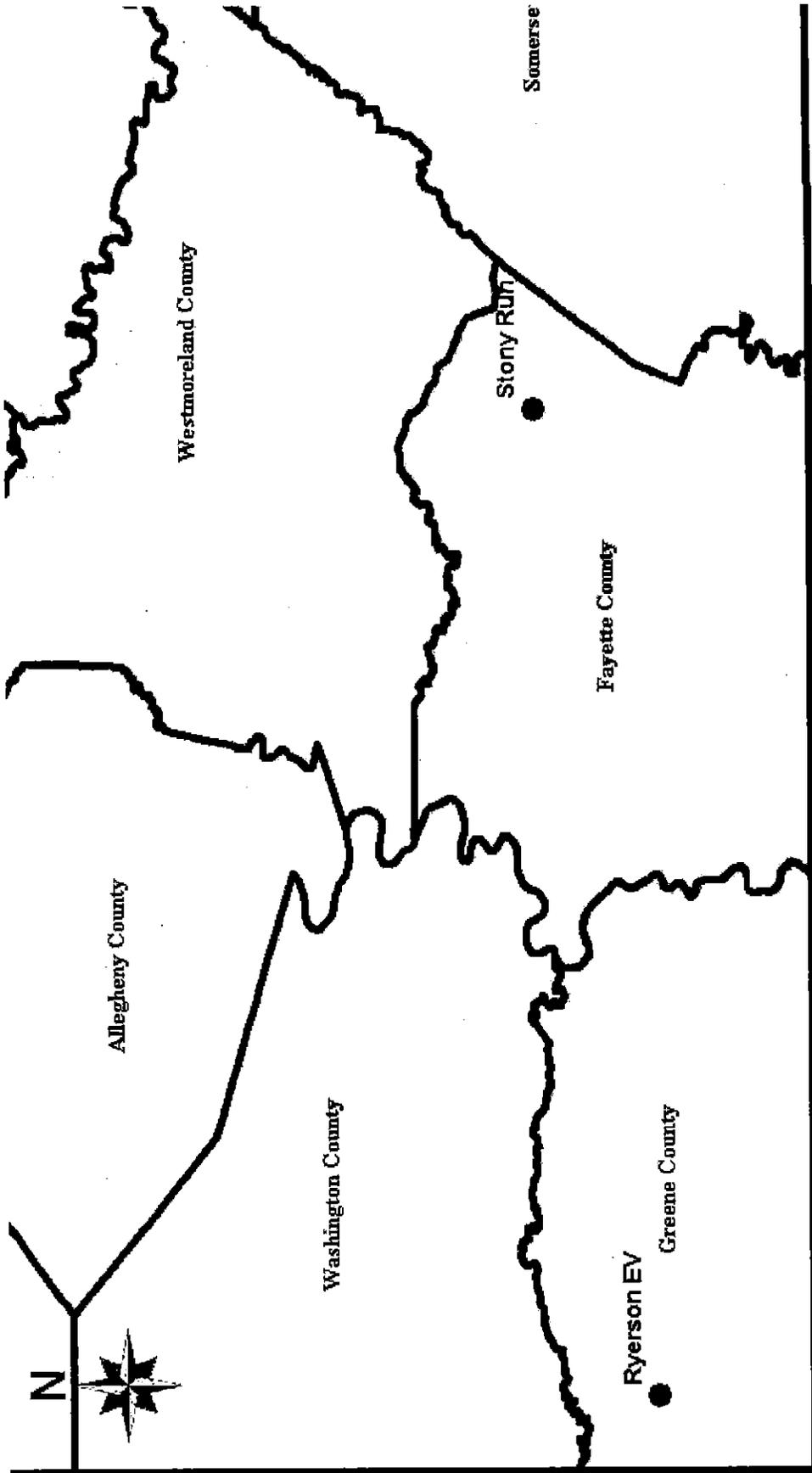
Physical and Chemical Assessment

A YSI 556 MPS water quality meter was used to measure pH, conductivity, temperature, and dissolved oxygen at the 3 candidate sites. The meter was calibrated with laboratory standards for pH prior to field sampling, and conductivity was compared to laboratory standards and found to be accurate within 5% prior to sampling. The dissolved oxygen probe was recalibrated at each site to adjust for changes in water temperature and atmospheric pressure. Latitude and longitude at the sites were obtained from Google Earth prior to sampling.

Biological Assessment

Standard Pennsylvania Department of Environmental Protection field and laboratory methods were used for assessing the water quality status of streams at each site (PA DEP 2003). The method consisted of collecting six, 1 meter-square benthic macroinvertebrate (500 micron mesh net) kick samples at 20 meter intervals along a 100 meter transect. The 6 samples were then composited into a single container, labeled inside and outside with a site number, preserved with 95% ethanol, and returned to the laboratory for processing.

In the laboratory each sample was handled independently beginning with rinsing the sample contents into a #30 sieve to remove the preservative and fine sediments. The contents of the sieve were then placed into a 20x35cm white enamel pan gridded into 28, 5x5cm cells. A goldfish bowl with 28 pieces of paper numbered 1 through 28 was used to randomly select each grid for picking macroinvertebrates from the sample. Between 4 and 8 grids were picked as needed to accomplish the 200+/-20% number of the individuals required to complete the method. A 5x5cm grid cutter was used to segregate the material in the randomly selected grid from the surrounding sample.



MAP 3. Location of the Stony Run candidate sampling sites (red dot) in Fayette County in relation to the EV reference stream (blue dot) in Ryerson Station State Park, Greene County.

Aquatic macroinvertebrate taxa were identified using Merritt & Cummins (1996) as the primary taxonomic reference and to supplement the functional group assignments of those taxa not listed for Pennsylvania in Appendix D: Pollution tolerance values and functional feeding group designations (PA DEP 2009). Appendix B of the US EPA Rapid Bioassessment Protocol (Barbour, et al 1997) was used to determine pollution tolerance values for any uncommon taxa not listed in Appendix D (PA DEP 2009). Stewart & Stark (1988) and Wiggins (1996) were used as supplemental taxonomic references. The number of individuals collected per sample within each taxonomic category is listed in Appendix Table 1. The metrics 1) Taxa richness, 2) Modified EPT, 3) Modified Hilsenhoff Index, 4) Percent dominant, and 5) Percent modified mayflies were calculated for each Site according to PA DEP (2003).

Results

Habitat Conditions of Streams

The upper Stony Run watershed includes two first order tributaries that merge above a culvert beneath a Township road creating a second-order stream below the road. Both of the low-gradient streams above the culvert had primarily clay substrates. Other than a few scattered large sandstone (fieldstone) rocks, there was very little cobble and gravel in the streambed. Other than a few deer carcasses and two major appliances dumped in and around the culvert, the conditions in the upper portions of the watershed were mostly forested with some inactive agricultural fields covered largely in broomsedge. There did not appear to be any major sources of pollution in these upper tributaries.

Our first sampling site, SR2a, was just below the culvert at the fork in the roads shown on Map 1. The substrate here was predominately gravel and small to medium cobble with a few larger size stones scattered in the 100 meter sampling reach. The stream corridor was forested, as were the upstream tributaries at least in the riparian zone. Here again there were inactive agricultural fields with no evidence of recent fertilization or cultivation.

The second sampling site, SR2b, was located on the property of a hunting and fishing club and was well forested and protected. There was a pond upstream of the sampling site, but the pond was offstream, perched on the floodplain with no direct inlet or outlet to the normal course of the stream. There was an overflow outlet from the pond to the stream, but its infrequent use during high volume storm events makes the pond's contribution to the quantity and quality of the stream insignificant. We ran a meter test on the pond and found the conditions to be normal in terms of pH, dissolved oxygen, and total dissolved solids. The pond was not believed to be influencing the stream to any significant degree.

The furthest downstream sampling site, SR3, is approximately 100 meters (stream length) upstream of the confluence of Stony Run with the receiving stream Indian Creek. We sampled a 100 meter reach downstream of the old railroad grade that provides access to the site. This stream segment passes through abandoned surface mine lands and timber slash. Nevertheless, the quality of the instream habitat appeared good.

Physical and Chemical Conditions

The three stream sections surveyed along Stony Run had low total dissolved solids and slightly acidic pH values as is typical on the Laurel Highlands (Table 1). Conditions at the time of sampling were wintertime normal flow. There was nothing remarkable about the physical and chemical data. Although we did not attempt to inventory fish during our investigation, we noted both trout and mottled sculpins while sampling SR3 in lower Stony Run.

TABLE 1. Physical and chemical conditions at field sites during the time of the stream surveys.

| Parameter | Units | Stream Location | | |
|------------------------|--------------|-------------------|-------------------|------------------|
| | | Stony Run SR2a | Stony Run SR2b | Stony Run SR3 |
| Date | M/D/Y | 2/13/2013 | 2/13/2013 | 2/13/2013 |
| Time | HH:MM:SS | 14:35:07 | 14:05:40 | 12:41:35 |
| Water temperature | °C | 4.68 | 4.75 | 3.96 |
| Specific conductance | uS/cm | 33 | 42 | 76 |
| Conductivity | mS/cm | 0.02 | 0.026 | 0.046 |
| Total dissolved solids | g/L | 0.021 | 0.027 | 0.049 |
| Salinity | ppt | 0.01 | 0.02 | 0.04 |
| Dissolved oxygen | % saturation | 91.8 | 101.1 | 98.7 |
| Dissolved oxygen | mg/L | 11.82 | 12.99 | 12.95 |
| pH | | 6.23 | 6.52 | 6.73 |
| Redox potential | mV | 136.9 | 131.7 | 117.8 |

Biological Conditions of Streams

Benthic macroinvertebrates in samples collected at the three sites included 508 individuals representing 31 distinct taxa (Appendix Table 1). These small tributary streams are dominated by mayflies (Ephemeroptera), stoneflies (Plecoptera), and caddisflies (Trichoptera), collectively the EPT taxa. The EPT taxa made up 77.2% of individuals in the 3 samples. Several true flies (Diptera) were present including the craneflies *Tipula abdominalis* and *Hexatoma*. The most prominent Dipterans were blackfly larvae (Simuliidae).

Biological metrics of the sample from SR2b were distinctly different from the other sites (Table 2). Compared to the other 2 sites there were fewer kinds of macroinvertebrates at SR2b and fewer EPT taxa. The result was a higher percent dominance by a single taxa at SR2b than at the other sites. However, the taxon that dominated the SR2b sample (with 60 individuals) was the relatively pollution-sensitive mayfly *Ephemerella* (pollution tolerance = 1 on a scale of 0-10) which made up 35.5% of the sample. *Ephemerella* also dominated the SR2a sample (with 40 individuals). The stonefly *Ostracerca* dominated the SR3 sample with 39 individuals, but *Ephemerella* was a close second with 34 individuals. The lower diversity numbers calculated in the lab did not seem to reflect the higher quality water and habitat observed in the field at SR2b. It is possible that the

relatively lower diversity index numbers obtained for Stony Run SR2b are due either to investigator error or are an artifact of the randomization process for picking macroinvertebrates for identification.

TABLE 2. Summary statistics of the five metric scores that are used to calculate the Biological Condition Index (BCI) for each stream. Richness=number of taxa collected; EPT are mayfly, caddisfly, and stonefly taxa collected; percent dominant is the percentage of the fauna represented by a single taxon, and the Hilsenhoff number is an index of pollution tolerance (0=intolerant up to 10=totally pollution tolerant).

| <u>Five metric scores used to calculate BCI</u> | <u>Stony SR2a</u> | <u>Stony SR2b</u> | <u>Stony SR3</u> |
|---|-----------------------|-----------------------|----------------------|
| <u>1. Taxa Richness</u> (higher is better) | <u>25</u> | <u>16</u> | <u>23</u> |
| EPT taxa | 17 | 12 | 16 |
| (minus) Tolerant EPT | 1 | 0 | 1 |
| <u>2. Modified EPT</u> (higher is better) | <u>16</u> | <u>12</u> | <u>15</u> |
| individuals in most abundant taxon | 40 | 60 | 39 |
| <u>3. Percent dominance by a taxon</u> (lower is better) | <u>23.67</u> | <u>35.50</u> | <u>22.94</u> |
| total mayflies | 73 | 96 | 59 |
| (minus) tolerant mayflies | 5 | 0 | 4 |
| <u>4. Percent modified mayflies</u> (lower is better) | <u>40.24</u> | <u>56.80</u> | <u>32.35</u> |
| <u>5. Hilsenhoff (pollution tolerance) index</u> (lower is better) | <u>2.33</u> | <u>1.37</u> | <u>1.98</u> |
| total individuals in sample | 169 | 169 | 170 |

Comparisons with EV Reference Stream

As noted above, the data we collected at the three candidate streams were compared with five datasets we had collected on four previous occasions in UNT North Fork Dunkard Fork in Ryerson Station State Park, Greene County. This stream has been frequently used by PA DEP and others as an EV reference for streams in southwestern Pennsylvania. We previously collected data from the Ryerson EV reference stream on July 5, 2008, March 29, 2009, April 18, 2010, and April 17, 2011. During the 2009 sampling we collected samples from 2 different locations along the Ryerson EV stream: the “upper” section was in the headwaters of the mainstream, and the “lower” section was the same location as we sampled in 2008, 2010, and 2011. Thus, for comparison with the three candidate sites, we utilized five sets of data from the Ryerson EV reference stream.

When compared to the EV reference stream at Ryerson Station State Park sampled on **July 5, 2008** (Table 3), the SR2a site scored 100% and the SR3 achieved 92.5% attainment, indicating both qualify for Exceptional Value status. The SR2b site failed (67.5%) to achieve a score needed for Special Protection status at the time of our February 2013 sampling as compared with this EV reference stream dataset.

TABLE 3. Biological metrics of the three Stony Run candidate streams compared to the Ryerson Station State Park EV reference stream sampled **July 5, 2008**. Comparative values are used to calculate Biological Condition Scores for the candidate streams using the Table in Section 4 (page 93) of the PA DEP Water Quality Implementation Guidance (PA DEP 2003).

| <i>Metric scores</i> | | Taxa richness | Modified EPT | Percent dominance | % modified mayflies | Hilsenhoff index |
|----------------------|------|---------------|--------------|-------------------|---------------------|------------------|
| RyersonEV2008 | | 30 | 19 | 24.01747 | 17.03057 | 2.179039 |
| Stony | SR2a | 25 | 16 | 23.67 | 40.24 | 2.33 |
| Stony | SR2b | 16 | 12 | 35.50 | 56.80 | 1.37 |
| Stony | SR3 | 23 | 15 | 22.94 | 32.35 | 1.98 |

Comparisons with the Ryerson Station State Park EV reference stream

| | | | | | | |
|-------|------|-------|-------|-------|--------|-------|
| Stony | SR2a | 83.33 | 84.21 | -0.35 | -23.21 | 0.15 |
| Stony | SR2b | 53.33 | 63.16 | 11.49 | -39.77 | -0.81 |
| Stony | SR3 | 76.67 | 78.95 | -1.08 | -15.32 | -0.20 |

| <i>Biological condition (normalized score)</i> | | <u>1</u> | <u>2</u> | <u>3</u> | <u>4</u> | <u>5</u> | Sum of scores | Percent attainment vs EV Reference |
|--|------|----------|----------|----------|----------|----------|---------------|------------------------------------|
| Stony | SR2a | 8 | 8 | 8 | 8 | 8 | 40 | 100 |
| Stony | SR2b | 0 | 4 | 7 | 8 | 8 | 27 | 67.5 |
| Stony | SR3 | 6 | 7 | 8 | 8 | 8 | 37 | 92.5 |

When compared to the **upper** section of the EV reference stream at Ryerson Station State Park sampled on **March 29, 2009** (Table 4), both SR2a and SR3 achieved scores (97.5 and 100% attainment, respectively) indicative of Exceptional Value status. The SR2b site failed (at 80%) to achieve the score needed for Special Protection status at the time of our February 2013 sampling as compared with this EV reference stream dataset.

TABLE 4. Biological metrics of Stony Run candidate streams stream compared to the **upper** section of the Ryerson Station State Park EV reference stream sampled **March 29, 2009** (Stout 2009). Comparative values are used to calculate Biological Condition Scores for the candidate streams using the Table in Section 4 (page 93) of the PA DEP Water Quality Implementation Guidance (PA DEP 2003).

| <i>Metric scores</i> | | Taxa <u>richness</u> | Modified <u>EPT</u> | Percent <u>dominance</u> | % modified <u>mayflies</u> | Hilsenhoff <u>index</u> |
|---------------------------|------|-------------------------|------------------------|-----------------------------|----------------------------------|----------------------------|
| RyersonEV2009upper | | 25.00 | 16.00 | 36.36 | 41.71 | 1.54 |
| Stony | SR2a | 25 | 16 | 23.67 | 40.24 | 2.33 |
| Stony | SR2b | 16 | 12 | 35.50 | 56.80 | 1.37 |
| Stony | SR3 | 23 | 15 | 22.94 | 32.35 | 1.98 |

Comparisons with the Ryerson Station State Park EV reference stream

| | | | | | | |
|-------|------|-----|-------|--------|--------|-------|
| Stony | SR2a | 100 | 100 | -12.69 | 1.47 | 0.79 |
| Stony | SR2b | 64 | 75 | -0.86 | -15.09 | -0.17 |
| Stony | SR3 | 92 | 93.75 | -13.42 | 9.36 | 0.44 |

| <i>Biological condition (normalized score)</i> | | <u>1</u> | <u>2</u> | <u>3</u> | <u>4</u> | <u>5</u> | Sum of <u>scores</u> | Percent attainment vs <u>EV Reference</u> |
|--|------|----------|----------|----------|----------|----------|-------------------------|---|
| Stony | SR2a | 8 | 8 | 8 | 8 | 7 | 39 | 97.5 |
| Stony | SR2b | 2 | 6 | 8 | 8 | 8 | 32 | 80 |
| Stony | SR3 | 8 | 8 | 8 | 8 | 8 | 40 | 100 |

When compared to the **lower** section of the EV reference stream at Ryerson Station State Park sampled on **March 29, 2009** (Table 5) both the SR2a and the SR3 sample achieved scores (100% and 95%, respectively) indicative of an Exceptional Value status. The SR2b site (70%) failed to achieve the score needed for Special Protection status at the time of our February 2013 sampling as compared with this EV reference stream dataset.

TABLE 5. Biological metrics of Stony Run candidate streams compared to the **lower** section of the Ryerson Station State Park EV reference stream sampled **March 29, 2009** (Stout 2009). Comparative values are used to calculate Biological Condition Scores for the candidate streams using the Table in Section 4 (page 93) of the PA DEP Water Quality Implementation Guidance (PA DEP 2003).

| <i>Metric scores</i> | | Taxa <u>richness</u> | Modified <u>EPT</u> | Percent <u>dominance</u> | % modified <u>mayflies</u> | Hilsenhoff <u>index</u> |
|---------------------------|------|-------------------------|------------------------|-----------------------------|----------------------------------|----------------------------|
| RyersonEV2009lower | | 25 | 17 | 20.59 | 39.71 | 1.47 |
| Stony | SR2a | 25 | 16 | 23.67 | 40.24 | 2.33 |
| Stony | SR2b | 16 | 12 | 35.50 | 56.80 | 1.37 |
| Stony | SR3 | 23 | 15 | 22.94 | 32.35 | 1.98 |

Comparisons with the Ryerson Station State Park EV reference stream

| | | | | | | |
|-------|------|-----|-------|-------|--------|-------|
| Stony | SR2a | 100 | 94.12 | 3.08 | -0.53 | 0.86 |
| Stony | SR2b | 64 | 70.59 | 14.91 | -17.10 | -0.10 |
| Stony | SR3 | 92 | 88.24 | 2.35 | 7.35 | 0.51 |

| <i>Biological condition (normalized score)</i> | | <u>1</u> | <u>2</u> | <u>3</u> | <u>4</u> | <u>5</u> | <u>Sum of scores</u> | <u>Percent attainment vs EV Reference</u> |
|--|------|----------|----------|----------|----------|----------|--------------------------|---|
| Stony | SR2a | 8 | 8 | 8 | 8 | 6 | 38 | 95 |
| Stony | SR2b | 2 | 5 | 5 | 8 | 8 | 28 | 70 |
| Stony | SR3 | 8 | 8 | 8 | 8 | 8 | 40 | 100 |

When compared to the EV reference stream at Ryerson Station State Park sampled on **April 18, 2010** (Table 6), both SR2a (95%) and SR2b (92.5%) attained scores indicative of Exceptional Value status. The SR3 sample (90%) just failed to achieve the minimum score (92%) for EV, but easily attained a score indicative of High Quality status.

TABLE 6. Biological metrics of Stony Run candidate streams compared to the Ryerson Station State Park EV reference stream sampled **April 18, 2010** (Stout 2010). Comparative values are used to calculate Biological Condition Scores for the candidate streams using the Table in Section 4 (page 93) of the PA DEP Water Quality Implementation Guidance (PA DEP 2003).

| <i>Metric scores</i> | | Taxa <u>richness</u> | Modified <u>EPT</u> | Percent <u>dominance</u> | % modified <u>mayflies</u> | Hilsenhoff <u>index</u> | | |
|--|------|-------------------------|------------------------|-----------------------------|----------------------------------|----------------------------|--------------------------|---|
| RyersonEV2010 | | 20 | 16 | 28.1 | 57.87 | 1.79 | | |
| Stony | SR2a | 25 | 16 | 23.67 | 40.24 | 2.33 | | |
| Stony | SR2b | 16 | 12 | 35.50 | 56.80 | 1.37 | | |
| Stony | SR3 | 23 | 15 | 22.94 | 32.35 | 1.98 | | |
| Comparisons with the Ryerson Station State Park EV reference stream | | | | | | | | |
| Stony | SR2a | 125 | 100 | -4.43 | 17.63 | 0.54 | | |
| Stony | SR2b | 80 | 75 | 7.40 | 1.07 | -0.42 | | |
| Stony | SR3 | 115 | 94 | -5.16 | 25.52 | 0.19 | | |
| <i>Biological condition (normalized score)</i> | | <u>1</u> | <u>2</u> | <u>3</u> | <u>4</u> | <u>5</u> | <u>Sum of scores</u> | <u>Percent attainment vs EV Reference</u> |
| Stony | SR2a | 8 | 8 | 8 | 6 | 8 | 38 | 95 |
| Stony | SR2b | 7 | 6 | 8 | 8 | 8 | 37 | 92.5 |
| Stony | SR3 | 8 | 8 | 8 | 4 | 8 | 36 | 90 |

When compared to the EV reference stream at Ryerson Station State Park sampled on **April 17, 2011** (Table 7), both SR2a and SR3 (95%) attained scores indicative of Exceptional Value status. The SR2b sample (82.5%) just failed to achieve the minimum score (83%) needed for a score indicative of High Quality status at the time of our February 2013 sampling.

TABLE 7. Biological metrics of Stony Run candidate streams compared to the Ryerson Station State Park Exceptional Value stream sampled **April 17, 2011** (Stout 2011). Comparative values are used to calculate Biological Condition Scores for the candidate streams using the Table in Section 4 (page 93) of the PA DEP Water Quality Implementation Guidance (PA DEP 2003).

| <i>Metric scores</i> | | Taxa <u>richness</u> | Modified <u>EPT</u> | Percent <u>dominance</u> | % modified <u>mayflies</u> | Hilsenhoff <u>index</u> |
|----------------------|------|-------------------------|------------------------|-----------------------------|----------------------------------|----------------------------|
| RyersonEV2011 | | 23 | 16 | 23.53 | 49.41 | 1.51 |
| Stony | SR2a | 25 | 16 | 23.67 | 40.24 | 2.33 |
| Stony | SR2b | 16 | 12 | 35.50 | 56.80 | 1.37 |
| Stony | SR3 | 23 | 15 | 22.94 | 32.35 | 1.98 |

Comparisons with the Ryerson Station State Park EV reference stream

| | | | | | | |
|-------|------|--------|--------|-------|-------|-------|
| Stony | SR2a | 108.70 | 100.00 | 0.14 | 9.18 | 0.82 |
| Stony | SR2b | 69.57 | 75.00 | 11.97 | -7.39 | -0.14 |
| Stony | SR3 | 100.00 | 93.75 | -0.59 | 17.06 | 0.47 |

| <i>Biological condition (normalized score)</i> | | <u>1</u> | <u>2</u> | <u>3</u> | <u>4</u> | <u>5</u> | Sum of <u>scores</u> | Percent attainment vs <u>EV Reference</u> |
|--|------|----------|----------|----------|----------|----------|-------------------------|---|
| Stony | SR2a | 8 | 8 | 8 | 8 | 6 | 38 | 95 |
| Stony | SR2b | 4 | 6 | 7 | 8 | 8 | 33 | 82.5 |
| Stony | SR3 | 8 | 8 | 8 | 6 | 8 | 38 | 95 |

Summary of Attainment Status

In comparison with the Ryerson Station State Park EV reference stream sampled five times in four previous years, Stony Run achieved Exceptional Value existing use scores in 5 out of 5 instances at Study Site SR2a (Table 8). At Site SR3 it scored at the EV level 4 out of 5 times, and once just below that level (at 90%). Site SR2b only once scored high enough to suggest EV conditions when (compared with the 2010 Ryerson sampling), and twice scored close to HQ status (83%) when compared with 2011 Ryerson data (82.5%) and 2009 upper Ryerson section data (80%).

TABLE 8. Percent attainment and indicated status of the three Stony Run candidate sites compared to Ryerson Station EV reference stream sampled in prior years.

| <u>Stream</u> | <u>Location</u> | Percent Attainment | | | | |
|---------------|-----------------|---------------------------|-------------------|-------------------|-------------|-------------|
| | | <u>2008</u> | <u>2009 upper</u> | <u>2009 lower</u> | <u>2010</u> | <u>2011</u> |
| Stony Run | SR2a | 100 | 97.5 | 95 | 95 | 95 |
| Stony Run | SR2b | 67.5 | 80 | 70 | 92.5 | 82.5 |
| Stony Run | SR3 | 92.5 | 100 | 100 | 90 | 95 |

| <u>Stream</u> | <u>Location</u> | Indicated Status | | | | |
|---------------|-----------------|-------------------------|-------------------|-------------------|-------------|-------------|
| | | <u>2008</u> | <u>2009 upper</u> | <u>2009 lower</u> | <u>2010</u> | <u>2011</u> |
| Stony Run | SR2a | EV | EV | EV | EV | EV |
| Stony Run | SR2b | non-attain | non-attain | non-attain | EV | non-attain |
| Stony Run | SR3 | EV | EV | EV | HQ | EV |

EV = 92% or higher attainment
 HQ = 83% up to 92% attainment
 non-attain = did not attain Special Protection (EV or HQ) status

Functional Composition of Stony Run Streams

An important aspect of stream health is the balance of functionality. Each of the candidate streams had fine particle filterer populations comprising about one-half of the population (Table 9). These are mostly collector-gatherer mayflies such as *Ephemera* that work the substrate for fine organic particles, or the net-spinning caddisfly *Dipterona* that filters the water column by spinning a silken net. Blackflies, *Prosimulium* in this case, use cephalic fans to filter the water column and are abundant. Among the algal grazers are *Epeorus* and *McCaffertium* (2 species, *M. fuscum* and *M. vicarium*). The most prominent leaf shredders were the crane fly *Tipula abdominalis* and the stonefly *Ostracera*. These two have different strategies; *T. abdominalis* bores head-long through leaf packs while *Ostracera* peels the epidermis off decaying leaves.

The balance of functional group composition appears to be indicative of healthy headwater streams. Most notably, predator populations appear reasonable at around 10% or less of the total population. Predator populations in excess of 20% are indicative of unsustainable conditions given that other insects are their primary diet and metabolic conversion efficiencies are only about 10% from one trophic level to the next. We also noted healthy salamander populations in both streams during field sampling.

TABLE 9. Functional group composition in samples from the three candidate streams.

| <u>Functional groups</u> | <u>Stony SR2a</u> | <u>Stony SR2b</u> | <u>Stony SR3</u> |
|--------------------------|-----------------------|-----------------------|----------------------|
| Leaf shredders | 17.2% | 20.1% | 34.1% |
| Fine particle collectors | 50.3% | 52.1% | 46.5% |
| Algal grazers | 20.7% | 23.7% | 14.1% |
| Predators | 11.8% | 4.1% | 5.3% |

Conclusions

We conclude that Stony Run appears to be eligible for redesignation from its current CWF (cold water fishes) designated use status to EV (exceptional value) existing use status. Biological conditions at 2 of the 3 candidate sites sampled on Stony Run displayed conditions and achieved the scores indicative of Exceptional Value existing use. Study site SR2a consistently achieved scores of 92% or higher when compared with five different data sets we previously had collected on the EV reference stream at Ryerson Station State Park. Study site SR3 achieved EV scores in 4 of the 5 comparisons with the Ryerson EV data; in the 5th, it failed to score 92%, but scored well enough (90%) for HQ attainment. The third site (SR2b) only once attained a score indicative of EV conditions, although two other times came close to the scores indicative of HQ quality. However, the anomalous metrics calculated for the SR2b sample do not appear to be representative of the Stony Run watershed overall, or even of the high quality stream conditions observed in the field at SR2b.

Authorship

This report was prepared by Dr. Benjamin Stout, III, Professor of Biology at Wheeling Jesuit University (Wheeling WV). Dr. Stout was responsible for the macroinvertebrate surveys at the candidate sites along Stony Run and for previous sampling at the EV reference site in Ryerson Station State Park. Dr. Stout also was responsible for the analysis and assessment of data collected at the various stream sites. Editorial review of this report, and compilation of graphics, was provided by Stephen P. Kunz and James A. Schmid of Schmid & Company, Inc., Consulting Ecologists (Media PA). Both Mr. Kunz and Dr. Schmid are certified as Senior Ecologists by the Ecological Society of America and as Professional Wetland Scientists by the Society of Wetland Scientists.

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APPENDIX TABLE 1. Number of individuals in taxa collected from the three Stony Run candidate streams in the Fayette County study area. Functional groups are 1=leaf shredders, 2=fine particle collectors, 3= algal grazers, 4=predators. Pollution tolerance ranges from 0 (intolerant) to 10 (highly tolerant of water pollution).

| <u>Pollution tolerance</u> | <u>Functional group</u> | <u>Insect order (or class)</u> | <u>Taxa List</u> | <u>Stony SR2a</u> | <u>Stony SR2b</u> | <u>Stony SR3</u> | <u>Study Total#</u> |
|----------------------------|-------------------------|--------------------------------|--------------------------------|-------------------|-------------------|------------------|---------------------|
| 6 | 3 | Coleoptera | <i>Dubraphria</i> | 8 | 4 | 4 | 16 |
| 5 | 3 | Coleoptera | <i>Ectopria</i> | 0 | 0 | 1 | 1 |
| 6 | 2 | Diptera | <i>Chironominae</i> | 10 | 2 | 4 | 16 |
| 2 | 4 | Diptera | <i>Hexatoma</i> | 2 | 0 | 0 | 2 |
| 2 | 2 | Diptera | <i>Prosimulium</i> | 22 | 11 | 23 | 56 |
| 4 | 1 | Diptera | <i>Tipula abdonimalis</i> | 7 | 0 | 6 | 13 |
| 3 | 4 | Diptera | <i>Dicranota</i> | 4 | 0 | 3 | 7 |
| 6 | 2 | Decapoda | <i>Cambarus</i> | 0 | 0 | 1 | 1 |
| 0 | 2 | Ephemeroptera | <i>Ameletus</i> | 0 | 1 | 1 | 2 |
| 6 | 2 | Ephemeroptera | <i>Baetis</i> | 5 | 0 | 4 | 9 |
| 0 | 3 | Ephemeroptera | <i>Epeorus rubrens</i> | 4 | 20 | 11 | 35 |
| 2 | 2 | Ephemeroptera | <i>Ephemera</i> | 1 | 0 | 0 | 1 |
| 1 | 2 | Ephemeroptera | <i>Ephemerella</i> | 40 | 60 | 34 | 134 |
| 4 | 2 | Ephemeroptera | <i>Eurylophelia</i> | 2 | 0 | 2 | 4 |
| 1 | 3 | Ephemeroptera | <i>Paraleptophlebia</i> | 14 | 7 | 6 | 27 |
| 3 | 3 | Ephemeroptera | <i>McCaffertium</i> | 7 | 8 | 1 | 16 |
| 0 | 1 | Plecoptera | <i>Acroneuria carolinensis</i> | 0 | 4 | 2 | 6 |
| 3 | 1 | Plecoptera | <i>Allocapnia</i> | 5 | 12 | 11 | 28 |
| 2 | 4 | Plecoptera | <i>Clioperla clio</i> | 3 | 0 | 2 | 5 |
| 2 | 4 | Plecoptera | <i>Cultus</i> | 0 | 0 | 1 | 1 |
| 2 | 1 | Plecoptera | <i>Ostracerca</i> | 13 | 18 | 39 | 70 |
| 0 | 1 | Plecoptera | <i>Talloperla maria</i> | 2 | 0 | 0 | 2 |
| 1 | 4 | Plecoptera | <i>Yugus</i> | 0 | 1 | 1 | 2 |
| 4 | 2 | Trichoptera | <i>Mystacides</i> | 2 | 0 | 0 | 2 |
| 0 | 2 | Trichoptera | <i>Diplectrona modesta</i> | 3 | 14 | 10 | 27 |
| 4 | 1 | Trichoptera | <i>Frenesia difficilus</i> | 1 | 0 | 0 | 1 |
| 3 | 3 | Trichoptera | <i>Neophylax</i> | 2 | 1 | 1 | 4 |
| 4 | 1 | Trichoptera | <i>Pycnopsyche</i> | 1 | 0 | 0 | 1 |
| 1 | 4 | Trichoptera | <i>Rhyacophila</i> | 8 | 5 | 2 | 15 |
| 1 | 4 | Megaloptera | <i>Nigronia serricornis</i> | 2 | 1 | 0 | 3 |
| 3 | 4 | Odonata | <i>Cordulagaster</i> | 1 | 0 | 0 | 1 |
| TOTAL | | | | 169 | 169 | 170 | 508 |