

Discussion

Due to the adoption of the state protocols of single and multihabitat evaluations, there is not enough data at this time to effectively conclude accurate trending information for comparison of sites between years.

These adopted methods will assist in the evaluation of Monroe County streams utilizing their Aquatic Life Use (ALU) IBI scoring benchmarks. Typically, a DEP biologist will conduct these sampling methods for ALU attainment benchmarks during the November through April time frame for special protection waters, which are designated as High Quality (HQ) and Exceptional Value (EV) streams.

Raw data is statistically evaluated through the metric standardization and normalization equations and index calculations. This year there were 53 stream stations evaluated, 48 with the riffle-run and 5 with the multihabitat assessment protocols. Overall, 40 out of 53 sites did not attain their specific designated uses by state standards. There were 4 sites that did not reach the collection protocol benchmarks, which require 200 total macroinvertebrate specimens per site [(+/- 40 organisms riffle-run) (+/- 20 organisms multihabitat)], which were LAKECR02 at 98, MCMICR20 at 59, TANKCR02 at 45, TUNKCR07 at 103. Stream impairments are indicated by low biological assessment scores. Further details are located in Appendix A.

Lower scores recorded during the 2008 field sampling may not meet the ALU benchmarks for indicated thresholds, however, these situations may be due to or have been influenced by natural conditions i.e. marshy wetlands, or could be attributed to the differences in previous sampling procedures and methodologies for assessments. A number of nonattaining sites are probably not impaired, but rather harbor natural conditions, which produce a lower IBI score. Historically, Monroe County streams had their designated uses based on public meetings and no sampled data. HQ and EV streams were probably conservation areas prior to 1977 when Chapter 93 was adopted with the current designations. These designations may not be accurate, and in the case of HQ and EV, the existing water quality is to be maintained and protected. These streams may not have had particularly high water quality for some parameters such as temperature, pH and alkalinity (Gary Walters 2009 pers. comm.).

The potentially impaired sites and probable cause of impairment are as follows:

- **AQUACR12** – The biological score rated 61.2 / 80.0 for this new site. There was a water intake upstream of the sample area that may be affecting the biotic community.
- **BUCKCR05** – The biological score rated 42.3 / 55.0. This site had abundant siltation as evidenced by the pebble count, no riparian buffer width and demonstrated poor habitat with an on stream dam and impoundment which created back water in the sample area.
- **BRODCR01** – The biological score rated 70.3 / 80.0. There was a shift in the particle size per pebble count data, which has influence on habitat potential with direct influence on the biological potential.

- **BRODCR13** – The biological score rated 59.6 / 63.0. A small difference from the benchmark, however, the pebble count indicates siltation and a low Beck’s index indicates a more tolerant community. The lack of stoneflies identified in the macroinvertebrate community indicates possible warmer water, high biological oxygen demand (BOD) and periodic lack of dissolved oxygen.
- **BRODCR17** – The biological score rated 56.7 / 63.0 for this new site. This site had potential impacts associated with the lack of riparian buffer. Also an iron seep was detected at this site and a more tolerant community identified.
- **BRODCR18** – The biological score rated 51.3 / 63.0 for this new site. A low Beck’s index and hilsenhoff indicate a more tolerant community. A single stonefly identified in the macroinvertebrate community indicates possible warmer water and impacts associated with potential dissolved oxygen depletion.
- **MARSCR08** – The biological score rated 70.8 / 80.0. A lower Beck’s index and riparian impacts are negatively affecting the macroinvertebrate community.
- **MARSCR09** – The biological score rated 70.9 / 80.0. A low Beck’s index, elevated water temperatures and riparian impacts are negatively affecting the macroinvertebrate community.
- **MARSCR10** – The biological score rated 77.7 / 80.0 for this new site. Such a minute difference from the benchmark indicates this site is probably not impaired.
- **MARSCR11** – The biological score rated 62.5 / 80.0 for this new site. Elevated coliform levels, riparian buffer and vegetation are lacking and influences from the residential community are possible sources of impairment.
- **MARSCR12** – The biological score rated 62.7 / 80.0 for this new site. Lower recorded EPT indicates a more tolerant community and riparian impacts may be due to a golf course upstream of the site. The presence of the trophic group “scrappers” indicates possible lack of overhead canopy.
- **PARACR08** – The biological score rated 74.3 / 80.0. Such a small difference from the benchmark indicates this site is probably not impaired.
- **TANKCR02** – The biological score rated 58.6 / 80.0. A low EPT, total taxa, Beck’s index and lack of mayflies indicates low biomass. The lack of depth and velocity regimes indicates possible intermittent flow disruption of the macroinvertebrate community. A low biomass of 45 specimens invalidates any statistical metric evaluation.
- **BUSHCR08** – The biological score rated 64.4 / 80.0 for this new site. Possible sources of impairment are indicated by a lack of canopy, higher water temperatures and possibly low dissolved oxygen content.
- **BUSHCR09** – The biological score rated 68.2 / 80.0 for this new site. The lack of stoneflies and dominant chironomids indicate sources of enrichment and a possible oxygen level problem.
- **BUSHCR10** – The biological score rated 76.5 / 80.0 for this new site. Such a small difference from the benchmark indicates this site is probably not impaired. This site is upstream of the Saw Creek confluence.
- **LEHIRI01** – The biological score rated 77.9 / 80.0. Such a small difference from the benchmark indicates this site is probably not impaired. This site recorded low dissolved oxygen, riparian impacts and lack of overhead canopy as evidenced by the abundance of scrappers in the macroinvertebrate community.
- **LEHIRI02** – The biological score rated 63.6 / 80.0. A possible influence from WWTP

discharge, the upstream site recorded a score that was 14 points higher. The sample was a more tolerant community dominated by chironomids and harbors less diversity when compared to the upstream site.

- **CLEARU02** – The biological score rated 47.3 / 80.0. Sources of impairment may be from poor habitat with riparian impacts affecting community composition, possibly from intermittent flow and dissolved oxygen problems.
- **DUPURU01** – The biological score rated 71.9 / 80.0 for this new site. Low flow conditions possibly impaired this site.
- **HAWKRU01** – The biological score rated 73.5 / 80.0. Such a small difference from the benchmark indicates that this site is probably not impaired but does have some riparian habitat impacts.
- **REDRU03** – The biological score rated 43.6 / 55.0. This may be natural conditions being a low gradient stream with sediment deposition and pool variability.
- **TOBYCR01** – The biological score rated 74.0 / 80.0. Such a small difference from the benchmark indicates that this site is probably not impaired, however, there are possible riparian impacts.
- **TOBYCR14** – The biological score rated 52.3 / 80.0. The sources of impairment may be from being downstream of a WWTP. A tolerant community indicated by low Beck's and high Hilsenhoff, low DO, high temperatures and abundant filter collectors indicates enrichment.
- **TOBYCR19** – The biological score rated 70.6 / 80.0 for this new site. Such a small difference from the benchmark indicates this site is probably not impaired.
- **TOBYCR20** – The biological score rated 53.4 / 80.0. The possible source may be from low biomass.
- **TUNKCR03** – The biological score rated 67.1 / 80.0. This site exhibited a dominant chironomid community and a shift in the pebble counts D-50, which indicates a change in the habitat.
- **CRCRPO04** – The biological score rated 68.4 / 80.0. A tolerant community indicated by Beck's index and a dominant chironomid community with low dissolved oxygen content indicates possible enrichment.
- **LAKECR01** – The biological score rated 67.5 / 80.0 for this new site. The habitat scores indicate negative riparian impacts.
- **LAKECR02** – The biological score rated 56.2 / 80.0 for this new site. A low biomass of 98 specimens invalidates any statistical metric evaluation, and siltation indicated by the pebble count greatly impacted this site.
- **MCMICR20** – The biological score rated 52.9 / 80.0 for this new site. A low Beck's index indicates a tolerant community with a low biomass of only 59 specimens. Low numbers invalidate any statistical metric evaluation.
- **MCMICR30** – The biological score rated 36.3 / 63.0. A low EPT, total taxa and low Beck's index indicates possible degradation from the WWTP discharge upstream of the site. No stoneflies identified indicate dissolved oxygen problems.
- **MCMICR32** – The biological score rated 65.4 / 80.0 for this new site. The oligochaeta (worm) community is considered pollution tolerant and lowered the statistical assessments for intolerant taxa numbers. This site exhibited low dissolved oxygen.
- **MCMICR33** – The biological score rated 60.1 / 80.0 for this new site. This site

exhibited riparian impacts, lack of instream cover, low EPT and the dominant taxa is a filter collector which may indicate an enrichment problem.

- **POCOCR14** – The biological score rated 68.3 / 80.0. This site exhibited habitat impacts and a low Beck's Index that indicates a more tolerant community.
- **POCOCR16** – The biological score rated 54.0 / 80.0. There is a loss of aquatic biodiversity from comparison to the upstream site, POCOCR20 at 77.6. This site exhibited habitat impacts, possibly due to residential development, resort use or other constraints, such as a water intake control device a few yards upstream. Other possible impairments include intermittent flows or unknown sources.
- **POCOCR17** – The biological score rated 67.1 / 80.0. There is a lack of a riparian buffer and other associated disturbance impacts.
- **POCOCR20** – The biological score rated 77.6 / 80.0. Such a small difference from the benchmark this site is probably not impaired.
- **SCOTCR04** – The biological score rated 69.9 / 80.0. This site exhibited habitat impacts and possible land use impacts.
- **DOTTCR04** – The biological score rated 73.0 / 80.0 for this new site. This site exhibited habitat impacts.

The county will continue to monitor these streams for changes to the ecosystems. The county and watershed groups should continue to examine and obtain supplemental land use and water chemistry information for three sites in particular: BRODCR13, CLEARU02 and REDRU03. BRODCR13 is exhibiting sediment accumulations within the substrate which is documented by the comparison of the D-50 pebble count. The impaired sites of Clear Run (CLEARU02) and Red Run (REDRU03) require additional research to identify the sources of impairment at these locations. It should be noted, however, that these conditions may be attributable to seasonal sampling problems.

For successful instream functions, organisms must have optimal habitat requirements to be balanced, as they fulfill their position within the trophic dynamics of the aquatic ecosystem and associated processes. These dynamics represent the food chain and flow of nutrients and energy. Streams that contain good water quality will support macroinvertebrates that are both sensitive to and tolerant of pollution, with no dominant groups or types of organisms within that community population. Consequently, when a stream has increased organic pollution found in point and nonpoint sources (nutrients found in fertilizers, sewage and other sources), it may affect the physical and biological functions of watersheds since fewer pollution sensitive organisms are able to colonize within these poor environmental conditions.

The Monroe County Water Quality Study will continue to utilize bioindicators such as macroinvertebrates to measure ecosystem conditions and will continue to investigate alterations to ecosystem health. The County will continue to utilize scientific studies specifically written for Monroe County by Federal agencies for example United States Environmental Protection Agency (USEPA), United States Geological Survey (USGS), and other agencies such as the Delaware River Basin Commission (DRBC). The scientific investigation Report 2008-5030, acknowledges that there must be a focused attention on growth of a population and its effects on land-use which has the ability to result in negative changes to watershed health and stream base flow amid increased demands for water consumption (Sloto 2008).

The MCPC has promoted progressive planning principles such as multi-municipal comprehensive plans for shared, balanced and directed economic growth which provides protection and stability to the natural resources and communities. A number of the County's municipalities have partnered together to effectively plan their regions. These plans lay the foundation for municipalities to share in infrastructure, zoning and land use consistency across municipal lines to effectively accomplish similar goals together.

There are certain practices that municipal leaders can initiate to maintain water quality and quantity, instream function and watershed processes. Such actions include utilizing best management practices (BMPs) for stormwater and promoting infill, subdivision and land development ordinances (SALDO) that restrict imperious surfaces, zoning ordinances that incorporate conservation design principles and growth management techniques that direct growth toward designated areas.

RECOMMENDATIONS

It is recommended that the Monroe County Water Quality Study continue to utilize the Instream Comprehensive Evaluations and Multi-habitat assessment protocols for consistency with state government guidelines.

The following sites are recommended to be referred to DEP for further investigation.

TOBYCR14 - Immediately upstream of S.R. 115 bridge.

Lat. 41° 04' 58.19"

Long. -75° 34' 58.94"

The biological score rated 52.3 / 80.0. This site exhibited a tolerant community indicated by low Beck's and high Hilsenhoff. Low DO, high temperature and abundant filter collectors indicates enrichment.

TOBYCR20 - Approximately 50 yards upstream of Coolbaugh WWTP discharge.

Lat. 41° 10' 19.34"

Long. -75° 25' 08.21"

The biological score rated 53.4 / 80.0. The possible sources may be from low biomass or problems associated from a previous diesel fuel spill.

MCMICR30 - Approximately 300 yards downstream of Stroudsburg WWTP discharge.

Lat. 40° 59' 16.65"

Long. -75° 11' 06.75"

The biological score rated 36.3 / 63.0. A low EPT, total taxa and a low Beck's index indicates possible degradation from the WWTP discharge upstream of site.

The Monroe County Planning Commission and the Conservation District will continue to develop long term trending associated with detailed watershed assessments. Also, the study will continue to document stream segments for those areas that have no data available.

Additional monitoring sites should be selected in consultation with active watershed groups within Monroe County and associated areas. Continued monitoring should be geared towards determining the extent and possible causes of instream impairment. These determinations will allow the County and the watershed associations the information required to address potential mitigation, restoration and redesignation petitions.

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Monroe County has conducted an annual water quality study for the past twenty three years. Through the years the program has evolved and will continue to, and the annual report has been refined to provide a comprehensive analysis of the County's streams.

There are a number of people and organizations to be recognized for their efforts in this year's study:

- The County would like to extend sincerest thanks to all the volunteers (and staff) who gave many hours to assure that accuracy was maintained while collecting field data.
- The continued professional support from Prosser Labs and Aquatic Resource Consulting.
- Without the permission of private property owners, the number of sampling sites would be greatly reduced. The County appreciates them for allowing access to their property.

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