MONROE COUNTY

WATER QUALITY STUDY 2006

Volume I of II – Executive Summary

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INTRODUCTION AND BACKGROUND

The annual water quality study in Monroe County has produced a solid foundation for both quantitative and qualitative analysis of the County's surface water. The main objective of this effort has been to develop procedures that specifically address intra-county water quality problems for the purpose of documentation and rectification and to continue efforts to establish baseline data for streams which have not previously been sampled. Since the study's inception, over 250 individual sites have been tested and many of these have been sampled during three or more years. The data collected provides the information necessary for analysis of the County's surface water.

The annual water quality studies began in 1985. During the first four years the study consisted of two basic hydrologic surveys: (1) groundwater (wells) and (2) surface water (streams). The groundwater resources were analyzed for chemical properties, while the surface water testing included a macroinvertebrate analysis and physical parameters as well as a chemical analysis. The groundwater portion of the study was discontinued in 1989 and the Study has focused solely on surface water since that time.

The 1993 Monroe County Surface Water Study marked a significant change in the way that the County looks at its surface water. In this year, the County began the process of integrating the US Environmental Protection Agency's (EPA) Rapid Bioassessment Protocols (RBPs). The RBPs examine water quality as it relates to the macroinvertebrate community and their habitat. This not only allows one to examine the existing quality of a stream, but it also gives insight into the potential quality of that stream.

In order to determine which streams could be compared as similar, the EPA's ecoregion format was chosen instead of watershed boundaries. Due to the large size of the ecoregions, the County refined the EPA system into subecoregions. The decision was then made to use reference conditions instead of a reference site. When a single reference site is used, all other sampling stations on that stream must be compared to that location. The reference condition incorporates reference sites from various streams within a subecoregion, sharing similar ecological conditions to create a scoring scheme, called a metric. The metrics are used to rank all sampling stations from that subecoregion.

The study divided the subecoregions into two smaller categories; streams with a drainage basin of less than 10 square miles and streams with a drainage basin greater than 10 square miles. The 10 square mile threshold approximates the point in drainage area size where a change is seen in the canopy cover of a stream. The canopy cover determines the amount of sunlight reaching the streambed which has a profound affect on the stream's ecology. The 10 square mile parameter is an ecological milestone in terms of the food cycle and source of primary energy (sun & nonsunlight) fuels. Streams having less than 10 square miles in drainage area generally have greater canopy cover and the primary food source in these streams is leaf litter. Streams having greater than 10 square miles in drainage area generally have wider channels allowing more sunlight to reach the streambed and photosynthesis becomes the primary energy source that affects the macroinvertebrate community. This does not mean that each subecoregion will have two scoring schemes since the Northern Sandstone Ridges subecoregion is comprised solely of streams that are less than 10 square miles in drainage area. Once the proper subecoregion and size of the drainage area of a site is determined, the proper metrics can be applied.

From 1996 through 1999 the County concentrated on establishing reference conditions.

In 2000, the Delaware River Basin Commission (DRBC) received a grant to conduct a goal based watershed management project in the Pocono Creek Watershed. The project included an analysis of existing information and data gaps and a need for more data was identified. As a result, the 2000 Water Quality Study contained additional sites to address this need.

In the 2001 study, it was determined that not every site needed chemical samples taken for lab analysis. Sites that are tested annually and which consistently showed good water quality no longer have chemical samples taken. The ability of the macroinvertebrate analysis to indicate impairment well after a possible incident and to track possible impairment trends at monitoring sites allowed the study to rely less on chemical testing.

The next change to the Study took place in 2003 when the County changed from a subjective evaluation of the stream bottom to an objective format (pebble counts). The addition of pebble counts allows for analysis of the bed load of a stream. The 2003 Study also included sites in support of the Paradise Creek Watershed Management Plan.

The study now supports two Watershed Management Plans, the Pocono Creek Sustainable Watershed Management Project and the Paradise Creek Watershed Management Plan. These studies utilize water quality data as a tool for determining current conditions of a watershed as well as to indicate success of the management plans after completion. The initial work conducted for these plans is to determine any data gaps and work to obtain any necessary data. Local input is garnered to determine future goals for each watershed. All available data is then analyzed to determine existing conditions for a picture of watershed health. The analysis is then utilized to determine tools by which to reach the goals that were identified. The County Study has proven to be an invaluable resource of existing data for these plans and is intended to be the tool used to monitor Plan success.

With reference conditions for all the streams in Monroe County defined, the Planning Commission now has an invaluable tool by which to assess the ecological condition of our surface water resources. The database being generated will allow for long term trending of water quality. This information can then be used to address chronic problem areas with recommendations for remediation.

RESULTS

Aquashicola Creek Watershed

Aquashicola Creek (HQ-CWF, MF)

SITE ID: AQUACR09 **MUNICIPALITY:** Eldred Township

SUBECOREGION: Northern Shale Valleys and Slopes > 10 square miles

SITE LOCATION: Approximately 100 yards upstream of the bridge on Mountain Road, near County border.

LATITUDE: 40° 49' 45.95" **LONGITUDE:** -75° 26' 45.17"

YEARS TESTED: 2006, 2005, 2004, 2003, 2002, 2001, 2000, 1999, 1998, 1997, 1996, 1995

Water chemistry samples for lab analysis were not collected at this site and all field chemistry parameters were within acceptable levels. A habitat score of 209 placed this site in the optimal category. The biological assessment score of 33 placed this site in the optimal category for the Northern Shale Valleys and Slopes > 10 square miles scoring scheme.

SITE ID: AQUACR10 **MUNICIPALITY:** Eldred Township

SUBECOREGION: Northern Shale Valleys and Slopes > 10 square miles

SITE LOCATION: At the Kunkletown Rod and Gun Club, immediately downstream of bridge on the private drive.

LATITUDE: 40° 50' 28.58" **LONGITUDE:** -75° 25' 24.34"

YEARS TESTED: 2006, 2005, 2004

Fecal coliform levels were highly elevated at this site, but all other water chemistry parameters tested at this site were within acceptable limits. The habitat score of 182 placed this site in the suboptimal-optimal category. The biological assessment score of 33 placed this site in the optimal category for the Northern Shale Valleys and Slopes, Riffle/Run >10 square miles scoring scheme.

Buckwha Creek (CWF)

SITE ID: BUCKCR01 **MUNICIPALITY:** Eldred Township

SUBECOREGION: Northern Shale Valleys and Slopes > 10 square miles

SITE LOCATION: Approximately 200 yards downstream of stone bridge in Kunkletown.

LATITUDE: 40° 50' 50.15" **LONGITUDE:** -75° 27' 03.63"

YEARS TESTED: 2006, 2005, 1994, 1992, 1991, 1990, 1985

The habitat score of 162 placed this site in the suboptimal category. Fecal coliform levels were highly elevated at this site. The biological assessment score of 31 placed this site in the optimal category for the Northern Shale Valleys and Slopes, Riffle/Run >10 square miles scoring scheme.

Brodhead Creek Watershed

Brodhead Creek (HQ-CWF / TSF, MF)

SITE ID: BRODCR01 **MUNICIPALITY:** Barrett Township

SUBECOREGION: Low Pocono > 10 square miles

SITE LOCATION: Approximately 50 yards upstream of Brinker's Bridge, at the intersection of Route 447 and Mill Creek Road.

LATITUDE: 41° 09' 52.13" **LONGITUDE:** -75° 14' 27.35"

YEARS TESTED: 2006 - 1995, and 1985

Water chemistry samples for lab analysis were not collected at this site and all field chemistry parameters were within acceptable levels. This site had a habitat score of 181, placing it in the suboptimal-optimal category. The biological assessment score was 35, ranking in the optimal category for the Low Pocono, Riffle/Run >10 square miles scoring scheme. This site demonstrates consistent trending for macroinvertebrates.

SITE ID: BRODCR12 **MUNICIPALITY:** Stroud Township

SUBECOREGION: Low Pocono > 10 square miles

SITE LOCATION: Approximately 100 yards downstream of the bridge on Route 191, near its intersection with Route 447.

LATITUDE: 41° 02' 10.75" **LONGITUDE:** -75° 12' 35.32"

YEARS TESTED: 2006, 2005, 2004, 2003, 2002, 2001, 2000, 1999, 1998, 1997, 1996, 1995

This site had a habitat score of 183, placing it in the suboptimal - optimal category. The biological assessment score of 31 placed this site in the optimal category for the Low Pocono, Riffle/Run >10 square miles scoring scheme. This site continues to exhibit consistent trending for macroinvertebrates.

SITE ID: BRODCR13 **MUNICIPALITY:** Smithfield Township

SUBECOREGION: Northern Shale Valleys and Slopes > 10 square miles

SITE LOCATION: Approximately 200 yards upstream of its mouth where it meets the Delaware River. DWGNRA boundary control point.

LATITUDE: 40° 59' 26.95" **LONGITUDE:** -75° 08' 06.47"

YEARS TESTED: 2006, 2005, 2004, 2003, 2002, 2001, 2000, 1999, 1998

This site had a habitat score of 151, placing it in the suboptimal category. The biological assessment score of 15 placed this site in the severely impaired category for the Northern Shale Valleys and Slopes > 10 square miles scoring scheme.

SITE ID: BRODCR14 **MUNICIPALITY:** Stroud Township

SUBECOREGION: Northern Shale Valleys and Slopes > 10 square miles

SITE LOCATION: Immediately downstream of bridge at intersection of Stokes Mill Rd and Stoke Ave.

LATITUDE: 41° 0' 56.91" **LONGITUDE:** -75° 11' 56.08"

YEARS TESTED: 2006

This site had a habitat score of 169, placing it in the suboptimal category. The biological assessment score of 31 placed this site in the optimal category for the Northern Shale Valleys and Slopes > 10 square miles scoring scheme.

SITE ID: BRODCR15 **MUNICIPALITY:** Stroud Township

SUBECOREGION: Northern Shale Valleys and Slopes > 10 square miles

SITE LOCATION: Directly behind Moose Lodge (site chosen for proposed STP outfall).

LATITUDE: 41° 00' 43.25" **LONGITUDE:** -75° 11' 40.26"

YEARS TESTED: 2006

This site had a habitat score of 141, placing it in the suboptimal category. The biological assessment score of 29 placed this site in the slightly impaired category for the Northern Shale Valleys and Slopes > 10 square miles scoring scheme.

Butz Run (HQ-CWF)

SITE ID: BUTZRU01 **MUNICIPALITY:** Paradise Township

SUBECOREGION: Low Pocono < 10 square miles

SITE LOCATION: Approximately 50 yards upstream of confluence with Paradise Creek.

LATITUDE: 41° 04' 41.20" **LONGITUDE:** -75° 13' 44.50"

YEARS TESTED: 2006, 2005, 2004, 2003

All parameters tested at this site were within acceptable limits. A habitat score of 150 placed this site in the suboptimal category. The biological assessment score of 23 placed this site in the moderately impaired category for the Low Pocono, Riffle/Run < 10 square miles scoring scheme.

Cranberry Creek (Paradise Creek Watershed) (HQ-CWF)

SITE ID: CRCRPA01 **MUNICIPALITY:** Paradise Township

SUBECOREGION: Low Pocono < 10 square miles

SITE LOCATION: Approximately 75 yards upstream of Browns Hill Road.

LATITUDE: 41° 06' 03.80" **LONGITUDE:** -75° 14' 58.60"

YEARS TESTED: 2006, 2005, 2004

This site contained an elevated temperature reading. A habitat score of 150 placed this site in the suboptimal category. The biological assessment score of 23 placed this site in the moderately impaired category for the Low Pocono, Riffle/Run < 10 square miles scoring scheme.

Cranberry Creek (HQ-CWF)

SITE ID: CRCRPA03 **MUNICIPALITY:** Barrett Township

SUBECOREGION: Low Pocono < 10 square miles

SITE LOCATION: Approximately 200 yards downstream of Bestway discharge.

LATITUDE: 41° 08' 51.30" **LONGITUDE:** -75° 17' 01.50"

YEARS TESTED: 2006, 2004, 2003

A habitat score of 193 placed this site in the optimal category. The biological assessment score of 27 placed this site in the slightly impaired category for the Low Pocono, Riffle/Run < 10 square miles scoring scheme.

Cranberry Creek (HQ-CWF)

SITE ID: CRANCR01 **MUNICIPALITY:** Stroud Township

SUBECOREGION: Low Pocono < 10 square miles

SITE LOCATION: Hallet Road below Penn Estates @ bridge on Griffen Property.

LATITUDE: 41° 02' 25.30" **LONGITUDE:** -75° 13' 23.38"

YEARS TESTED: 2006

A habitat score of 170 placed this site in the suboptimal category. The biological assessment score of 19 placed this site in the moderately impaired category for the Low Pocono, Riffle/Run < 10 square miles scoring scheme.

Cherry Creek (HQ-CWF)

SITE ID: CHERCR11 **MUNICIPALITY:** Delaware Water Gap Borough

SUBECOREGION: Northern Shale Valleys and Slopes > 10 square miles

SITE LOCATION: Over the dike at the corner of the Laird Technologies parking lot.

LATITUDE: 41° 02' 25.30" **LONGITUDE:** -75° 13' 23.38"

YEARS TESTED: 2006, 2004, 2003, 2002, 2001, 2000, 1999, 1998, 1997, 1996, 1995

A habitat score of 175 placed this site in the suboptimal category. The biological assessment score of 31 placed this site in the optimal category for the Northern Shale Valleys and Slopes > 10 square miles scoring scheme.

Devils Hole Creek (EV)

SITE ID: DEHOCR04 **MUNICIPALITY:** Paradise Township

SUBECOREGION: Low Pocono < 10 square miles

SITE LOCATION: Approximately 15 yards upstream of confluence with Paradise Creek.

LATITUDE: 41° 07' 54.00" **LONGITUDE:** -75° 18' 50.00"

YEARS TESTED: 2006, 2005, 2004, 2003

The fecal coliform level was above the recommended levels. A habitat score of 176 placed this site in the suboptimal category. The biological assessment score of 31 placed this site in the optimal category for the Low Pocono, Riffle/Run < 10 square miles scoring scheme.

Forest Hills Run (HQ-CWF)

SITE ID: FOHIRU01 **MUNICIPALITY:** Paradise Township

SUBECOREGION: Low Pocono < 10 square miles

SITE LOCATION: Approximately 25 yards upstream of Lower Swiftwater Road.

LATITUDE: 41° 06' 03.10" **LONGITUDE:** -75° 16' 20.40"

YEARS TESTED: 2006, 2005, 2004, 2003, 1991, 1985

The temperature at this site was above recommended levels. A habitat score of 168 placed this site in the suboptimal category. The biological assessment score of 25 placed this site in the slightly impaired category for the Low Pocono, Riffle/Run < 10 square miles scoring scheme.

SITE ID: FOHIRU06 **MUNICIPALITY:** Paradise Township

SUBECOREGION: Low Pocono < 10 square miles

SITE LOCATION: Approximately 75 yards upstream of stream crossing at Mt Airy Lodge parking lot.

LATITUDE: 41° 06' 46.00" **LONGITUDE:** -75° 19' 34.90"

YEARS TESTED: 2006, 2005, 2003, 1990

The fecal coliform count was above acceptable limits. A habitat score of 173 placed this site in the suboptimal category. The biological assessment score of 19 placed this site in the moderately impaired category for the Low Pocono, Riffle/Run < 10 square miles scoring scheme.

SITE ID: FOHIRU09 **MUNICIPALITY:** Paradise Township

SUBECOREGION: Low Pocono < 10 square miles

SITE LOCATION: Approximately 25 yards downstream of Carlton Road.

LATITUDE: 41° 06' 51.00" **LONGITUDE:** -75° 18' 42.30"

YEARS TESTED: 2006, 2005, 2004, 2003

The temperature and conductivity levels at this site were again above recommended levels. A habitat score of 173 placed this site in the suboptimal category. The biological assessment score of 15 placed this site in the severely impaired category for the Low Pocono, Riffle/Run < 10 square miles scoring scheme.

Marshalls Creek (HQ-CWF)

SITE ID: MARSCR08 **MUNICIPALITY:** Smithfield Township

SUBECOREGION: Northern Shale Valleys and Slopes > 10 square miles

SITE LOCATION: Approximately 50 yards upstream of bridge on Route 209.

LATITUDE: 41° 02' 05.17" **LONGITUDE:** -75° 07' 26.94"

YEARS TESTED: 2006, 2005, 2004, 2003, 2002, 2001, 2000, 1999, 1998, 1997, 1996

No water chemistry samples were collected for lab analysis at this site. This site had a habitat score of 175, placing it in the suboptimal category. The biological assessment score of 25 placed this site in the slightly impaired category for the Northern Shale Valleys and Slopes, Riffle/Run > 10 square miles scoring scheme.

SITE ID: MARSCR09 **MUNICIPALITY:** Smithfield Township

SUBECOREGION: Northern Shale Valleys and Slopes > 10 square miles

SITE LOCATION: Approximately 25 yards upstream of bridge on County Bridge Road.

LATITUDE: 41° 01' 32.77" **LONGITUDE:** -75° 07' 50.92"

YEARS TESTED: 2006, 2005, 2004, 2003, 2002, 2001, 2000, 1999, 1998, 1997, 1996

No water chemistry samples were collected for lab analysis at this site. This site continues to display a temperature slightly above the recommended maximum. A habitat score of 171 placed this site in the suboptimal category. The biological assessment score of 25 placed this site in the slightly impaired category for the Northern Shale Valleys and Slopes, Riffle/Run > 10 square miles scoring scheme.

Paradise Creek (HQ-CWF)

SITE ID: PARACR01 **MUNICIPALITY:** Paradise Township

SUBECOREGION: Low Pocono > 10 square miles

SITE LOCATION: Approximately 50 yards upstream of Lower Swiftwater Road.

LATITUDE: 41° 06' 07.30" **LONGITUDE:** -75° 16' 07.60"

YEARS TESTED: 2006, 2005, 2004, 2003, 1988, 1985

The temperature was elevated above the maximum levels and the habitat score of 179 placed this site in the suboptimal category. The biological assessment score of 25 placed this site in the moderately impaired category for the Low Pocono, Riffle/Run > 10 square miles scoring scheme.

SITE ID: PARACR03 **MUNICIPALITY:** Stroud Township

SUBECOREGION: Low Pocono > 10 square miles

SITE LOCATION: Approximately 150 yards upstream of the railroad bridge on Route 191.

LATITUDE: 41° 04' 19.60" **LONGITUDE:** -75° 13' 36.40"

YEARS TESTED: 2006, 2005, 2004, 2003, 1995, 1985

There was a replicate sample taken at this site. A habitat score of 192 placed this site in the optimal category. The biological assessment score of 25/27 placed this site in the slightly impaired category for the Low Pocono, Riffle/Run > 10 square miles scoring scheme.

SITE ID: PARACR04 **MUNICIPALITY:** Paradise Township

SUBECOREGION: Low Pocono < 10 square miles

SITE LOCATION: Approximately 50 yards downstream of confluence of Tank Creek and Yankee Run.

LATITUDE: 41° 07' 43.80" **LONGITUDE:** -75° 18' 57.80"

YEARS TESTED: 2005, 2004, 2003, 1985

All parameters tested at this site were within acceptable limits. A habitat score of 193 placed this site in the optimal category. The biological assessment score of 31 placed this site in the slightly impaired category for the Low Pocono, Riffle/Run < 10 square miles scoring scheme.

Sambo Creek (CWF, MF)

SITE ID: SAMBCR10 **MUNICIPALITY:** East Stroudsburg Borough

SUBECOREGION: Northern Shale Valleys and Slopes < 10 square miles

SITE LOCATION: Approximately 100 yards upstream of the mouth.

LATITUDE: 41° 00' 17.75" **LONGITUDE:** -75° 11' 27.43"

YEARS TESTED: 2006, 2005, 2004

A habitat score of 156 placed this site in the suboptimal category. The biological assessment score of 17 placed this site in the severely impaired category for the Northern Shale Valleys and Slopes, Riffle/Run <10 square miles scoring scheme.

Swiftwater Creek (HQ-CWF)

SITE ID: SWIFCR02 **MUNICIPALITY:** Paradise Township

SUBECOREGION: Low Pocono < 10 square miles

SITE LOCATION: Approximately 25 yards downstream of its confluence with Forest Hills Run.

LATITUDE: 41° 06' 03.70" **LONGITUDE:** -75° 16' 16.70"

YEARS TESTED: 2006, 2005, 2004, 2003, 1988

Temperature was elevated this year. A habitat score of 170 placed this site in the suboptimal category. The biological assessment score of 17 placed this site in the moderately impaired category for the Low Pocono, Riffle/Run < 10 square miles scoring scheme.

SITE ID: SWIFCR03 **MUNICIPALITY:** Pocono Township

SUBECOREGION: Low Pocono < 10 square miles

SITE LOCATION: Immediately downstream of old bridge at the Swiftwater Inn (Route 611).

LATITUDE: 41° 05' 39.90" **LONGITUDE:** -75° 19' 41.70"

YEARS TESTED: 2006 -1990, 1988

All water chemistry parameters tested at this site were within acceptable limits. This site placed in the suboptimal - optimal category with a habitat score of 183. A biological assessment score of 25 placed this site in the slightly impaired category for the Low Pocono, Riffle/Run <10 square miles scoring scheme.

SITE ID: SWIFCR05 **MUNICIPALITY:** Pocono Township

SUBECOREGION: Low Pocono < 10 square miles

SITE LOCATION: Approximately 200 yards downstream of sanofi pasteur property.

LATITUDE: 41° 05' 41.00" **LONGITUDE:** -75° 18' 34.10"

YEARS TESTED: 2006 -1990

All water chemistry parameters tested at this site were within acceptable limits. A habitat score of 188 placed this site in the suboptimal category for the habitat analysis. A biological assessment score of 25 placed this site in the slightly impaired category for the Low Pocono, Riffle/Run <10 square miles scoring scheme.

SITE ID: SWIFCR06 **MUNICIPALITY:** Paradise Township

SUBECOREGION: Low Pocono < 10 square miles

SITE LOCATION: Approximately 20 yards upstream of its confluence with Forest Hills Run.

LATITUDE: 41° 06' 06.80" **LONGITUDE:** -75° 16' 18.80"

YEARS TESTED: 2006, 2005, 2004, 2003, 1991

Temperature was elevated this year. A habitat score of 195 placed this site in the suboptimal category. The biological assessment score of 23 placed this site in the moderately impaired category for the Low Pocono, Riffle/Run > 10 square miles scoring scheme.

SITE ID: SWIFCR07 **MUNICIPALITY:** Pocono Township

SUBECOREGION: Low Pocono < 10 square miles

SITE LOCATION: Approximately 75 yards upstream of Rt. 314.

LATITUDE: 41° 06' 02.00" **LONGITUDE:** -75° 20' 51.39"

YEARS TESTED: 2006, 2005, 2004, 2003, 2002, 2001

All field parameters tested at this site were within acceptable limits. A habitat score of 192 placed this site in the optimal category. The biological assessment score of 27 placed this site in the slightly impaired category for the Low Pocono, Riffle/Run < 10 square miles scoring scheme.

Bushkill Creek Watershed

Bushkill Creek (HQ-TSF)

SITE ID: BUSHCR07 **MUNICIPALITY:** Middle Smithfield Township

SUBECOREGION: Low Pocono > 10 square miles

SITE LOCATION: Approximately 100 yards downstream of Middle Smithfield STP discharge. DWGNRA boundary control point.

LATITUDE: 41° 05' 03.30" **LONGITUDE:** -75° 01' 20.96"

YEARS TESTED: 2006 -1991

No water chemistry samples were collected for lab analysis at this site. A habitat score of 193 placed this site in the optimal category. The biological assessment score of 29 placed this site in the optimal category for the Low Pocono, Riffle/Run >10 square miles scoring scheme.

Lehigh River Watershed

Lehigh River (HQ-CWF)

SITE ID: LEHIRI01 **MUNICIPALITY:** Coolbaugh Township

SUBECOREGION: Pocono Plateau > 10 square miles

SITE LOCATION: Above STP in Thornhurst.

LATITUDE: 41° 10' 33.26" **LONGITUDE:** -75° 35' 01.47"

YEARS TESTED: 2006

This site placed in the optimal category with a habitat score of 215. The biological assessment score of 28 placed this site in the optimal category for Pocono Plateau, Riffle/Run >10 square miles scoring scheme.

SITE ID: LEHIRI02 **MUNICIPALITY:** Coolbaugh Township

SUBECOREGION: Pocono Plateau > 10 square miles

SITE LOCATION: Below STP in Thornhurst.

LATITUDE: 41° 10' 20.99" **LONGITUDE:** -75° 35' 19.56"

YEARS TESTED: 2006

This site placed in the suboptimal-optimal category with a habitat score of 185. The biological assessment score of 26 placed this site in the optimal category for the Pocono Plateau, Riffle/Run >10 square miles scoring scheme.

McMichael Creek Watershed

Dry Sawmill Run (HQ-CWF)

SITE ID: DRSARU01 **MUNICIPALITY:** Pocono Township

SUBECOREGION: Low Pocono < 10 square miles

SITE LOCATION: Approximately 1/2 mile south of Sullivan Trail at its intersection with Brookdale Road.

LATITUDE: 41° 06' 96.80" **LONGITUDE:** -75° 37' 26.30"

YEARS TESTED: 2006, 2005, 2004, 2003, 2002, 2001, 2000, 1997

This site is being tested as part of the Pocono Creek Sustainable Watershed Management Project. All water chemistry parameters tested at this site were within acceptable limits. A habitat score of 199 placed this site in the optimal category. A biological assessment score of 25 placed this site in the slightly impaired category for the Low Pocono, Riffle/Run < 10 square miles scoring scheme.

McMichael Creek (EV / HQ-CWF / TSF)

SITE ID: MCMICR21 **MUNICIPALITY:** Stroudsburg Borough

SUBECOREGION: Northern Shale Valleys and Slopes > 10 square miles

SITE LOCATION: Approximately 30 yards downstream of its confluence with Pocono Creek.

LATITUDE: 40° 58' 47.75" **LONGITUDE:** -75° 11' 45.02"

YEARS TESTED: 2006 - 1996

The habitat score of 134 placed this site in the suboptimal category. The biological assessment score of 25 placed this site in the slightly impaired category for the Northern Shale Valleys and Slopes, Riffle/Run > 10 square miles scoring scheme.

SITE ID: MCMICR28 **MUNICIPALITY:** Hamilton Township

SUBECOREGION: Northern Shale Valleys and Slopes > 10 square miles

SITE LOCATION: Adjacent to County soccer fields, upstream of Appenzell Creek.

LATITUDE: 40° 56' 50.10" **LONGITUDE:** -75° 17' 23.80"

YEARS TESTED: 2006, 2005, 2004, 2003

The temperature was elevated above the maximum levels and the fecal coliform count was above acceptable limits. The habitat score of 185 placed it in the suboptimal-optimal category. The biological assessment score of 21 placed this site in the moderately impaired category for the Northern Shale Valleys and Slopes, Riffle/Run > 10 square miles scoring scheme.

SITE ID: MCMICR30 **MUNICIPALITY:** Stroudsburg Borough

SUBECOREGION: Northern Shale Valleys and Slopes > 10 square miles

SITE LOCATION: Approximately 300 yards downstream of Stroudsburg STP discharge.

LATITUDE: 40° 59' 16.63" **LONGITUDE:** -75° 11' 06.75"

YEARS TESTED: 2006, 2005, 2004

All water chemistry parameters tested at this site were within acceptable limits. The habitat score of 157 placed this site in the suboptimal-optimal category. The biological assessment score of 21 placed this site in the moderately impaired category for the Northern Shale Valleys and Slopes, Riffle/Run > 10 square miles scoring scheme.

Indian Run (HQ-CWF)

SITE ID: INDIRU01 **MUNICIPALITY:** Pocono Township

SUBECOREGION: Low Pocono < 10 square miles

SITE LOCATION: Immediately upstream of Fairview Ave.

LATITUDE: 41° 06' 20.88" **LONGITUDE:** -75° 22' 27.05"

YEARS TESTED: 2006, 2005, 2003, 1998, 1997

No water chemistry samples were collected for lab analysis at this site. All water chemistry parameters tested at this site were within acceptable limits. A habitat score of 200 placed this site in the optimal category. The biological assessment score of 29 placed this site in the slightly impaired category for the Low Pocono, Riffle/Run < 10 square miles scoring scheme.

Pocono Creek (HQ-CWF)

SITE ID: POCOCR14 **MUNICIPALITY:** Stroudsburg Borough

SUBECOREGION: Northern Shale Valleys and Slopes > 10 square miles

SITE LOCATION: Approximately 50 yards upstream of its confluence with McMichael Creek.

LATITUDE: 40° 58' 48.50" **LONGITUDE:** -75° 11' 46.60"

YEARS TESTED: 2006, 2005, 2004, 2003, 2002, 2001, 2000, 1999, 1995

This site is being tested as part of the Pocono Creek Sustainable Watershed Management Project. Temperature was elevated again this year. The habitat score of 158 placed this site in the suboptimal category. The biological assessment score of 25 placed this site in the slightly impaired category for the Northern Shale Valleys and Slopes, Riffle/Run > 10 square miles scoring scheme.

SITE ID: POCOCR15 **MUNICIPALITY:** Pocono Township

SUBECOREGION: Low Pocono > 10 square miles

SITE LOCATION: Approximately 25 yards upstream of the bridge on Rim Rock Drive.

LATITUDE: 41° 00' 13.00" **LONGITUDE:** -75° 16' 48.70"

YEARS TESTED: 2006, 2005, 2004, 2003, 2002, 2001, 2000, 1999

This site is being tested as part of the Pocono Creek Sustainable Watershed Management Project. All water chemistry parameters tested at this site were within acceptable limits except fecal coliform. The habitat score of 170 is within the suboptimal range of supportive habitat. This site placed in the optimal category for the Low Pocono, Riffle/Run > 10 square miles scoring scheme with a biological assessment of 31.

SITE ID: POCOCR16 **MUNICIPALITY:** Pocono Township

SUBECOREGION: Low Pocono < 10 square miles

SITE LOCATION: Approximately 200 yards south of Mountain View Village, approximately 10 yards downstream of its confluence with Coolmoor Creek.

LATITUDE: 41° 03' 06.00" **LONGITUDE:** -75° 20' 16.90"

YEARS TESTED: 2006, 2005, 2004, 2003, 2002, 2001, 2000, 1999

This site is being tested as part of the Pocono Creek Sustainable Watershed Management Project. All water chemistry parameters tested at this site were within acceptable limits. A habitat score of 151 placed this site in the suboptimal category. This site scored a 27 in its biological assessment, which placed it in the slightly impaired category for the Low Pocono, Riffle/Run < 10 square miles scoring scheme.

SITE ID: POCOCR17 **MUNICIPALITY:** Pocono Township

SUBECOREGION: Low Pocono < 10 square miles

SITE LOCATION: Approximately 50 yards downstream of Sullivan Trail.

LATITUDE: 41° 03' 02.70" **LONGITUDE:** -75° 19' 15.80"

YEARS TESTED: 2006, 2005, 2004, 2003, 2002, 2001, 2000

This site is being tested as part of the Pocono Creek Sustainable Watershed Management Project. All water chemistry parameters tested at this site were within acceptable limits except fecal coliform. A habitat score of 177 placed this site in the suboptimal category. This site ranked in the moderately impaired category for the Low Pocono, Riffle/Run < 10 square miles scoring scheme with a biological assessment score of 19.

SITE ID: POCOCR18 **MUNICIPALITY:** Stroud Township

SUBECOREGION: Northern Shale Valleys and Slopes > 10 square miles

SITE LOCATION: Approximately 50 yards downstream of Shafers School House Road.

LATITUDE: 40° 59' 27.60" **LONGITUDE:** -75° 15' 19.10"

YEARS TESTED: 2006, 2005, 2004, 2003, 2002, 2001, 2000

This site is being tested as part of the Pocono Creek Sustainable Watershed Management Project. All water chemistry parameters tested at this site were within acceptable limits except fecal coliform. This site placed in the suboptimal category for habitat with a score of 175. The biological assessment score of 25 placed this site in the slightly impaired category for the Northern Shale Valleys and Slopes, Riffle/Run > 10 square miles scoring scheme.

SITE ID: POCOCR19 **MUNICIPALITY:** Pocono Township

SUBECOREGION: Low Pocono > 10 square miles

SITE LOCATION: At the Crossings Factory Stores overflow parking area.

LATITUDE: 41° 03' 00.80" **LONGITUDE:** -75° 18' 49.70"

YEARS TESTED: 2006, 2005, 2004, 2003, 2002, 2001

This site is being tested as part of the Pocono Creek Sustainable Watershed Management Project. All water chemistry parameters tested at this site were within acceptable limits. A habitat score of 144 placed this site in the suboptimal category. The biological assessment score of 31 placed this site in the optimal category for the Low Pocono, Riffle/Run < 10 square miles scoring scheme.

SITE ID: POCOCR20 **MUNICIPALITY:** Pocono Township

SUBECOREGION: Low Pocono < 10 square miles

SITE LOCATION: Approximately 15 yards downstream of its confluence with Wolf Swamp Run.

LATITUDE: 41° 03' 34.90" **LONGITUDE:** -75° 22' 11.80"

YEARS TESTED: 2006, 2005, 2004, 2003, 2002, 2001

This site is being tested as part of the Pocono Creek Sustainable Watershed Management Project. All water chemistry parameters tested at this site were within acceptable limits. A habitat score of 199 placed this site in the optimal category. The biological assessment score of 27 indicates slight impairment for the Low Pocono, Riffle/Run < 10 square miles scoring scheme.

SITE ID: POCOCR22 **MUNICIPALITY:** Stroud Township

SUBECOREGION: Northern Shale Valleys and Slopes > 10 square miles

SITE LOCATION: Approximately 1 mile downstream of Shafers School House Road at Kirkwood Camp.

LATITUDE: 40° 59' 03.32" **LONGITUDE:** -75° 14' 59.45"

YEARS TESTED: 2006, 2005, 2004

This site is being tested as part of the Pocono Creek Sustainable Watershed Management Project. This site was the only site to be tested for heavy metals this year. All water chemistry parameters tested at this site were within acceptable limits, except fecal coliform. The habitat score of 187 placed this site in the suboptimal category. The biological assessment score of 31 placed this site in the optimal category for the Northern Shale Valleys and Slopes, Riffle/Run > 10 square miles scoring scheme.

Scotrun Creek (HQ-CWF)

SITE ID: SCOTCR04 **MUNICIPALITY:** Pocono Township

SUBECOREGION: Low Pocono < 10 square miles

SITE LOCATION: Approximately 100 yards upstream of bridge at the Crossings Factory Stores overflow parking area.

LATITUDE: 41° 04' 05.30" **LONGITUDE:** -75° 19' 10.20"

YEARS TESTED: 2005, 2004, 2003

This site is being tested as part of the Pocono Creek Sustainable Watershed Management Project. All water chemistry parameters tested at this site were within acceptable limits except fecal coliform. The habitat score of 150 indicates a suboptimal habitat (riparian impacts and lack of instream cover). The biological assessment score of 17/23 placed this site in the moderately impaired category for the Low Pocono, Riffle/Run < 10 square miles scoring scheme.

Pohopoco Creek Watershed

Jonas Creek (CWF)

SITE ID: JONASCR01 **MUNICIPALITY:** Polk Township

SUBECOREGION: Low Pocono < 10 square miles

SITE LOCATION: South of Dotters Corner Road immediately upstream of bridge.

LATITUDE: 40° 58' 01.16" **LONGITUDE:** -75° 30' 48.20"

YEARS TESTED: 2006

All water chemistry parameters tested at this site were within acceptable limits. A habitat score of 191 placed this site in the optimal category. The biological assessment score of 29 indicates slight impairment for the Low Pocono, Riffle/Run < 10 square miles scoring scheme.

Pohopoco Creek (CWF)

SITE ID: POHOCR06 **MUNICIPALITY:** Polk Township

SUBECOREGION: Northern Shale Valleys and Slopes > 10 square miles

SITE LOCATION: At Berger Road (where stream bends to the west near the road) at the County line.

LATITUDE: 40° 53' 58.09" **LONGITUDE:** -75° 30' 24.70"

YEARS TESTED: 2006 - 1995

The habitat score of 196 placed this site in the optimal category. The biological assessment score of 31 placed this site in the optimal category for the Northern Shale Valleys and Slopes, Riffle/Run > 10 square miles scoring scheme.

SITE ID: POHOCR08 **MUNICIPALITY:** Chestnuthill Township

SUBECOREGION: Northern Shale Valleys and Slopes > 10 square miles

SITE LOCATION: Upstream of 209 bridge at Beechwood Inn.

LATITUDE: 40° 54' 56.74" **LONGITUDE:** -75° 26' 09.29"

YEARS TESTED: 2006

The habitat score of 149 placed this site in the suboptimal category. The biological assessment score of 31 placed this site in the optimal category for the Northern Shale Valleys and Slopes, Riffle/Run > 10 square miles scoring scheme. The fecal coliform levels at this site were extremely elevated.

Weir Creek (CWF)

SITE ID: WEIRCR02 **MUNICIPALITY:** Chestnuthill Township

SUBECOREGION: Northern Shale Valleys and Slopes < 10 square miles

SITE LOCATION: Approximately 25 yards upstream of County Park Rd.

LATITUDE: 40° 54' 29.40" **LONGITUDE:** -75° 25' 50.20"

YEARS TESTED: 2005, 2001, 2000

The fecal coliform level was elevated. A habitat score of 170 placed this site in the optimal category. The biological assessment score was 21, which ranks in the moderately impaired category for the Northern Shale Valleys and Slopes, Riffle/Run < 10square miles scoring scheme.

Tobyhanna Creek Watershed

Tobyhanna Creek (HQ-CWF)

SITE ID: TOBYCR01 **MUNICIPALITY:** Coolbaugh Township

SUBECOREGION: Pocono Plateau > 10 square miles

SITE LOCATION: Approximately 75 yards downstream of S.R. 423 bridge at east boundary of Warnertown and State Game Lands.

LATITUDE: 41° 09' 43.52" **LONGITUDE:** -75° 27' 23.58"

YEARS TESTED: 2006, 2005, 1998

Temperature was elevated at this site. A habitat score of 177 placed this site in the suboptimal category. The biological assessment score of 24 placed this site in the slightly impaired category for the Pocono Plateau, Riffle/Run >10 square miles scoring scheme.

SITE ID: TOBYCR14 **MUNICIPALITY:** Tobyhanna Township

SUBECOREGION: Pocono Plateau > 10 square miles

SITE LOCATION: Immediately upstream of the Route 115 bridge, downstream of the STP.

LATITUDE: 41° 04' 57.61" **LONGITUDE:** -75° 35' 00.85"

YEARS TESTED: 2005, 1998

A habitat score of 177 placed this site in the suboptimal category. The biological assessment score of 24 placed this site in the slightly impaired category for the Pocono Plateau, Riffle/Run >10 square miles scoring scheme.

Hawkey Run

SITE ID: HAWKRU02 **MUNICIPALITY:** Coolbaugh Township

SUBECOREGION: Pocono Plateau < 10 square miles

SITE LOCATION: Approximately 250 yards west of Rte. 380 & 100 yards NE of Stillwater Lake.

LATITUDE: 41° 07' 39.52" **LONGITUDE:** -75° 24' 06.01"

YEARS TESTED: 2006

This stream is not yet classified in Title 25 of the Pennsylvania code, but is a tributary to Upper Tunkhannock Creek which is classified HQ-CWF.

All water chemistry parameters tested at this site were within acceptable limits. A habitat score of 203 placed this site in the optimal category. The biological assessment score of 14 placed this site in the severely impaired category for the Low Pocono, Riffle/Run < 10 square miles scoring scheme.

Red Run (HQ-CWF)

SITE ID: REDRU03 **MUNICIPALITY:** Coolbaugh Township

SUBECOREGION: Pocono Plateau < 10 square miles

SITE LOCATION: Approximately 100 yards upstream of Industrial Park Drive.

LATITUDE: 41° 07' 44.61" **LONGITUDE:** -75° 22' 41.84"

YEARS TESTED: 2006, 2005, 2004, 2003, 2002

All field chemistry parameters tested at this site were within acceptable limits. The habitat score of 166 placed this site in the suboptimal category. The biological assessment score of 22 placed this site in the slightly impaired category for the Pocono Plateau, Riffle/Run < 10 square miles scoring scheme.

Trout Creek (HQ-CWF)

SITE ID: TROUCR03 **MUNICIPALITY:** Tobyhanna Township

SUBECOREGION: Pocono Plateau > 10 square miles

SITE LOCATION: ½ mile downstream of Arrowhead Lake Dam.

LATITUDE: 41° 09' 11.15" **LONGITUDE:** -75° 34' 59.09"

YEARS TESTED: 2006

Temperature was elevated at this site. A habitat score of 189 placed this site in the suboptimal category. The biological assessment score of 18 placed this site in the slightly impaired category for the Pocono Plateau, Riffle/Run >10 square miles scoring scheme.

Tunkhannock Creek (HQ-CWF)

SITE ID: TUNKCR03 **MUNICIPALITY:** Tunkhannock Township

SUBECOREGION: Pocono Plateau > 10 square miles

SITE LOCATION: Approximately 100 yards upstream of Route 115 bridge, near its intersection with Rte 903.

LATITUDE: 41° 03' 30.20" **LONGITUDE:** -75° 33' 13.07"

YEARS TESTED: 2006 - 1993

Water chemistry samples for lab analysis were not collected at this site and all field chemistry parameters were within acceptable levels. This site placed in the optimal category with a habitat score of 200. The biological assessment score of 28 placed this site in the optimal category for the Pocono Plateau, Riffle/Run >10 square miles scoring scheme.

SITE ID: TUNKCR06 **MUNICIPALITY:** Tunkhannock Township

SUBECOREGION: Pocono Plateau Glide/Pool

SITE LOCATION: Approximately 1/2 mile upstream of the stone bridge on Hypsy Gap Road.

LATITUDE: 41° 02' 11.47" **LONGITUDE:** -75° 26' 18.89"

YEARS TESTED: 2006, 2005, 2004, 2003, 2002, 2001, 2000, 1999, 1998, 1997, 1996, 1995

Due to the nature of this site (a slow moving, meandering, wetland stream) flow readings are not taken. Water chemistry samples for lab analysis were not collected at this site. The habitat score of 211 placed this site in the optimal category. The biological assessment score of 24 placed this site in the slightly impaired category for the Pocono Plateau Glide/Pool scoring scheme.

DISCUSSION

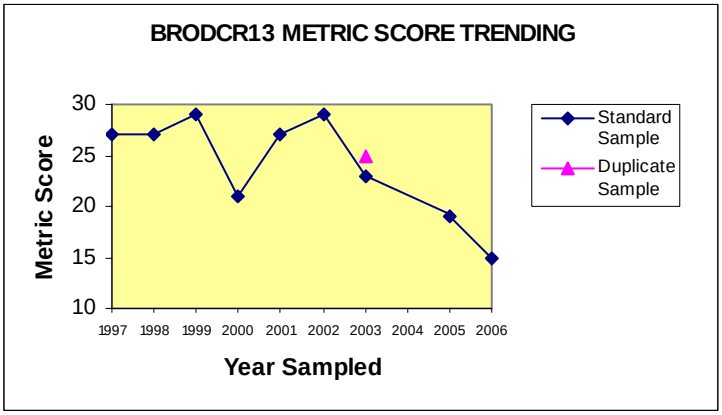
It should be noted that the weather patterns that occurred during the 2006 study contributed to flows which were generally higher than expected for this time of year. This was a stark contrast to the 2005 study which had flows that were generally lower than expected.

This year, 17 sites (or 30.35%) ranked as optimal, 23 sites (or 41.07%) ranked as slightly impaired, 12 sites (or 21.4%) ranked as moderately impaired, while 4 sites (or 7.14%) ranked as severely impaired.

The Rapid Bioassessment Protocols have begun to indicate impairments at several locations in the County. These impairments are indicated by low or decreasing biological assessment scores. The potentially impaired sites and probable cause of impairment are as follows:

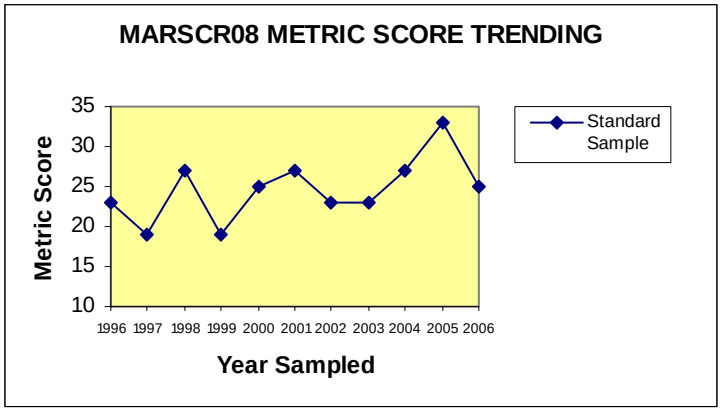
Brodhead Creek Watershed

Brodhead Creek (BRODCR13) upstream of its confluence with the Delaware River shows signs of serious impairment. The stream channel again exhibits signs of alteration due to extreme flooding events. This site has continued to exhibit a large amount of fungus/algae in combination with a type of papery/wood pulp substance that is found on the stream bottom. This site is downstream of several wastewater treatment plants which may contribute to the severe impairment found.



Forest Hills Run (FOHIRU09) downstream of Carlton Road again shows signs of severe impairment, (biological assessment score of 15) a decrease of 6 points. Elevated fecal coliform counts were documented at this site. This stream is most likely experiencing impairment due a combination of lake effect and sewer and fertilizer enrichment. The dominant taxon at this site was Chironomids. Located upstream of this site are a golf course, lake and a sewer plant which are all potential contributors to the degrading effects by both point and non-point sources. It is recommended that a nutrient management program be initiated on the property upstream of this site.

Marshalls Creek (MARSCR08) Approximately 50 yards upstream of bridge on Route 209, near Jay Park Plaza, (biological assessment score of 25) a decrease of 8 points. The cause is unknown.



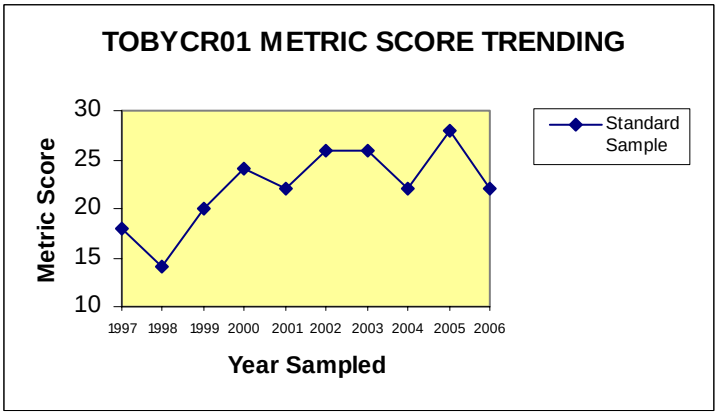
Paradise Creek (PARACR01) Approximately 50 yards upstream of Lower Swiftwater Road, (biological assessment score of 25) a decrease of 8 points. This may be due to lake effect/ dredging and shifting substrates.

Paradise Creek (PARACR03) Approximately 150 yards upstream of the old railroad bridge over Route 191, (biological assessment score of 27/25, (a replicate sample was taken here) a decrease from 35 last year. This result is probably indicative of the large rain events and shifting substrates which correspond to loss of habitat.

Sambo Creek (SAMBCR10) Approximately 100 yards upstream of the mouth, next to East Stroudsburg South High School, (biological assessment score of 17) a decrease of 8 points and is severely impaired. This cause is unknown.

Tobyhanna Creek Watershed

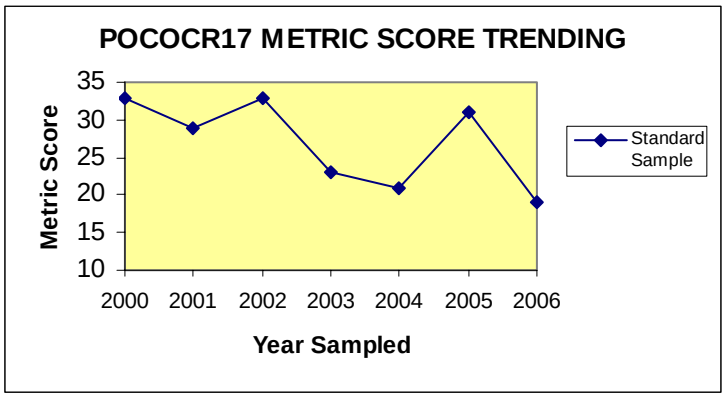
Tobyhanna Creek (TOBYCR01) downstream of the bridge on Route 423 in State Game Lands 127 registered a decrease of 6 points in the biological assessment score. This site has recovered from prior impairment, however, these results demonstrate that the STP mixing zone may have expanded its zone of impairment to Warnertown.



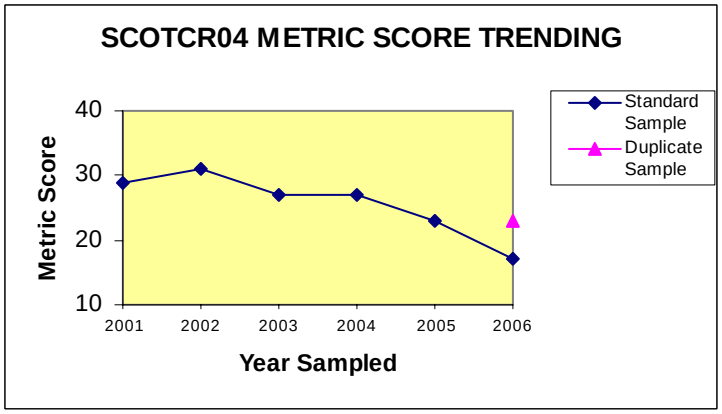
McMichael Creek Watershed

McMichael Creek (MCMICR28) downstream of Pleasant Valley Manor shows signs of moderate impairment (biological assessment score of 21) which is the same as last year, a continuing trend. Further testing should be continued to eliminate potential sources of impairment. A possible monitoring option is to deploy a meter which is capable of recording several parameters over an extended period of time at predetermined intervals during various flow regimes.

Pocono Creek (POCOCR17) downstream of Sullivan Trail shows signs of moderate impairment (biological score of 19) a decrease of 12 points. This could be related to water withdrawals.



Scotrun Creek (SCOTCR04) Approximately 100 yards upstream of bridge at the Crossings Factory Stores overflow parking area, (biological assessment score of 17/23; a replicate sample was taken here) a decrease from 23 last year. This may indicate the effects of the sewage treatment plant problems upstream.



RECOMMENDATIONS

It is recommended that the Water Quality Study continue to utilize and refine the Rapid Bioassessment Protocols developed specifically for the streams in the County by the US Environmental Protection Agency and Monroe County.

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

BRODCR13 – Brodhead Creek, Approximately 200 yards upstream of its mouth where it meets the Delaware River. (DWGNRA boundary control point).

FOHIRU09 – Forest Hills Run, Approximately 25 yards downstream of Carlton Road.

MARSCR08 – Marshalls Creek, Approximately 50 yards upstream of bridge on Rte. 209.

PARACR01 – Paradise Creek, Approximately 50 yards upstream of Lower Swiftwater Road.

POCOCR17 – Pocono Creek, Approximately 50 yards downstream of Sullivan Trail.

TOBYCR01 – Tobyhanna Creek, Approximately 75 yards downstream of S.R. 423 bridge at east boundary of Warnertown and State Game Lands 127.

The Planning Commission and Conservation District should continue to partner with the five watershed organizations in the county to refine the study while making the greatest and most effective use of resources in conducting the study.

The study should continue to focus on monitoring sites developed for long term trending associated with detailed watershed assessments in the Pocono Creek and Paradise Creek watersheds and add additional trending sites in the future as detailed assessments are conducted in other watersheds.

Additional monitoring sites should be selected in consultation with the five watershed organizations in the county with priority given to sites that have shown either constant impairment or a downward trend. Continued monitoring at these sites should be geared toward determining the extent and possible causes of the impairment. Making these determinations will give the County and the watershed organizations the information they need to address potential mitigation and restoration activities.

PROJECT PARTICIPANTS

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Monroe County Planning Commission
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Project Coordinator: Amy Lewis

Cooperating Agencies:

Pennsylvania Dept. of Environmental Protection - Bureau of Water Quality Management
Monroe County Conservation District
United States Environmental Protection Agency

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ACKNOWLEDGMENTS

Monroe County has conducted an annual water quality study for the past twenty one years. Through the years the program has evolved 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 continued professional support from Prosser Labs.

–sanofi pasteur has once again sponsored 2 sites along the Swiftwater Creek. Their continued support for the program and their commitment to the environment is appreciated.

–The County would like to thank the Brodhead Watershed Association for its continued support and financial assistance by sponsoring several sites in this year's study.

– The County would like to extend sincerest thanks to Bill Clark, Tom and Deb Brady, Donna and Al Barney, Theresa Merli, Bonnie Smith, Michael Reisenwitz, and the volunteers who gave many hours to assure that accuracy was maintained while collecting field data.

– Without the permission of private property owners, the number of sampling sites would be greatly reduced. The County thanks them for allowing access to their property.

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