
**ASSESSMENT OF INTERSTATE
STREAMS IN THE
SUSQUEHANNA RIVER BASIN**

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Introduction

The Susquehanna River Basin is the largest river basin on the Atlantic Coast of the United States, draining 27,510 square miles. The Susquehanna River originates at the outlet of Otsego Lake near Cooperstown, N.Y. From there the river flows 444 miles through New York, Pennsylvania, and Maryland before emptying into the Chesapeake Bay at Havre de Grace, Md. Eighty-three streams cross state lines in the basin. Several streams traverse the state borders at multiple points, contributing to 91 total crossings. Of those 91 crossings, 45 streams flow from New York into Pennsylvania, 22 from Pennsylvania into New York, 15 from Pennsylvania into Maryland, and nine from Maryland into Pennsylvania. Many streams are small, and 32 are unnamed.

The Susquehanna River Basin Commission (SRBC) reviews projects that may have interstate impacts on water resources in the Susquehanna River Basin. Established in 1986, SRBC's Interstate Streams Monitoring Program provides data from border streams that are not routinely assessed by state agencies in New York, Maryland, and Pennsylvania. Currently, the state agencies do not monitor all of the interstate streams and do not produce comparable data needed to determine potential impacts on the water quality of interstate streams. SRBC's ongoing interstate monitoring program is partially funded through a grant from the U.S. Environmental Protection Agency (USEPA).

The interstate water quality monitoring program includes periodic collection of water and biological samples from interstate streams, as well as assessments of their physical habitat. Water quality data are used to: (1) assess compliance with water quality standards, (2) characterize stream quality and seasonal variations, (3) build a database for assessment of water quality trends, (4) identify streams for reporting to USEPA under Section 305(b) of the Clean Water Act, (5) provide information to signatory states for Integrated List purposes and possible total Maximum Daily Load (TMDL) development, and (6) identify areas for restoration and protection. Biological conditions are assessed using representative benthic macroinvertebrate and fish populations, which provide an indication of the biological health of a stream and serve as indicators of water quality.

SRBC's interstate monitoring program began in April 1986. For the first five years, results were reported based on water-year (from October to the following September). In 1991, SRBC changed the reporting periods to correspond with its fiscal year (from July to the following June). In 2008, SRBC transitioned to a reporting period based on the calendar year (from January to that December). Reports are typically completed the summer of the year following the collection period. Therefore, this report includes data collected between January 1 and December 31, 2010. Beginning in 2007, a web-based format was initiated to provide a more user-friendly product that is easily accessible to government agencies as well as any individuals or groups that may be interested in the condition of these streams and rivers. Recent reports are available on SRBC's web site at <http://www.srbc.net/programs/monitoring.htm>.

Methods

Field and Laboratory Methods

Sampling Frequency

In 1989, SRBC divided the interstate streams into three groups according to the degree of water quality impairment, historical water quality impacts, and potential for degradation. These groupings were determined based on historical water quality and land use. To date, these groups remain consistent and are described below.

Group 1

Streams with impaired water quality or those judged to have a high potential for degradation due to large drainage areas or historical pollution have been assigned to Group 1, which includes 13 sites along the Pennsylvania-New York border and eight sites along the Pennsylvania-Maryland border. Group 1 streams are sampled four times per year, once in each of the following months: February, May, July or August, and October. Water quality samples and field chemistry measurements are taken at each Group 1 site during these months. Macroinvertebrate collections are taken and habitat assessments are made during the July/August sampling period. Initiated in 2009, a representative fish community sample will be collected at all Group 1 sites, in alternating years, during the May sampling period. The large river sites CHEM 12.0, COWN 1.0, COWN 2.2, SUSQ 10, SUSQ 44.5, SUSQ 289.1, SUSQ 340.0, SUSQ 365.0, and TIOG 10.8 will be excluded from fish sampling due to difficulties associated with large size.

Group 2

Streams judged to have a moderate potential for impacts have been assigned to Group 2, which includes eight sites along the Pennsylvania-New York border and three sites along the Pennsylvania-Maryland border. Water quality samples, field chemistry parameters, benthic macroinvertebrate samples, and physical habitat information were obtained from Group 2 sites once per year, during base flow conditions in the summer months of July or August. Fish sampling started in 2009 and will occur at all Group 2 streams in alternating years.

Group 3

Streams judged to have a low potential for impacts have been assigned to Group 3, which includes 22 sites along the Pennsylvania-New York border. No Group 3 sites are located along the Pennsylvania-Maryland border. In May of each year, macroinvertebrates, field chemistry parameters, and habitat conditions were assessed at Group 3 sites.

Stream Discharge

Stream discharge is measured at all stations unless high stream flows make access hazardous or impossible. Several stations are located near U.S. Geological Survey (USGS)

stream gages. The stations include the following: the Susquehanna River at Windsor, N.Y. (SUSQ 365.0), the Susquehanna River at Kirkwood, N.Y. (SUSQ 340.0), the Susquehanna River at Sayre, Pa. (SUSQ 289.1), the Susquehanna River at Marietta, Pa. (SUSQ 44.5), the Susquehanna River at Conowingo, Md. (SUSQ 10.0), the Chemung River at Chemung, N.Y. (CHEM 12.0), the Tioga River near Lindley, N.Y. (TIOG 10.8), the Cowanesque River at Lawrenceville, Pa. (COWN 1.0 & COWN 2.2), and Octoraro Creek near Richardsmere, Md. (OCTO 6.6). Recorded stages from USGS gaging stations and ratings curves were used to determine instantaneous discharges measured in cubic feet per second (cfs). Instantaneous discharges for stations not located near USGS gaging stations were measured at the time of sampling, using standard USGS procedures (Buchanan and Somers, 1969) and a FlowTracker.

Water Samples

Water samples were collected at each of the Group 1 and Group 2 streams to measure nutrient and metal concentrations. Water samples were collected using a depth-integrated sampler. Composite samples were obtained by collecting several depth-integrated samples across the stream channel and combining them in a churn splitter that was previously rinsed with stream water. Water samples were mixed thoroughly in the churn splitter and collected in one 500-ml bottle, two 250-ml bottles, and two 40-ml vials. The 500-ml sample bottle was used for a raw sample. Each of the 250-ml bottles consisted of a whole water sample, one fixed with 10-percent nitric acid (HNO_3) for metal analysis and one fixed with 10-percent sulfuric acid (H_2SO_4) for nutrient analysis. The two 40-ml vials were pre-cleaned and fixed with sulfuric acid (H_2SO_4). The vials were filled with sample water and were used to measure total organic carbon (TOC). The samples were chilled on ice and sent to the Pennsylvania Department of Environmental Protection (PADEP), Bureau of Laboratories in Harrisburg, Pa., within 24 hours of collection.

Field Chemistry

Temperature, dissolved oxygen, conductivity, and pH were measured in the field for Group 1 and 2 stations. In addition to the parameters listed above, alkalinity and acidity were also measured in the field for all Group 3 stations. Temperature, dissolved oxygen, conductivity, and pH were measured using a YSI model 6820 multiparameter water quality sonde. Dissolved oxygen and pH probes were calibrated each day prior to sampling. The conductivity probe was calibrated at the beginning of each week. When alkalinity and acidity were to be measured at Group 3 stations, pH was determined by using a Cole-Parmer Model 5996 meter that was calibrated at the beginning of each day. Alkalinity was then determined by titrating a known volume of sample water to pH 4.5 with 0.02N sulfuric acid (H_2SO_4). Acidity was measured by titrating a known volume of sample water to pH 8.3 with 0.02N sodium hydroxide (NaOH).

Macroinvertebrate and physical habitat sampling

Macroinvertebrate samples were collected from Group 1 and Group 2 stations in July and August while Group 3 stations were sampled in May. The benthic macroinvertebrate community was sampled and assessed to provide an indication of the biological condition of the stream.

Macroinvertebrates were defined as aquatic insects and other invertebrates too large to pass through a No. 30 sieve.

Benthic macroinvertebrate samples were analyzed according to field and laboratory methods described in Rapid Bioassessment Protocol for Use in Streams and Rivers by Barbour et al. (1999). Sampling was performed using a 1-meter-square kick screen with size No. 30 mesh. The kick screen was stretched across the current to collect organisms dislodged from riffle/run areas by physical agitation of the stream substrate. Two kick screen samples were collected from a representative riffle/run at each station. The two samples were composited and preserved in 95-percent ethyl alcohol for later laboratory identification and analysis.

In the laboratory, composite samples were sorted into 200-organism subsamples using a gridded pan and a random numbers table. Organisms within the subsample were identified to genus (except Chironomidae and Oligochaeta) and enumerated using taxonomic keys developed by Merrit and Cummins (1996), Peckarsky et al. (1990), and Pennak (1989). Each taxon was assigned an organic pollution tolerance value and a functional feeding category (Chalfant, 2007).

Physical habitat conditions at each station were assessed using a slightly modified version of the habitat assessment procedure outlined by Barbour et al. (1999). Eleven habitat parameters were field-evaluated at each site and used to calculate a site-specific habitat assessment score. Habitat parameters were evaluated on a scale of 0 to 20 and were based on instream composition, channel morphology, and riparian zone and bank conditions. Some of the parameters to be evaluated varied based on whether the stream was characterized by riffles and runs or by glides and pools.

Fish Sampling

Fish community assessments were adapted from the RBP manual (Barbour et al., 1999) and from the Maryland Biological Stream Survey (Roth et al., 1998). Electrofishing at 25 wadeable Group 1 and 2 interstate stream stations occurs in alternate years, beginning in 2009. Eighteen stations were initially sampled in 2009 and five were sampled in 2010. The remaining nine Group 1 and 2 streams are too large to be effectively sampled using current protocols. Conditions at the time of sampling had to be conducive to electrofishing operations. Specifically, flows had to be manageable and allow the electrofishing team to traverse the entire width of the stream. Water clarity also had to be sufficient to allow visual detection of immobilized fish at all depths. Every possible effort was made prior to departure for sampling activities to ensure that ideal conditions were realized.

Electrofishing at each site consisted of two passes on a 75-meter segment containing best available habitat. Efforts were made to locate the upstream point at a natural cutoff (e.g., impassible riffles, falls, head of a pool) that could deter fish from moving out of the sample reach. If a natural cutoff was not present, block nets were deployed to keep fish within the reach. After placing a piece of flagging tape in a visible location at the downstream point, staff measured five wetted channel widths, in meters, with a tape or rangefinder while walking to the upstream limit of the reach. Sample reach distance was adjusted if a natural cutoff occurred

within ± 5 meters of the 75-meter mark. If there was no natural cutoff at the upstream margin of the reach, block nets were used.

GPS coordinates for the upstream and downstream limits of the sample reach were recorded on the field data sheet. Sampling teams consisted of three or four members, depending on stream size. Backpack (battery-powered electrical-generated) or towed barge electrofishing units with two handheld probes were used. Electrofishing consisted of a two-pass coverage of the entire width and length of the selected stream segment. Beginning at the downstream limit of the sample reach, the sampling team proceeded upstream, covering the entire stream width and using a sinuous pattern when necessary. Each team member made every effort to capture all fish sighted that were more than 25mm in length so that a representative sample was collected. Start and stop times, as well as accumulated electrofishing time (shock time), were recorded on the field data sheet.

Nets and holding cages with 0.25-inch mesh were used to prevent escape. All fish were identified to species in the field, when possible. Fish that could not be readily identified in the field were preserved in 10-percent formalin and returned to the laboratory for identification. Digital photographs were taken of all unknown specimens, as were voucher (reference) photographs of each species. After processing fish from the first pass, all individuals were returned to the stream at a point downstream of the reach, where fish could not travel back into the sample reach. All data were entered into SRBC's Access database.

Data Synthesis Methods

Chemical water quality

Results of laboratory analysis for chemical parameters were compared to New York, Pennsylvania, and Maryland state water quality standards. Additionally, a simple water quality index (WQI) was calculated using procedures established by McMorran (1988). The WQI was used to make comparisons between sampling periods and stations within the same geographical region; therefore, the water quality data were divided into three groups. One group contains stations along the New York-Pennsylvania border (14 stations), another contains stations along the Pennsylvania-Maryland border (nine stations), and the remaining group compares large river stations (nine stations). The data in each group were sorted by parameter and ranked by increasing order of magnitude, with several exceptions. Dissolved oxygen was ranked by decreasing order of magnitude, while pH, alkalinity, acidity, calcium, and magnesium were not included in the WQI analysis. The values of each chemical analysis were divided by the highest ranking value in the group to obtain a percentile. The WQI score was calculated by averaging all percentile ranks for each sample. WQI scores ranged from 1 to 100, with high WQI scores indicating poor water quality.

Biological and physical habitat conditions

Benthic macroinvertebrate samples were assessed using procedures described by Barbour et al. (1999), Klemm et al. (1990), and Plafkin et al. (1989). Using these methods, staff calculated a series of biological indices for a stream and compared them to a reference station in

the same region to determine the degree of impairment. The metrics used in the survey were summarized below. Metric 2 (Shannon Diversity Index) followed the methods described in Klemm et al. (1990), and all other metrics were taken from Barbour et al. (1999).

The 200-organism subsample data were used to generate scores for each of the seven metrics. Scores for metrics 1-4 were converted to a biological condition score, based on the percent similarity of the metric score, relative to the metric score of the reference site. Scores for metrics 5-7 were based on set scoring criteria developed for the percentages (Plafkin et al., 1989; Ohio Environmental Protection Agency, 1987b). The sum of the biological condition scores constituted the total biological score for the sample site, and total biological score was used to assign each site to a biological condition category. Habitat assessment scores of sample sites were compared to those of reference sites to classify each sample into a habitat condition category.

Fish data were analyzed using an adapted version of the Maryland Biological Stream Survey (MBSS) Fish Index of Biological Integrity (IBI) (Roth et al., 1998; Roth et al., 2000; Southerland et al., 2005). Two versions of the Fish IBI were used depending on the location of the stream. All Pennsylvania-Maryland border streams were assessed using the Eastern Piedmont metrics while Pennsylvania-New York streams were assessed using the Highlands metrics. The Eastern Piedmont version used contains the following eight metrics: number of native species, number of benthic species, number of intolerant species, percent tolerant fish, percent abundance of dominant species, percent generalists, omnivores, invertivores, percent lithophilic spawners, and number of individuals per square meter. The metric biomass per square meter was omitted from the analysis as biomass data were not available at the time of sampling. The Highlands version used contains the following seven metrics: number of benthic species, number of intolerant species, percent tolerant fish, percent generalists, omnivores and invertivores, percent insectivores, and percent lithophilic spawners. Each metric received a score of 1, 3, or 5 based on scoring criteria for each ecoregion (Roth et al., 2000). Metric scores were then averaged and the fish community received a classification according to the table below.

Narrative Descriptions of Stream Biological Integrity Associated with Each of the IBI Categories (Roth et al., 2000)

Good	IBI score 4.0-5.0	Comparable to reference streams considered to be minimally impacted. On average, biological metrics fall within the upper 50% of reference site conditions.
Fair	IBI score 3.0-3.9	Comparable to reference conditions, but some aspects of biological integrity may not resemble the qualities of these minimally impacted streams. On average, biological metrics are within the lower portion of the range of reference sites (10 th to 50 th percentile).
Poor	IBI score 2.0-2.9	Significant deviation from reference conditions, with many aspects of biological integrity not resembling qualities of minimally degraded streams, indicating some degradation. On average, biological metrics fall below the 10 th percentile of reference site values.
Very Poor	IBI score 1.0-1.9	Strong deviation from reference conditions, with most aspects of biological integrity not resembling the qualities of minimally impacted streams, indicating severe degradation. On average, biological metrics fall below the 10 th percentile of reference site values; most or all metrics are below this level.

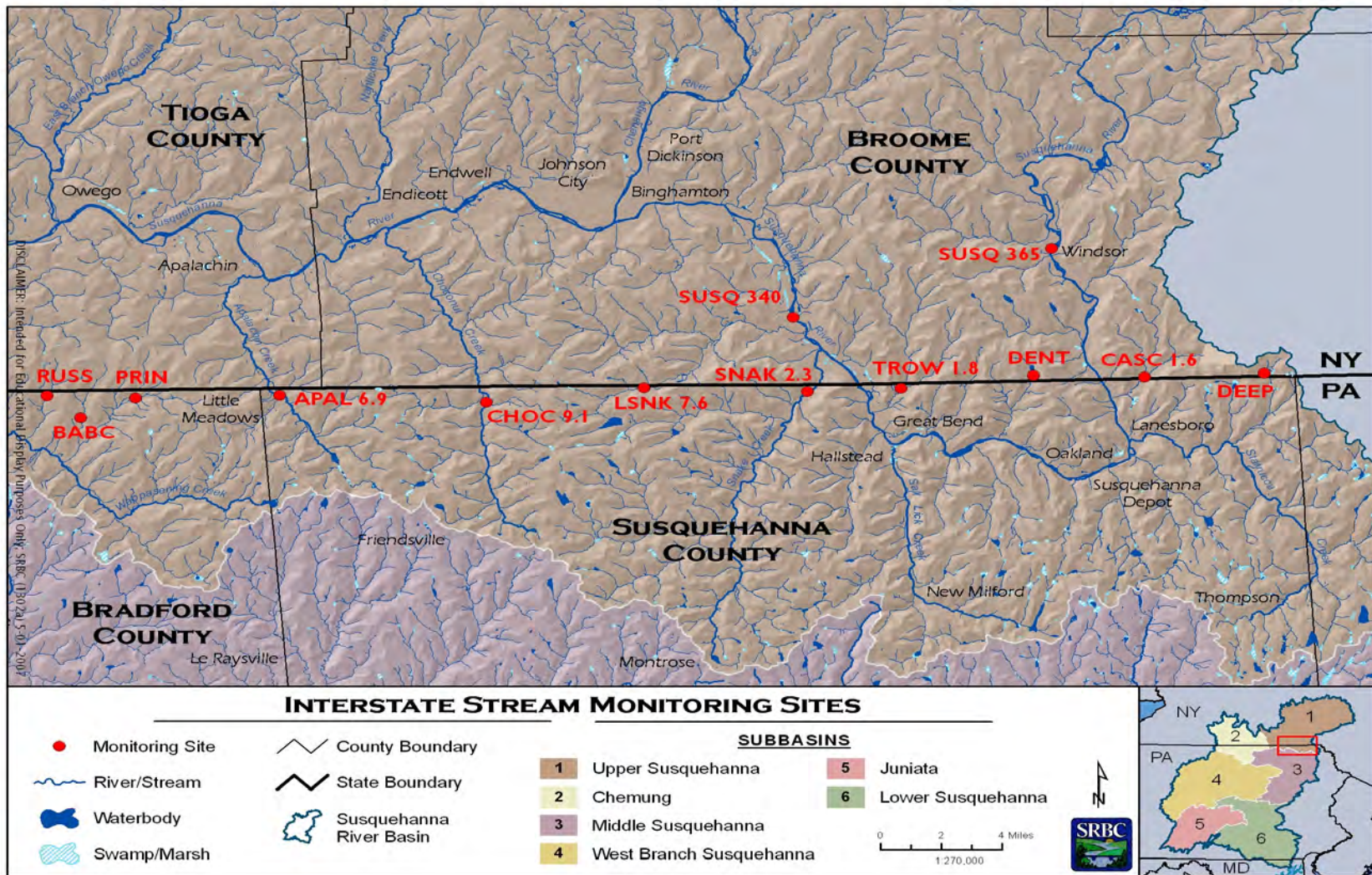
List of New York- Pennsylvania Interstate Streams

Station	Stream and Location	Monitoring Group	Rationale
APAL 6.9*	Apalachin Creek, Little Meadows, PA	2	Monitor for potential water quality impacts
BABC	Babcock Run, Cadis, PA	3	Monitor for potential impacts
BILL	Bill Hess Creek, Nelson, PA	3	Monitor for potential impacts
BIRD	Bird Creek, Webb Mills, NY	3	Monitor for potential impacts
BISC	Biscuit Hollow, Austinburg, PA	3	Monitor for potential impacts
BNTY 0.9	Bentley Creek, Wellsburg, NY	1	Monitor for potential water quality impacts
BRIG	Briggs Hollow, Nichols, NY	3	Monitor for potential impacts
BULK	Bulkley Brook, Knoxville, PA	3	Monitor for potential impacts
CAMP	Camp Brook, Osceola, PA	3	Monitor for potential impacts
CASC 1.6	Cascade Creek, Lanesboro, PA	1	Monitor for potential water quality impacts
CAYT 1.7	Cayuta Creek, Waverly, NY	1	Municipal discharge from Waverly, NY
CHEM 12.0	Chemung River, Chemung, NY	1	Municipal and industrial discharges from Elmira, NY
CHOC 9.1	Choconut Creek, Vestal Center, NY	2	Monitor for potential water quality impacts
COOK	Cook Hollow, Austinburg, PA	3	Monitor for potential impacts
COWN 2.2	Cowanesque River, Lawrenceville, PA	1	Impacts from flood control reservoir
COWN 1.0	Cowanesque River, Lawrenceville, PA	1	Recovery zone from upstream flood control reservoir
DEEP	Deep Hollow Brook, Danville, NY	3	Monitor for potential impacts
DENT	Denton Creek, Hickory Grove, PA	3	Monitor for potential impacts
DRYB	Dry Brook, Waverly, NY	3	Monitor for potential impacts
HLDN 3.5	Holden Creek, Woodhull, NY	2	Monitor for potential water quality impacts
LSNK 7.6	Little Snake Creek, Brackney, PA	1	Monitor for potential water quality impacts
LWAP	Little Wappasening Creek, Nichols, NY	3	Monitor for potential impacts
NFCR 7.6	North Fork Cowanesque River, North Fork, PA	2	Monitor for potential water quality impacts
PARK	Parks Creek, Litchfield, NY	3	Monitor for potential impacts
PRIN	Prince Hollow Run, Cadis, PA	3	Monitor for potential impacts
REDH	Redhouse Run, Osceola, PA (formerly Beagle Hollow Run)	3	Monitor for potential impacts
RUSS	Russell Run, Windham, PA	3	Monitor for potential impacts
SACK	Sackett Creek, Nichols, NY	3	Monitor for potential impacts
SEEL 10.3	Seeley Creek, Seeley Creek, NY	1	Monitor for potential water quality impacts
SMIT	Unnamed tributary to Smith Creek, East Lawrence, PA	3	Monitor for potential impacts
SNAK 2.3	Snake Creek, Brookdale, PA	2	Monitor for potential water quality impacts
SOUT 7.8	South Creek, Fassett, PA	2	Monitor for potential water quality impacts
STRA	Strait Creek, Nelson, PA	3	Monitor for potential impacts
SUSQ 365.0	Susquehanna River, Windsor, NY	1	Large drainage area (1,882 sq. mi.); municipal discharges from Cooperstown, Sidney, Bainbridge, and Oneonta
SUSQ 340.0	Susquehanna River, Kirkwood, NY	1	Large drainage area (2,232 sq. mi.); historical pollution due to sewage from Lanesboro, Oakland, Susquehanna, Great Bend, and Hallstead
SUSQ 289.1	Susquehanna River, Sayre, PA	1	Large drainage area (4,933 sq. mi.); municipal and industrial discharges
TIOG 10.8	Tioga River, Lindley, NY	1	Pollution from acid mine discharges and impacts from flood control reservoirs
TRUP 4.5	Troups Creek, Austinburg, PA	1	High turbidity and moderately impaired macroinvertebrate populations
TROW 1.8	Trowbridge Creek, Great Bend, PA	2	Monitor for potential water quality impacts
WAPP 2.6	Wappasening Creek, Nichols, NY	2	Monitor for potential water quality impacts
WBCO	White Branch Cowanesque River, North Fork, PA	3	Monitor for potential impacts
WHIT	White Hollow, Wellsburg, NY	3	Monitor for potential impacts

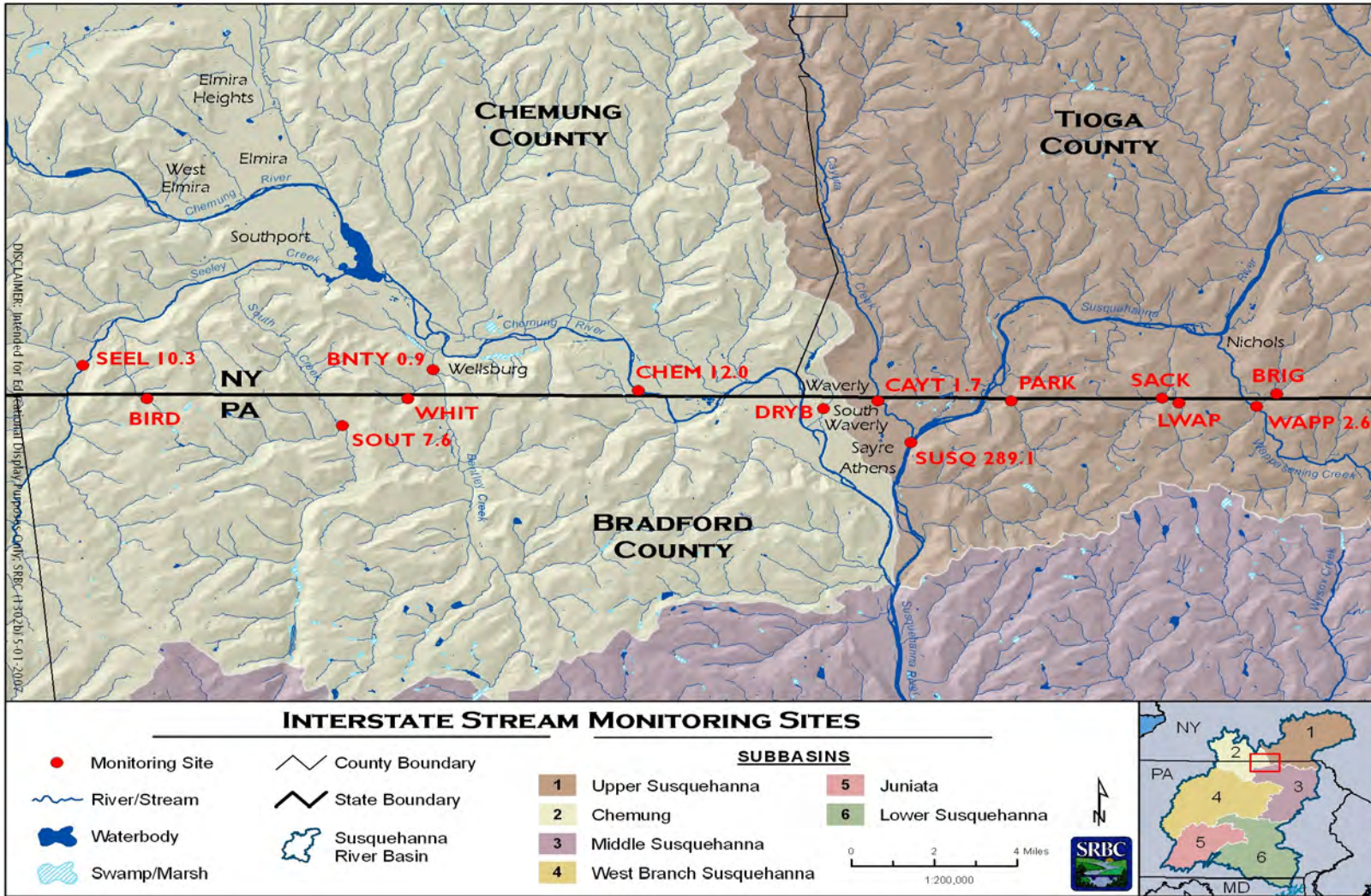
List of Pennsylvania-Maryland Interstate Streams

Station	Stream and Location	Monitoring Group	Rationale
BBDC 4.1	Big Branch Deer Creek, Fawn Grove, PA	2	Monitor for potential water quality impacts
CNWG 4.4	Conowingo Creek, Pleasant Grove, PA	1	High nutrient loads and other agricultural runoff; nonpoint runoff to Chesapeake Bay
DEER 44.2	Deer Creek, Gorsuch Mills, MD	1	Past pollution from Gorsuch Mills, MD, Stewartstown, PA; nonpoint runoff to Chesapeake Bay
EBAU 1.5	Ebaughs Creek, Stewartstown, PA	1	Municipal discharge from Stewartstown, PA; nonpoint runoff to Chesapeake Bay
FBDC 4.1	Falling Branch Deer Creek, Fawn Grove, PA	2	Monitor for potential water quality impacts
LNGA 2.5	Long Arm Creek, Bandanna, PA	1	Monitor for potential water quality impacts
OCTO 6.6	Octoraro Creek, Rising Sun, MD	1	High nutrient loads due to agricultural runoff from New Bridge, MD; water quality impacts from Octoraro Lake; nonpoint runoff to Chesapeake Bay
SBCC 20.4	South Branch Conewago Creek, Bandanna, PA	2	Monitor for potential water quality impacts
SCTT 3.0	Scott Creek, Delta, PA	1	Historical pollution due to untreated sewage
SUSQ 44.5	Susquehanna River, Marietta, PA	1	Bracket hydroelectric dams near the state line
SUSQ 10.0*	Susquehanna River, Conowingo, MD	1	Bracket hydroelectric dams near the state line

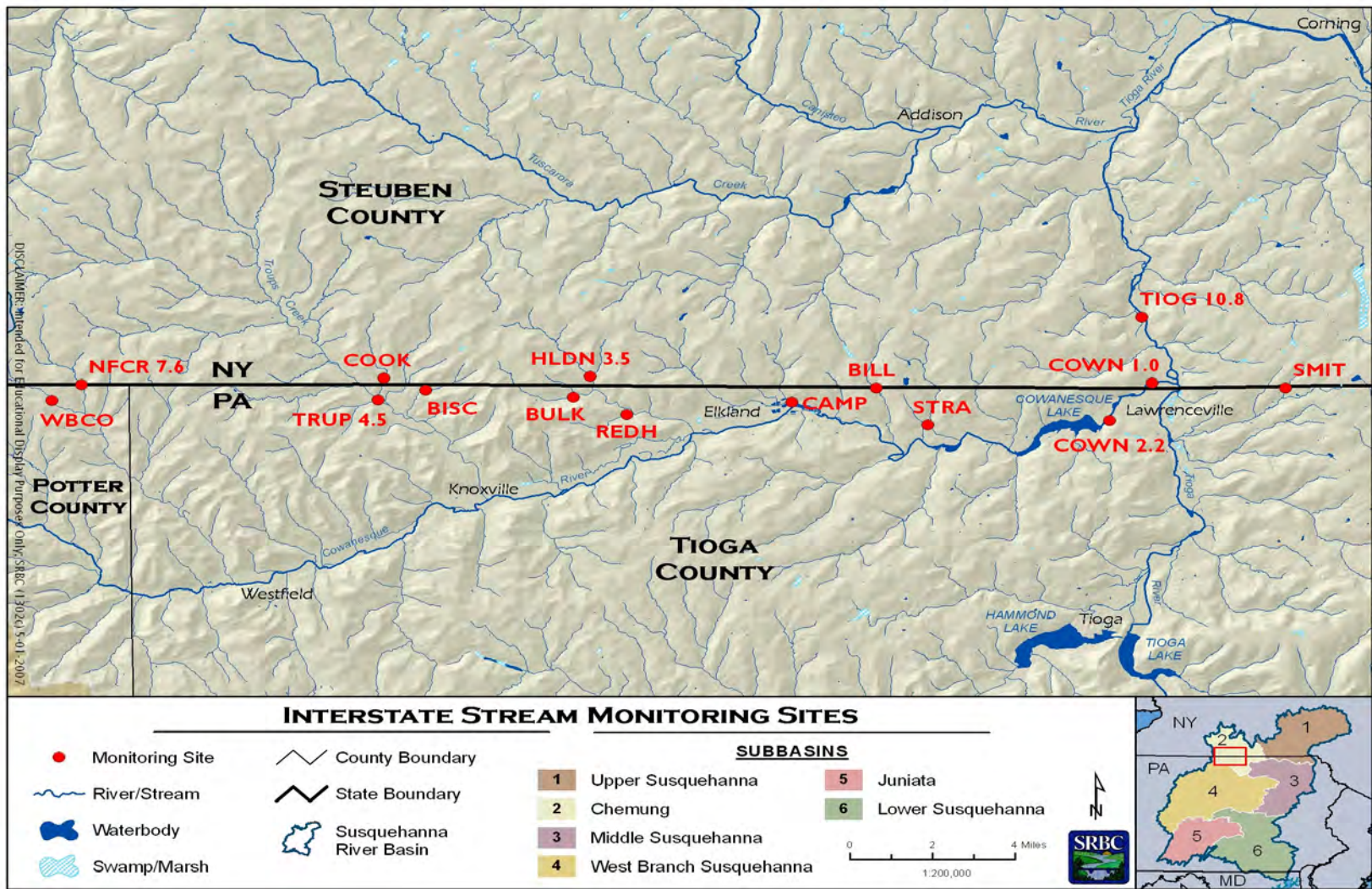
*denotes no macroinvertebrates were collected in 2010



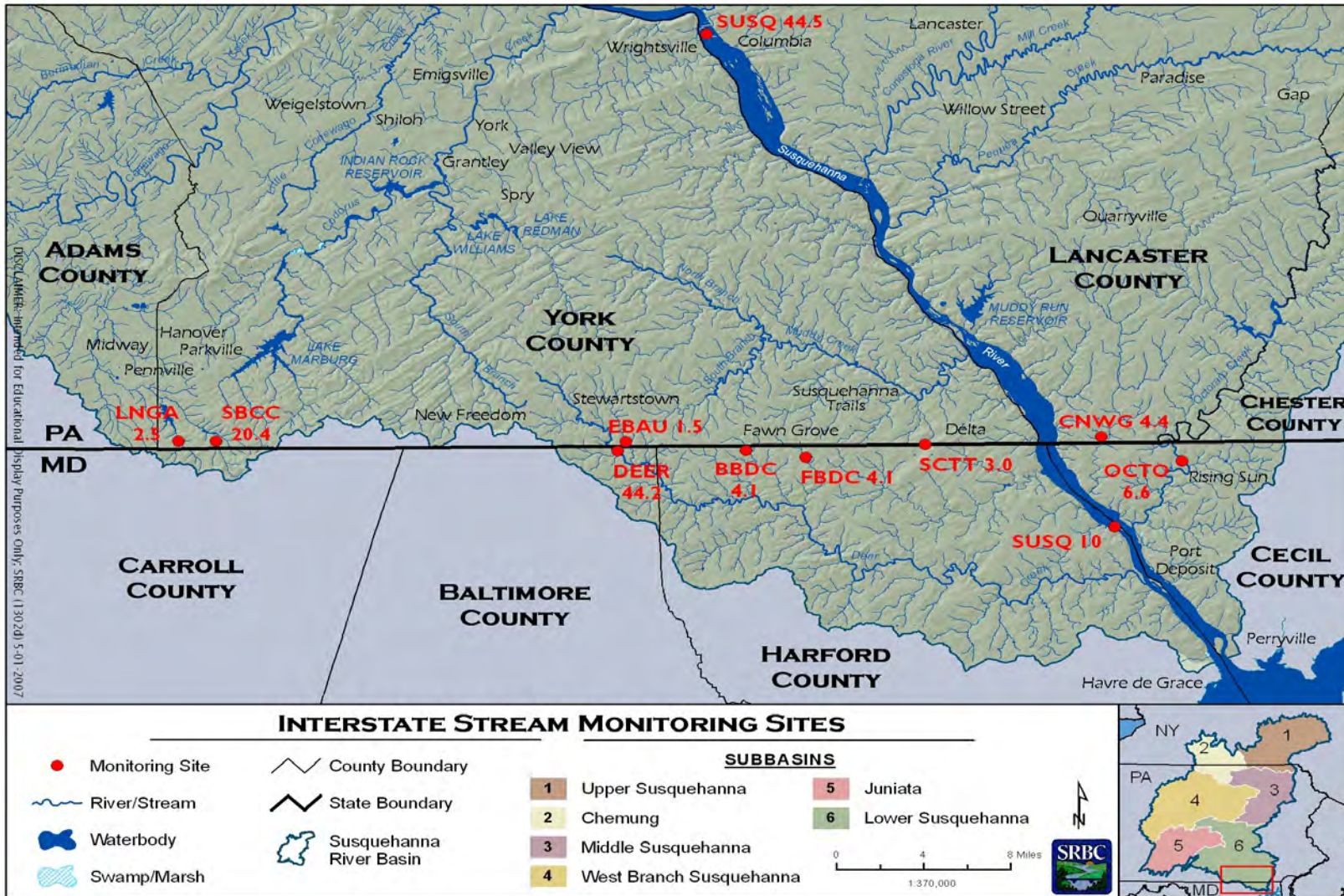
Map of New York-Pennsylvania Interstate Streams (eastern section)



Map of New York-Pennsylvania Interstate Streams (central section)



Map of New York-Pennsylvania Interstate Streams (western section)



Map of Pennsylvania-Maryland Interstate Streams

Criteria Used to Evaluate Physical Habitat

Habitat Parameter	OPTIMAL (20-16)	SUBOPTIMAL (15-11)	MARGINAL (10-6)	POOR (5-0)
1. Epifaunal Substrate (R/R)¹	Well-developed riffle/run; riffle is as wide as stream and length extends 2 times the width of stream; abundance of cobble.	Riffle is as wide as stream but length is less than 2 times width; abundance of cobble; boulders and gravel common.	Run area may be lacking; riffle not as wide as stream and its length is less than 2 times the width; some cobble present.	Riffle or run virtually nonexistent; large boulders and bedrock prevalent; cobble lacking.
1. Epifaunal Substrate (G/P)²	Preferred benthic substrate abundant throughout stream site and at stage to allow full colonization (i.e., log/snags that are not new fall and not transient).	Substrate common but not prevalent or well suited for full colonization potential.	Substrate frequently disturbed or removed.	Substrate unstable or lacking.
2. Instream Cover (R/R)	> 50% mix of boulders, cobble, submerged logs, undercut banks, or other stable habitat.	30-50% mix of boulder, cobble, or other stable habitat; adequate habitat.	10-30% mix of boulder, cobble, or other stable habitat; habitat availability less than desirable.	< 10% mix of boulder, cobble, or other stable habitat; lack of habitat is obvious.
2. Instream Cover (G/P)	> 50% mix of snags, submerged logs, undercut banks, or other stable habitat; rubble, gravel may be present.	30-50% mix of stable habitat; adequate habitat for maintenance of populations.	10-30% mix of stable habitat; habitat availability less than desirable.	Less than 10% stable habitat; lack of habitat obvious.
3. Embeddedness^a (R/R)	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediments.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediments.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediments.	Gravel, cobble, and boulder particles are >75% surrounded by fine sediments.
3. Pool Substrate Characterization (G/P)	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
4. Velocity/Depth Regimes^b (R/R)	All 4 velocity/depth regimes present (slow/deep, slow/shallow, fast/deep, fast/shallow).	Only 3 of 4 regimes present (if fast/shallow is missing, score lower than if missing other regimes).	Only 2 of 4 regimes present (if fast/shallow or slow/shallow are missing, score low).	Dominated by 1 velocity/depth regime.
4. Pool Variability^c (G/P)	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.

Criteria Used to Evaluate Physical Habitat—Continued

Habitat Parameter	OPTIMAL (20-16)	SUBOPTIMAL (15-11)	MARGINAL (10-6)	POOR (5-0)
5. Sediment Deposition (R/R)	Little or no enlargement of islands or point bars and <5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from coarse gravel; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, coarse sand on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; >50% of the bottom changing frequently; pools almost absent due to sediment deposition.
5. Sediment Deposition (G/P)	Less than 20% of bottom affected; minor accumulation of fine and coarse material at snags and submerged vegetation; little or no enlargement of island of point bars.	20-50% affected; moderate accumulation; substantial sediment movement only during major storm event; some new increase in bar formation.	50-80% affected; major deposition; pools shallow, heavily silted; embankments may be present on both banks; frequent and substantial movement during storm events.	Channelized; mud, silt, and/or sand in braided or non-braided channels; pools almost absent due to substantial sediment deposition.
6. Channel Flow Status (R/R) (G/P)	Water reaches base of both lower banks and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate exposed.	Water fills 25-75% of the available channel and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
7. Channel Alteration^d (R/R) (G/P)	No channelization or dredging present.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization (>20 yr) may be present, but not recent.	New embankments present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; >80% of the reach channelized and disrupted.
8. Frequency of Riffles (R/R)	Occurrence of riffles relatively frequent; distance between riffles divided by the width of the stream equals 5 to 7; variety of habitat.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream equals 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the stream width is between 15-25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is >25.
8. Channel Sinuosity (G/P)	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long time.
9. Condition of Banks^e (R/R) (G/P)	Banks stable; no evidence of erosion or bank failure, little potential for future problems; <5% of bank affected; on Glide/Pool streams side slopes generally <30%.	Moderately stable; infrequent, small areas of erosion mostly healed over; 5-30% of bank in reach has areas of erosion; on Glide/Pool streams side slopes up to 40% on one bank; slight erosion potential in extreme floods.	Moderately unstable, 30-60% of banks in reach have areas of erosion; high erosion potential during floods; on Glide/Pool streams side slopes up to 60% on some banks.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; on side slopes, 60-100% of bank has erosional scars; on Glide/Pool streams side slopes > 60% common.
(score each bank 0-10)	(9-10)	(6-8)	(3-5)	(0-2)

Criteria Used to Evaluate Physical Habitat—Continued

Habitat Parameter	OPTIMAL (20-16)	SUBOPTIMAL (15-11)	MARGINAL (10-6)	POOR (5-0)
10. Vegetative Protective Cover (R/R) (G/P) (score each bank 0-10)	>90% of the streambank surfaces covered by vegetation; vegetative disruption through grazing or mowing minimal. (9-10)	70-90% of the streambank surfaces covered by vegetation; disruption evident but not affecting full plant growth potential to any great extent. (6-8)	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation. (3-5)	<50% of the streambank surfaces covered by vegetation; disruption is very high; vegetation removed to 5 cm or less. (0-2)
11. Riparian Vegetative Zone Width (R/R) (G/P) (score each bank 0-10)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clearcuts, lawns, or crops) have not impacted zone. (9-10)	Width or riparian zone 12-18 meters; human activities have impacted zone only minimally. (6-8)	Width of riparian zone 6-12 meters; human activities have impacted zone only minimally. (3-5)	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities. (0-2)

- ¹ R/R – Riffle/Run Habitat assessment parameters used for streams characterized by riffles and runs.
- ² G/P – Glide/Pool Habitat assessment parameters used for streams characterized by glides and pools.
- ^a Embeddedness The degree to which the substrate materials that serve as habitat for benthic macroinvertebrates and for fish spawning and egg incubation (predominantly cobble and/or gravel) are surrounded by fine sediment. Embeddedness is evaluated with respect to the suitability of these substrate materials as habitat for macroinvertebrates and fish by providing shelter from the current and predators and by providing egg deposition and incubation sites.
- ^b Velocity/Depth Regimes The general guidelines are 0.5 m depth to separate shallow from deep, and 0.3 m/sec to separate fast from slow.
- ^c Pool Variability Rated based on the variety and spatial complexity of slow- or still-water habitat within the sample segment. It should be noted that even in high-gradient segments, functionally important slow-water habitat may exist in the form of plunge-pools and/or larger eddies. General guidelines are any pool dimension (i.e., length, width, oblique) greater than half the cross-section of the stream for separating large from small and 1 m depth separating shallow and deep.
- ^d Channel Alteration A measure of large-scale changes in the shape of the stream channel. Channel alteration includes: concrete channels, artificial embankments, obvious straightening of the natural channel, rip-rap, or other structures.
- ^e Condition of Banks Steep banks are more likely to collapse and suffer from erosion than are gently sloping banks and are therefore considered to be unstable. Left and right bank orientation is determined by facing downstream.

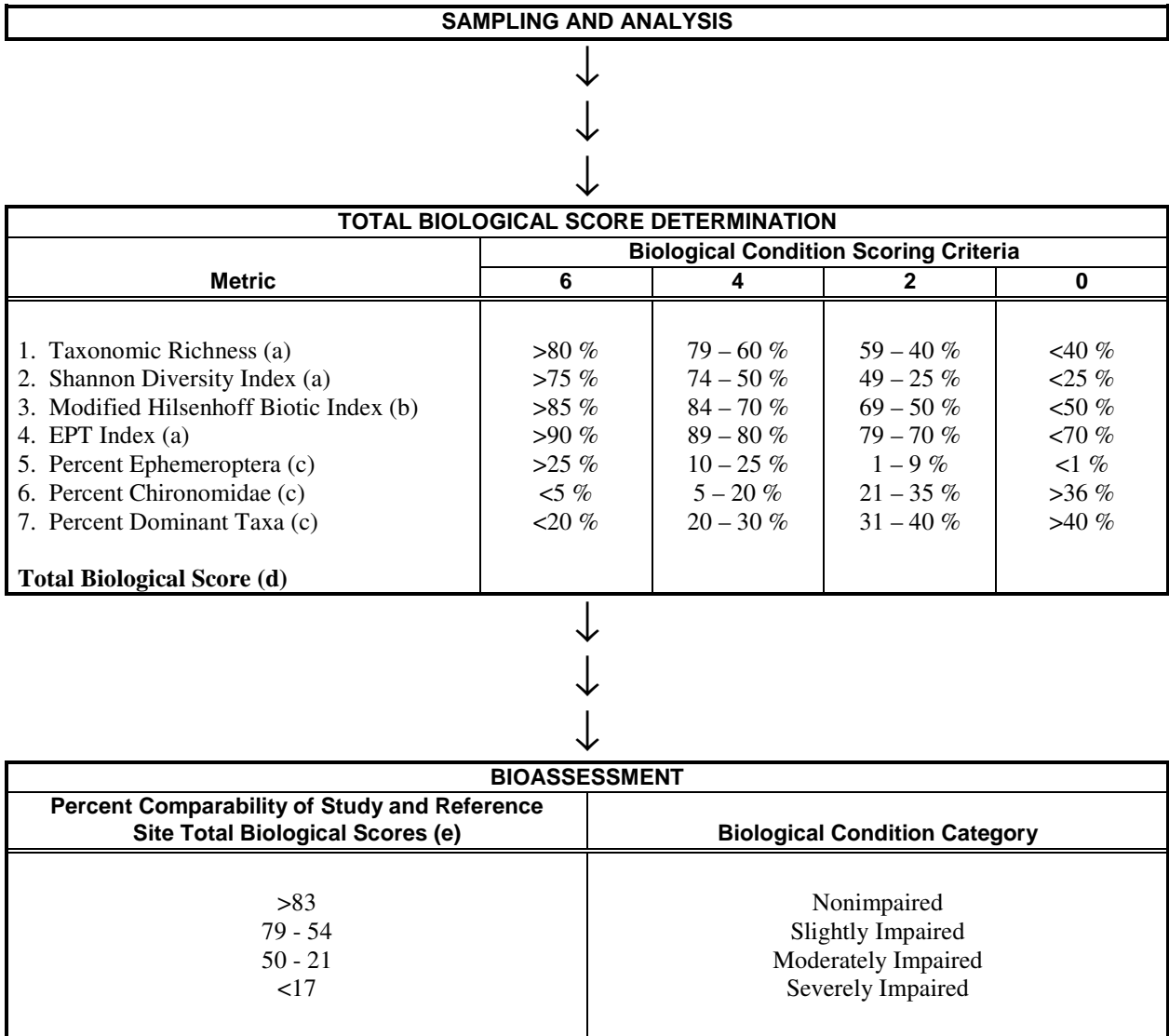
Source: Modified from Barbour et al., 1999.

Summary of Metrics Used to Evaluate the Overall Biological Integrity of Stream and River Benthic Macroinvertebrate Communities

Metric	Description
1. Taxonomic Richness (a)	The total number of taxa present in the 200-organism subsample. Number decreases with increasing stress.
2. Shannon Diversity Index (b)	A measure of biological community complexity based on the number of equally or nearly equally abundant taxa in the community. Index value decreases with increasing stress.
3. Modified Hilsenhoff Biotic Index (a)	A measure of the organic pollution tolerance of a benthic macroinvertebrate community. Index value increases with increasing stress.
4. EPT Index (a)	The total number of Ephemeroptera (mayfly), Plecoptera (stonefly), and Trichoptera (caddisfly) taxa present in the 200-organism subsample. Number decreases with increasing stress.
5. Percent Ephemeroptera (a)	The percentage of Ephemeroptera in the 200-organism subsample. Ratio decreases with increasing stress.
6. Percent Dominant Taxa (a)	Percentage of the taxon with the largest number of individuals out of the total number of macroinvertebrates in the sample. Percentage increases with increasing stress.
7. Percent Chironomidae (a)	The percentage of Chironomidae in a 200-organism subsample. Ratio increases with increasing stress.

Sources: (a) Barbour et al., 1999 (b) Klemm et al., 1990

Summary of Criteria Used to Classify the Biological Conditions of Sample Sites



- (a) Score is study site value/reference site value X 100.
- (b) Score is reference site value/study site value X 100.
- (c) Scoring criteria evaluate actual percent contribution, not percent comparability to the reference station.
- (d) Total Biological Score = the sum of Biological Condition Scores assigned to each metric.
- (e) Values obtained that are intermediate to the indicated ranges will require subjective judgment as to the correct placement into a biological condition category.

Summary of Criteria Used to Classify the Habitat Conditions of Sample Sites

DETERMINATION OF HABITAT ASSESSMENT SCORES				
Parameter	Habitat Parameter Scoring Criteria			
	Excellent	Good	Fair	Poor
Epifaunal Substrate	20-16	15-11	10-6	5-0
Instream Cover	20-16	15-11	10-6	5-0
Embeddedness/Pool Substrate	20-16	15-11	10-6	5-0
Velocity/Depth Regimes/Pool Variability	20-16	15-11	10-6	5-0
Sediment Deposition	20-16	15-11	10-6	5-0
Channel Flow Status	20-16	15-11	10-6	5-0
Channel Alteration	20-16	15-11	10-6	5-0
Frequency of Riffles/Channel Sinuosity	20-16	15-11	10-6	5-0
Condition of Banks (a)	20-16	15-11	10-6	5-0
Vegetative Protective Cover (a)	20-16	15-11	10-6	5-0
Riparian Vegetative Zone Width (a)	20-16	15-11	10-6	5-0
Habitat Assessment Score (b)				



HABITAT ASSESSMENT	
Percent Comparability of Study and Reference Site Habitat Assessment Scores	Habitat Condition Category
>90	Excellent (comparable to reference)
89-75	Supporting
74-60	Partially Supporting
<60	Nonsupporting

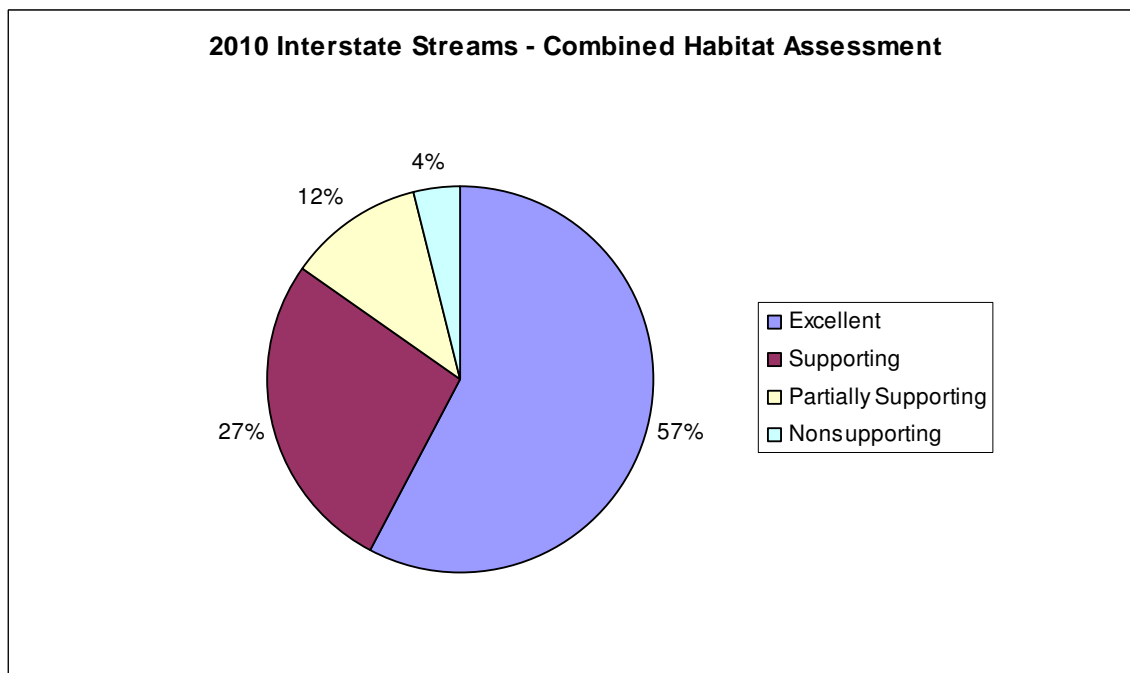
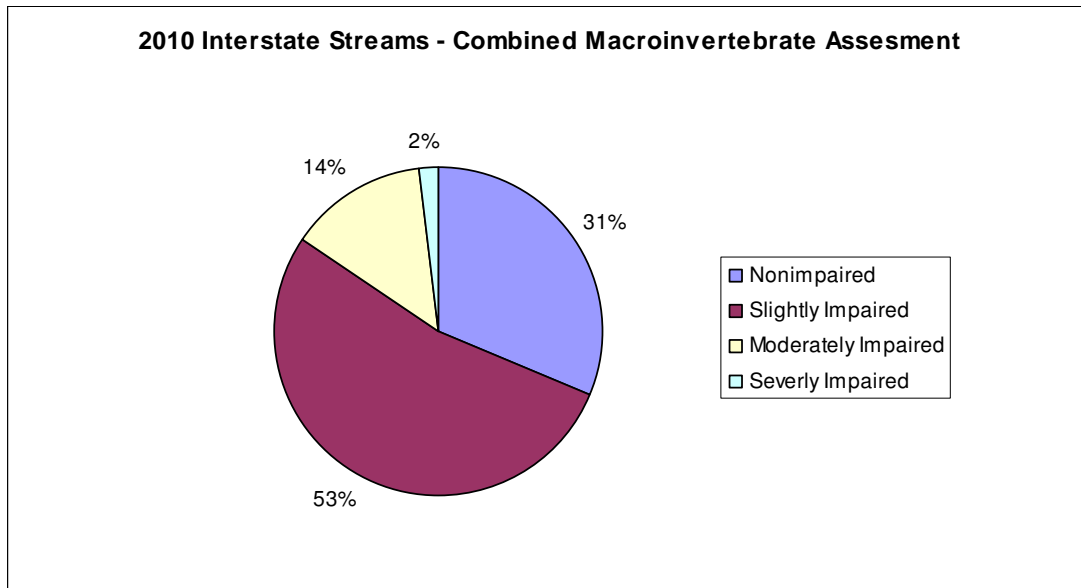
(a) Combined score of each bank

(b) Habitat Assessment Score = Sum of Habitat Parameter Scores

Results

Macroinvertebrates and Habitat

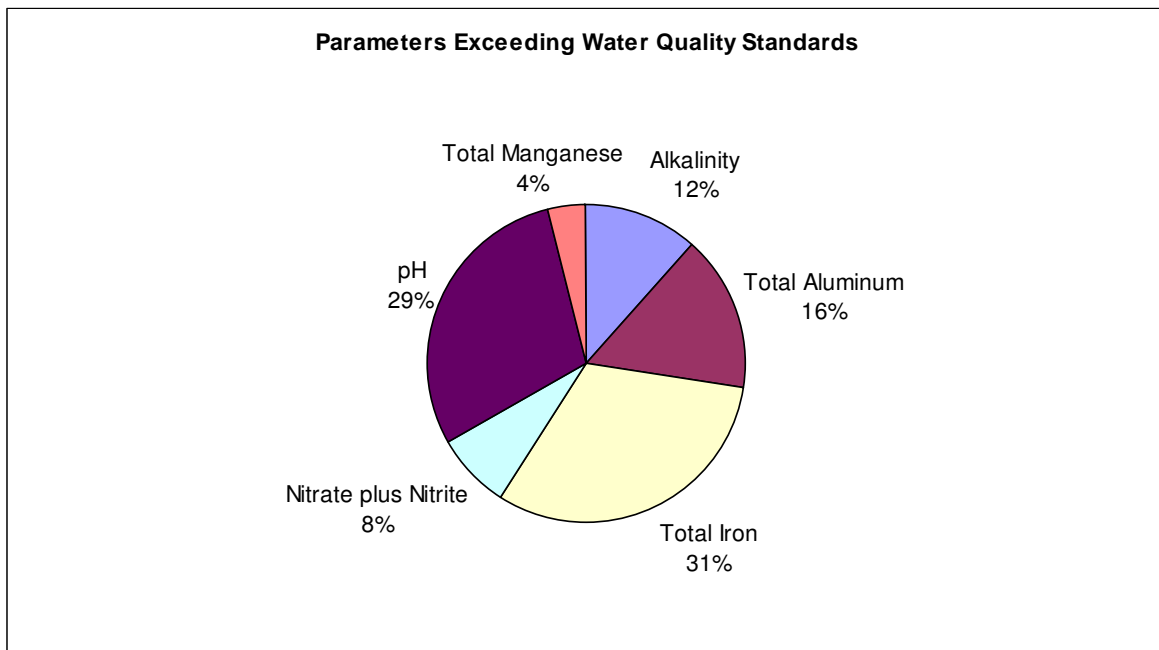
In 2010, 86 percent of the interstate streams assessed had a biological community deemed nonimpaired or slightly impaired. Nonimpaired biological communities were present at 16 of 51 streams assessed, while only one was considered severely impaired. Physical habitat was rated as being excellent or supporting for 84 percent of the streams evaluated. Of the 52 total sites where physical habitat was assessed, 30 sites were rated as excellent while only two were nonsupporting.



Water Quality

Water quality results based on field and laboratory observations for all interstate streams are presented below. The parameter most frequently exceeding state standards was total iron. Overall, 32 of 53 stations (60 percent) did not have any observations exceeding state standards. During 2010, 10 of 53 (19 percent) stations had more than one measured parameter outside of accepted limits.

Parameter	Standard	Standard Value	Number of Observations	Number Exceeding Standards
Alkalinity	PA aquatic life	20 mg/L	115	6
Total Aluminum	NY aquatic (chronic)	100 µg/L	60	8
Total Iron	NY aquatic (chronic) PA aquatic life	300 µg/L 1500 µg/L	60	16
Nitrate plus Nitrite	PA public water supply	10 mg/L	95	4
pH	NY general MD aquatic life PA aquatic life	6.5-8.5 6.5-8.5 6.0-9.0	116	15
Total Manganese	NY aquatic (chronic)	300 µg/L	95	2
Turbidity	MD aquatic life	150 NTU	35	0
Dissolved Oxygen	PA aquatic life	5.0 mg/L	115	0



Sites with at Least One Parameter Exceeding State Thresholds

Grouping	# exceeding	sites available in group	proportion exceeding
Group 1 (NY)	11	13	84.62%
Group 2 (NY)	3	8	37.50%
Group 1 (MD)	2	8	25.00%
Group 2 (MD)	1	3	33.33%
Group 3	4	21	19.05%
Total	21	53	39.62%

Grouping	# exceeding	sites available in group	proportion exceeding
Group 1	13	21	61.90%
Group 2	4	11	36.36%
Group 3	4	21	19.05%
Total	21	53	39.62%

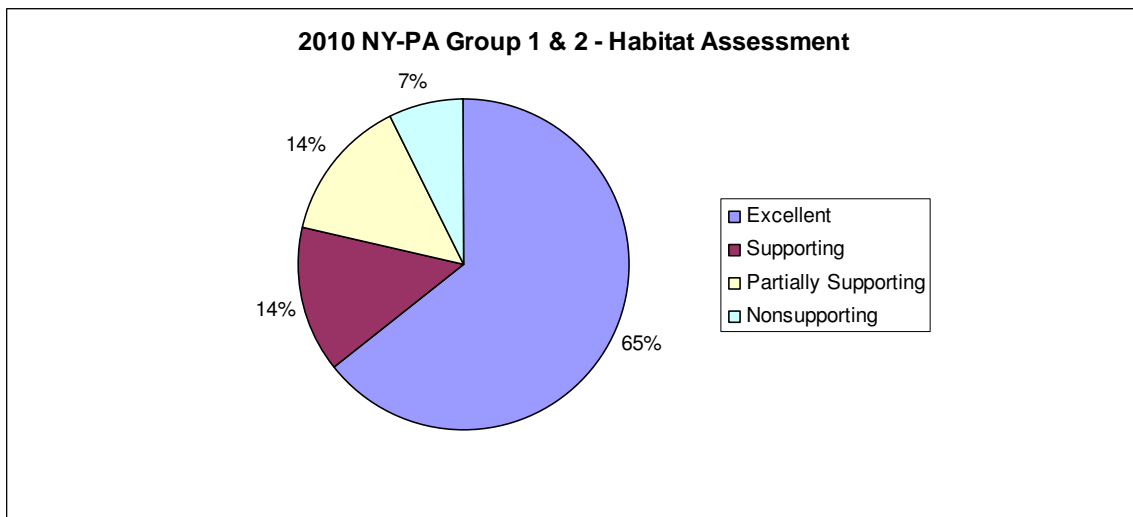
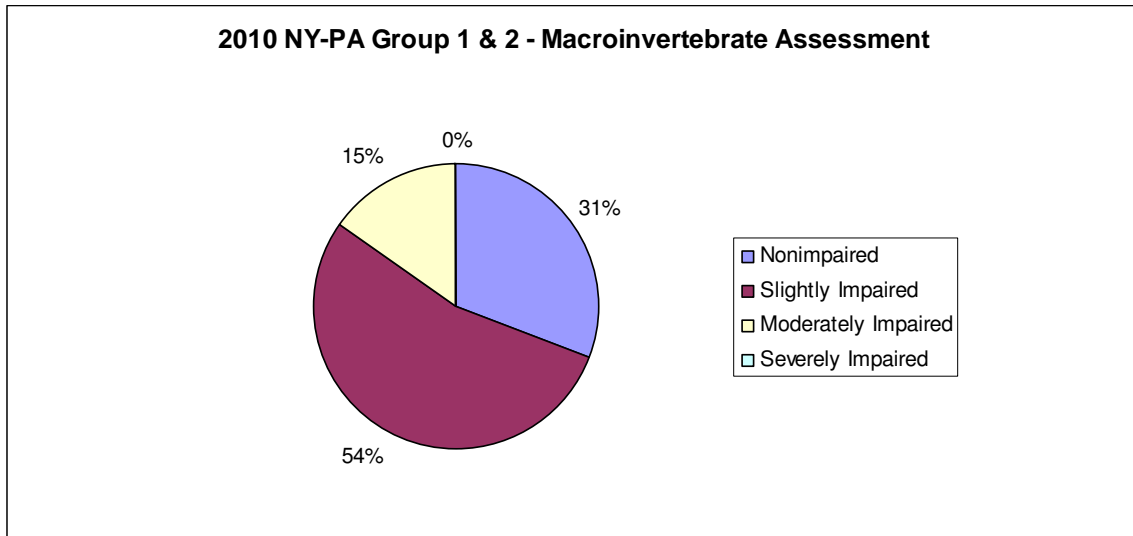
Sites with Two or More Parameters Exceeding State Thresholds

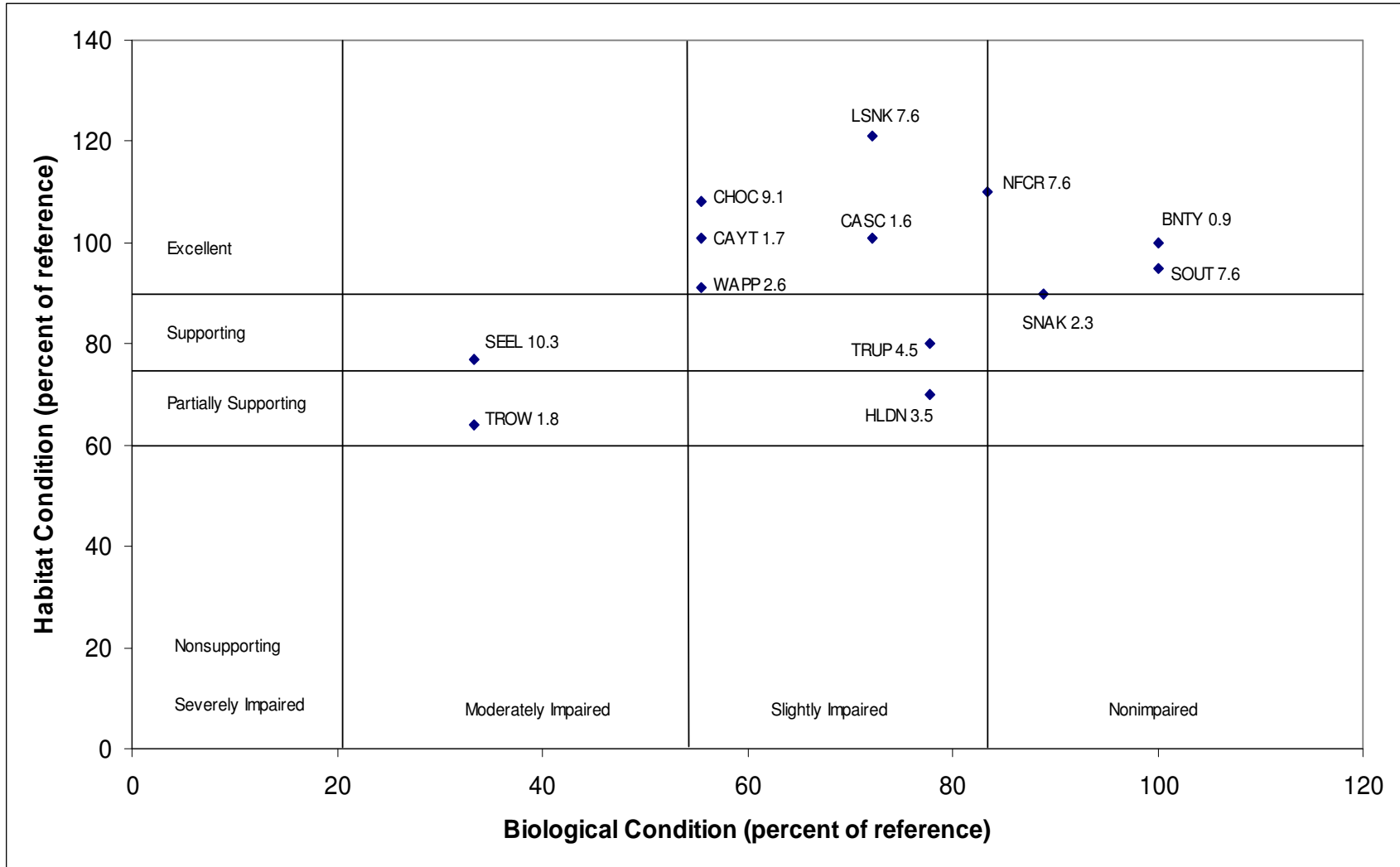
Grouping	# exceeding	sites available in group	proportion exceeding
Group 1 (NY)	6	13	46.15%
Group 2 (NY)	0	8	0.00%
Group 1 (MD)	2	8	25.00%
Group 2 (MD)	0	3	0.00%
Group 3	2	21	9.52%
Total	10	53	18.87%

Grouping	# exceeding	sites available in group	proportion exceeding
Group 1	8	21	38.09%
Group 2	0	11	0.00%
Group 3	2	21	9.52%
Total	10	53	18.87%

Results for 2010 New York-Pennsylvania Group 1 & 2 Stream Assessments

Sites that represent the best available combination of conditions, in terms of biological community, water quality, and physical habitat for each group of stream sites are designated as reference sites. In 2010, Bentley Creek at Wellsburg, N.Y. (BNTY 0.9), served as the reference site to which all other New York-Pennsylvania Group 1 and 2 streams were compared. Bentley Creek possessed the best available habitat in the group and shared the highest biological assessment score with South Creek (SOUT 7.6). The macroinvertebrate community was not assessed at Apalachin Creek (APAL 6.9) in 2010. Of the 13 Group 1 and Group 2 streams where the biological community was assessed, four sites had nonimpaired ratings, seven were slightly impaired, and two were classified as moderately impaired. Habitat was rated excellent at nine sites, supporting at two sites, partially supporting at two sites, and nonsupporting at Apalachin Creek at Little Meadows, Pa. (APAL 6.9), where staff noted anomalous conditions.

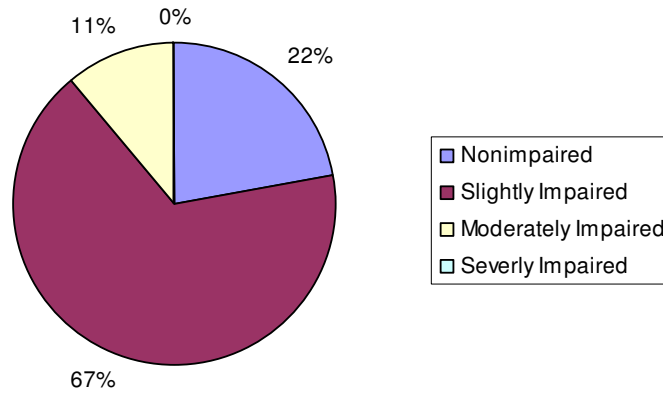




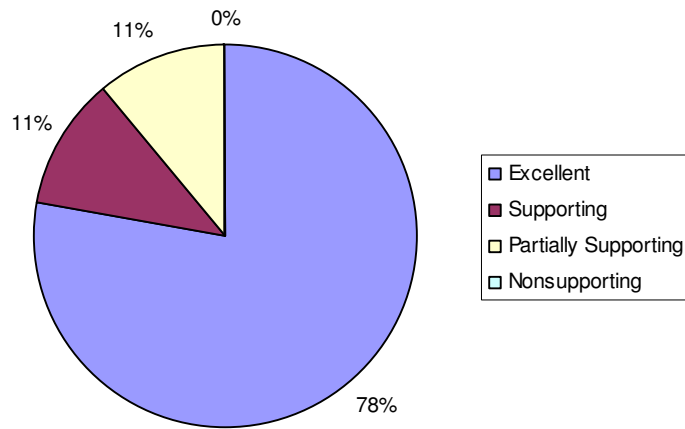
Results for 2010 Pennsylvania-Maryland Stream Assessments

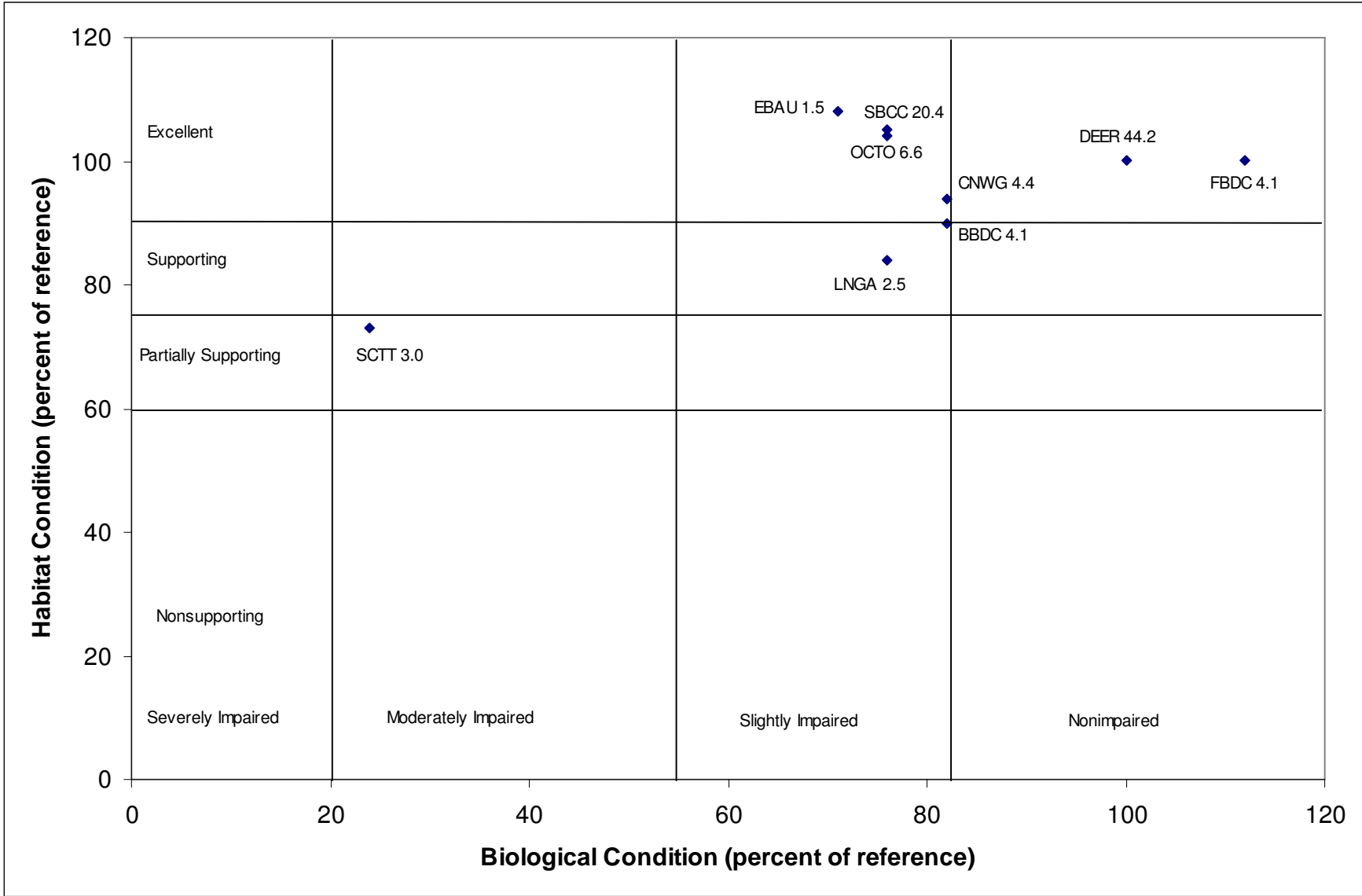
Sites that represent the best available combination of conditions, in terms of biological community, water quality, and physical habitat for each group of stream sites are designated as reference sites. In 2010, Deer Creek at Gorsuch Mills, Md. (DEER 44.2), served as the reference station to which all other Pennsylvania-Maryland Group 1 and 2 streams were compared. Deer Creek possessed excellent available physical habitat, a nonimpaired macroinvertebrate community, and consistently favorable water quality index scores. Deer Creek also served as the reference station for the group in 2008. Physical habitat at Group 1 and 2 sites was considered excellent or supporting, with biological communities scoring as nonimpaired or slightly impaired at 89 percent of the streams surveyed. Scott Creek (SCTT 3.0) was the lone station within the group which had a moderately impaired macroinvertebrate community and partially supporting physical habitat.

2010 PA-MD Group 1 & 2 - Macroinvertebrate Assessment



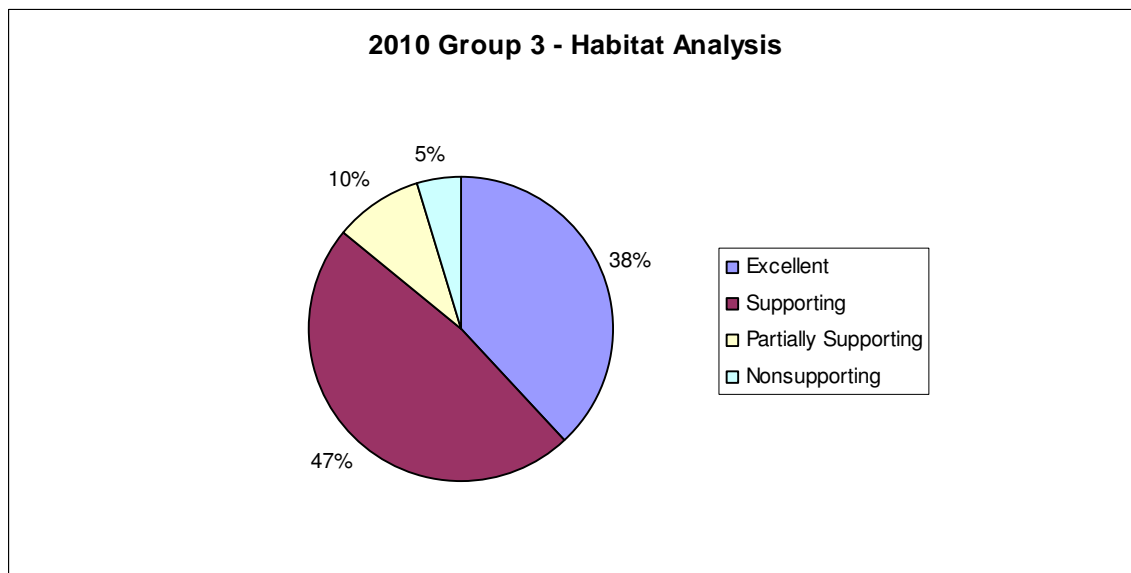
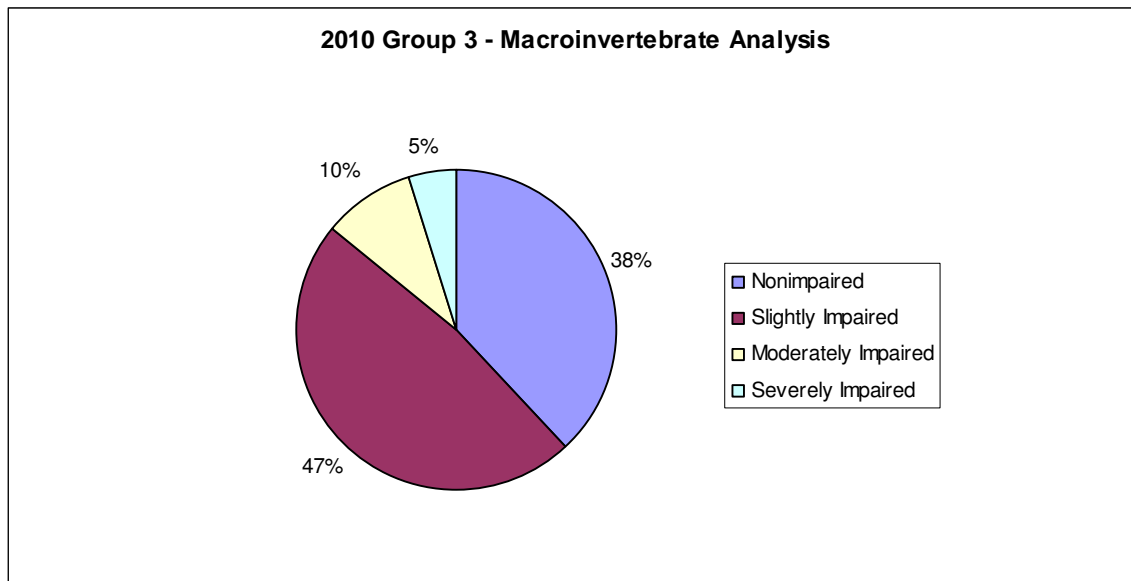
2010 PA-MD Group 1 & 2 - Habitat Assessment

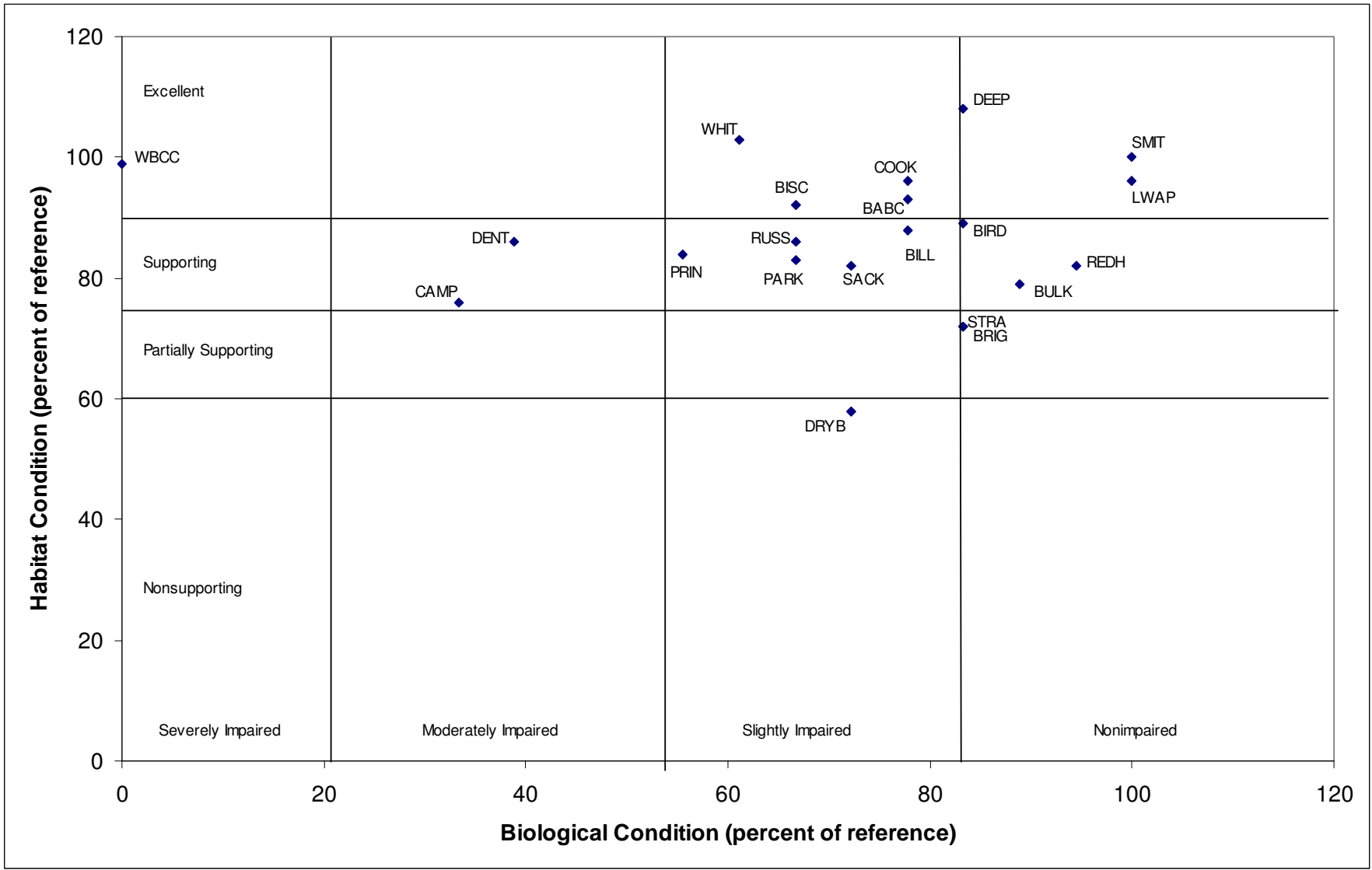




Results for 2010 New York-Pennsylvania Group 3 Stream Assessments

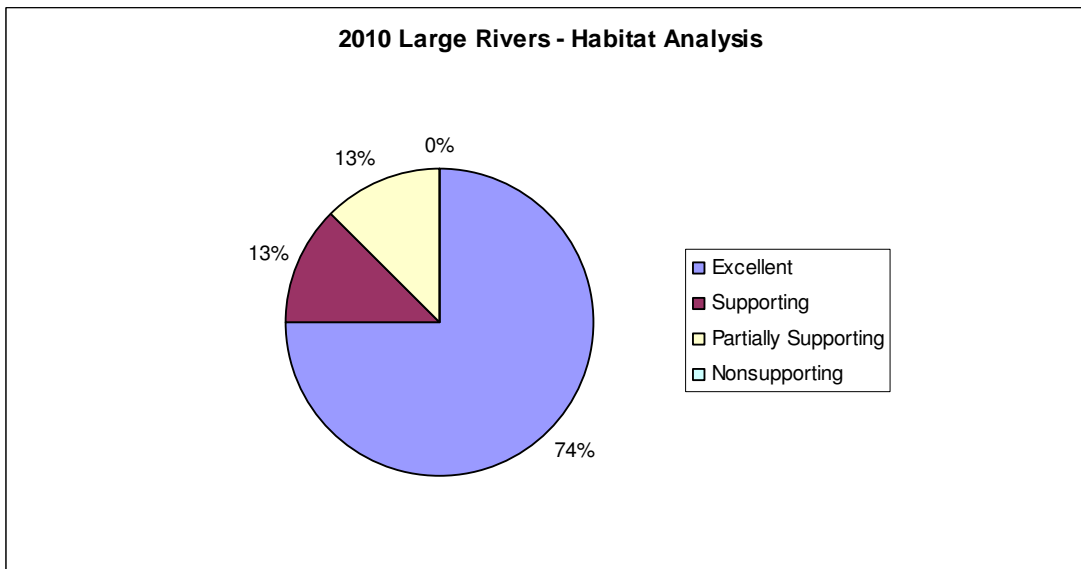
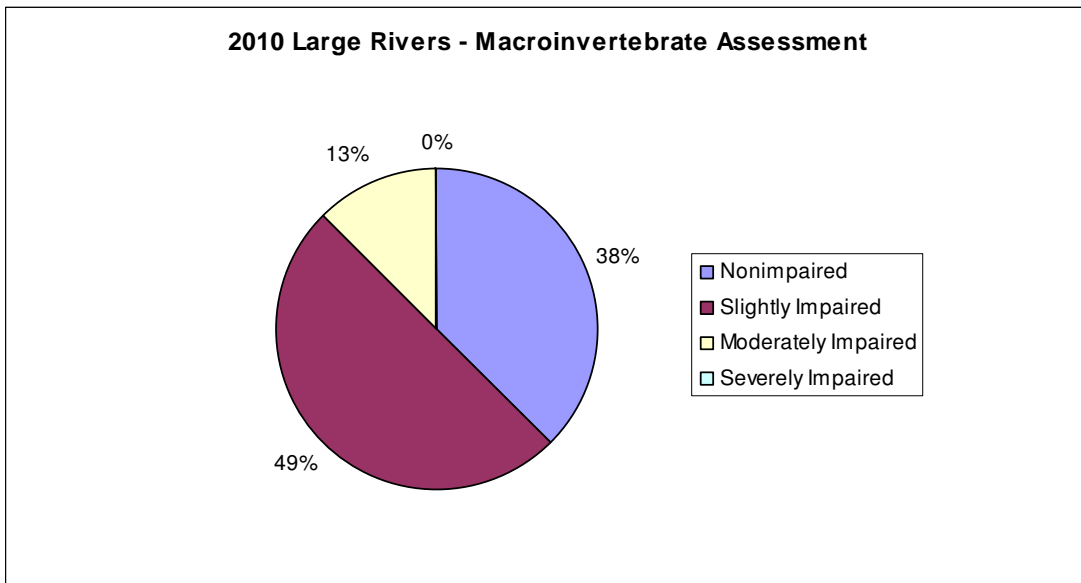
Sites that represent the best available combination of conditions, in terms of biological community, water quality, and physical habitat for each group of stream sites are designated as reference sites. In 2010, Smith Creek near East Lawrence, Pa. (SMIT), served as the reference station to which all other Group 3 streams were compared. Smith Creek had a nonimpaired biological community and excellent physical habitat. Based on historical data, Smith Creek has consistently been one of the best streams in Group 3. Eighty-five percent of Group 3 streams received a rating of nonimpaired or slightly impaired. Physical habitat was assessed as being excellent or supporting in 85 percent of Group 3 interstate streams.

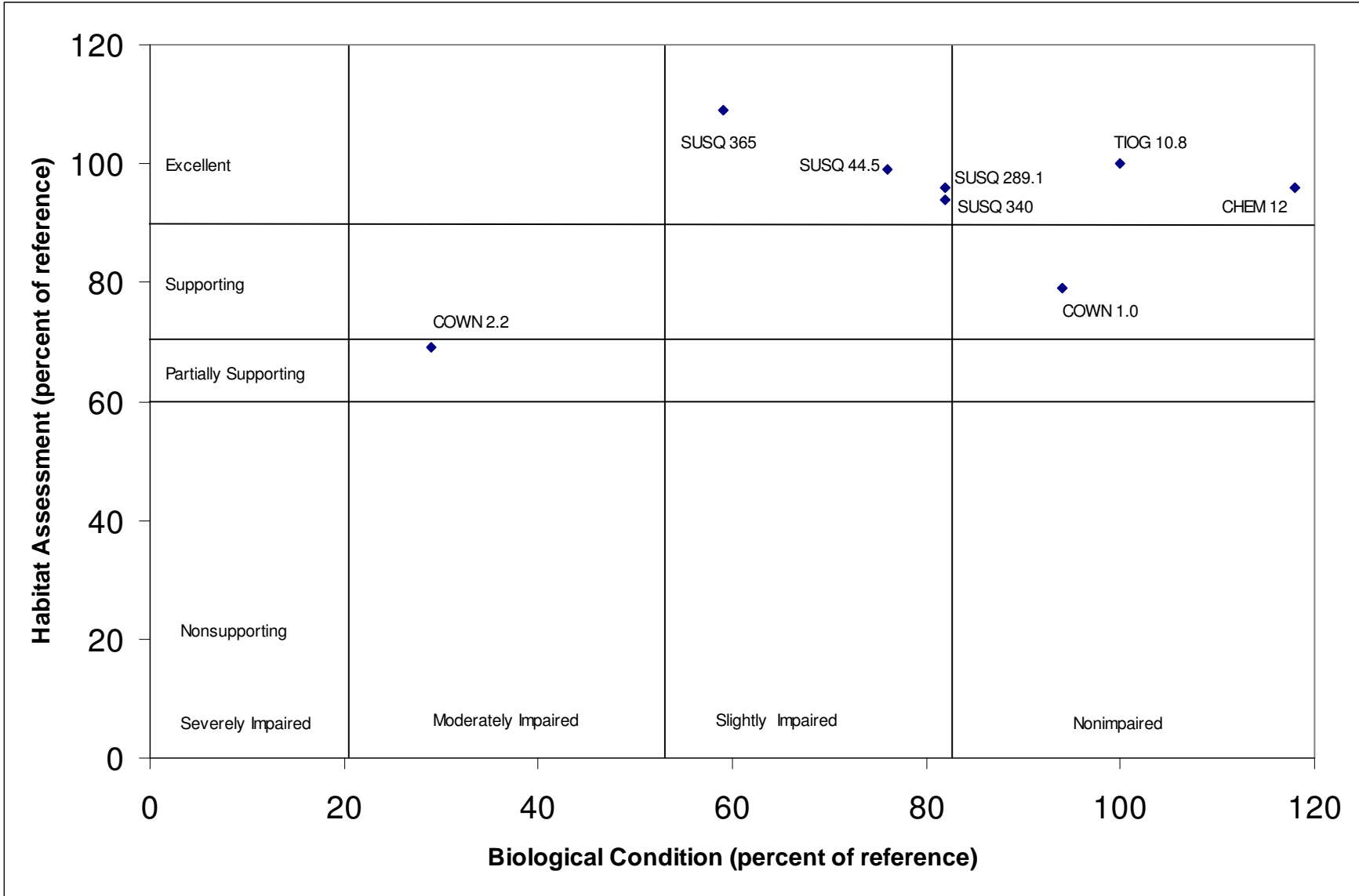




Results for 2010 Large Rivers Assessment

Sites that represent the best available combination of conditions, in terms of biological community, water quality, and physical habitat for each group of stream sites are designated as reference sites. In 2010, the Tioga River at Lindley, N.Y. (TIOG 10.8), served as the reference site to which all other large river sites were compared. This station also served as the reference site in 2008. Physical habitat was rated as excellent for the fifth consecutive year. The biological community at TIOG 10.8 was assessed as nonimpaired. Overall, habitat at the large river sites is very good. Only one station, COWN 2.2, had conditions rated as partially supporting. Eighty-seven percent of large river stations had nonimpaired or slightly impaired macroinvertebrate communities.





Site Results for Group 1 and 2 Streams on the New York-Pennsylvania Border

Apalachin Creek at Little Meadows, PA (APAL 6.9)

Group 2

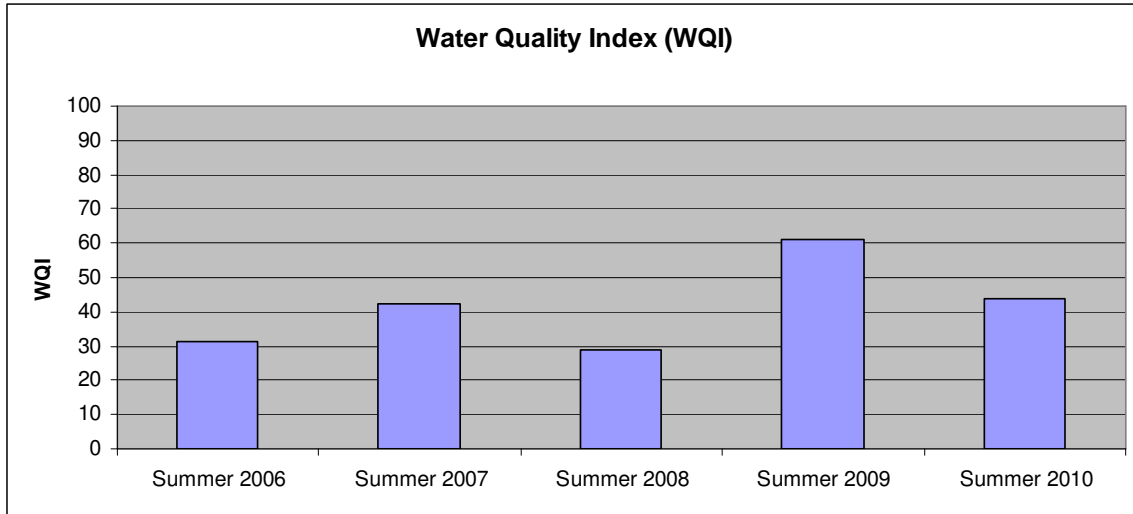


Habitat Conditions:

Overall physical habitat conditions received a score of 52 of a possible 220. Excessive sedimentation, poor velocity/depth regimes, and an absence of riffles led to a nonsupporting rating.

Water Quality:

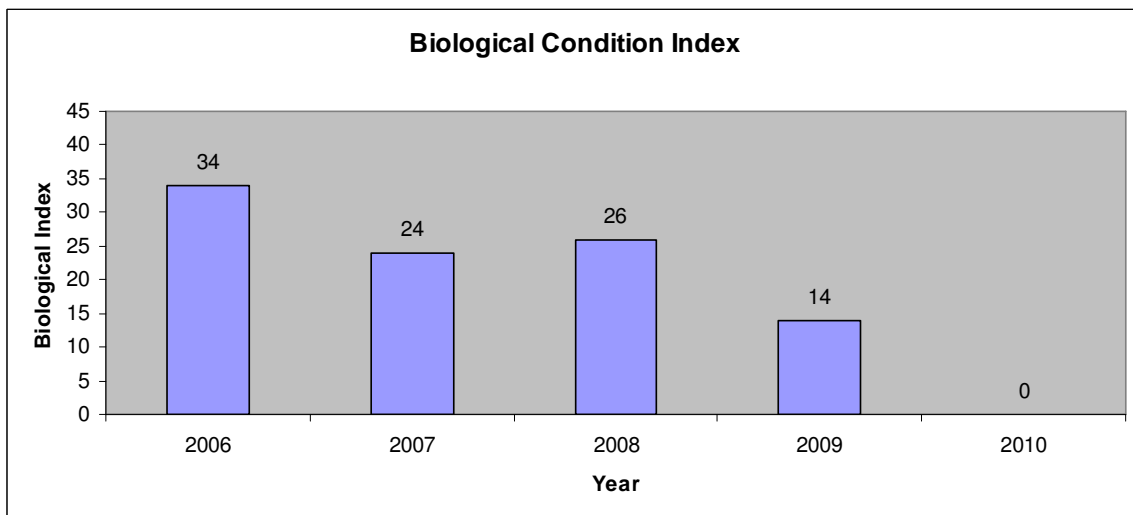
Total iron concentration exceeded water quality standards.



Biological Condition:

Macroinvertebrates were not sampled in 2010 at APAL 6.9.

Biological Condition		
Year	Score	Rating
2006	34	Nonimpaired
2007	24	Slightly Impaired
2008	26	Slightly Impaired
2009	14	Moderately Impaired
2010	NA	NA



Bentley Creek at Wellsburg, NY (BNTY 0.9)

Group 1

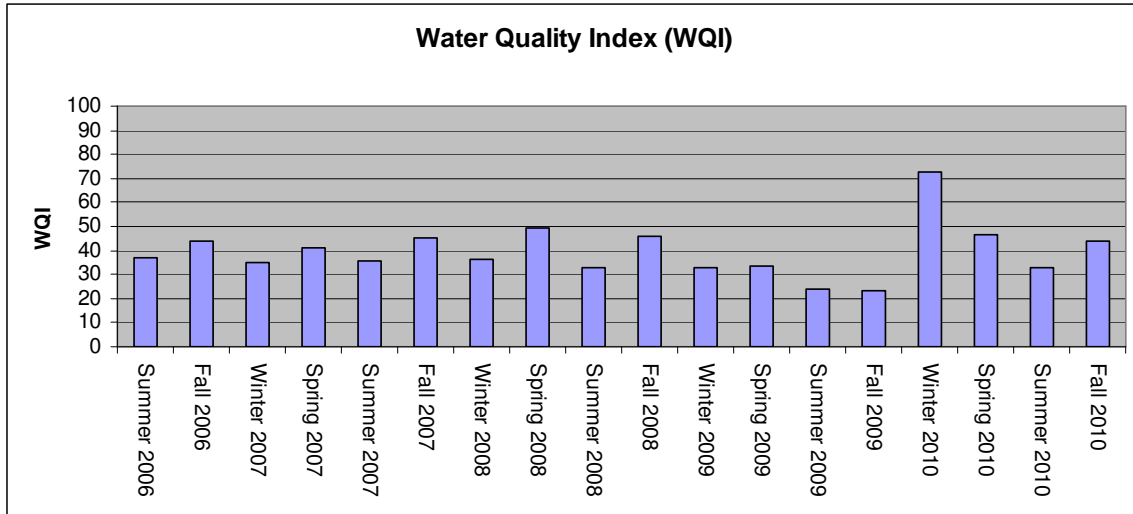


Habitat Conditions:

Overall physical habitat scored 134 out of a possible 220. SRBC staff noted minimal sediment deposition, little embeddedness, and good vegetation protecting both banks. Physical habitat was rated as excellent.

Water Quality:

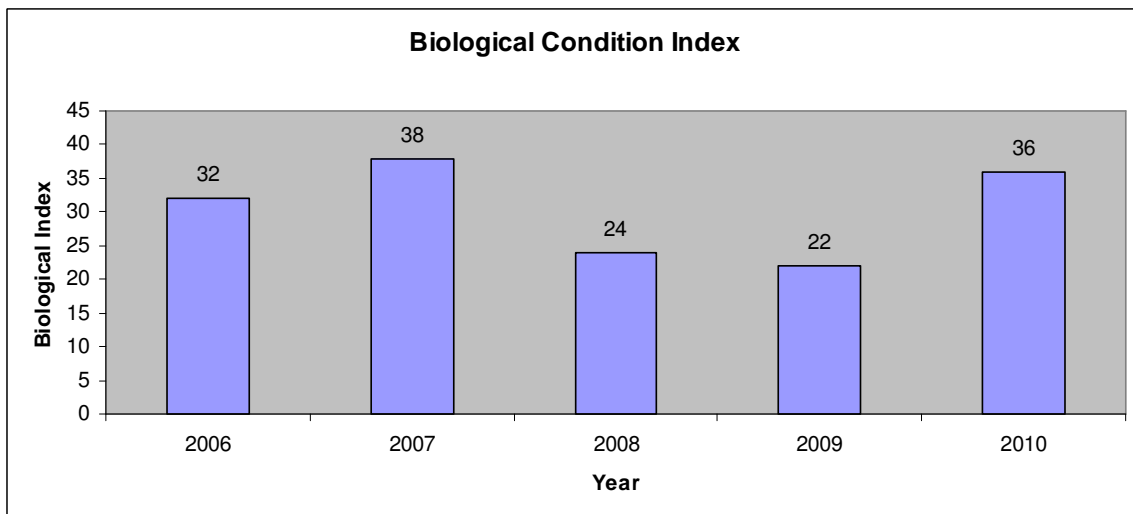
A pH value of 8.87 was measured in May 2010 and exceeded water quality standards.



Biological Condition:

The biological community was rated as nonimpaired in 2010. Bentley Creek served as the reference site to which all other Pennsylvania-New York Group 1 and 2 streams were compared.

Biological Condition		
Year	Score	Rating
2006	32	Nonimpaired
2007	38	Nonimpaired
2008	24	Slightly Impaired
2009	22	Slightly Impaired
2010	36	Nonimpaired



Cascade Creek at Lanesboro, PA (CASC 1.6)

Group 1

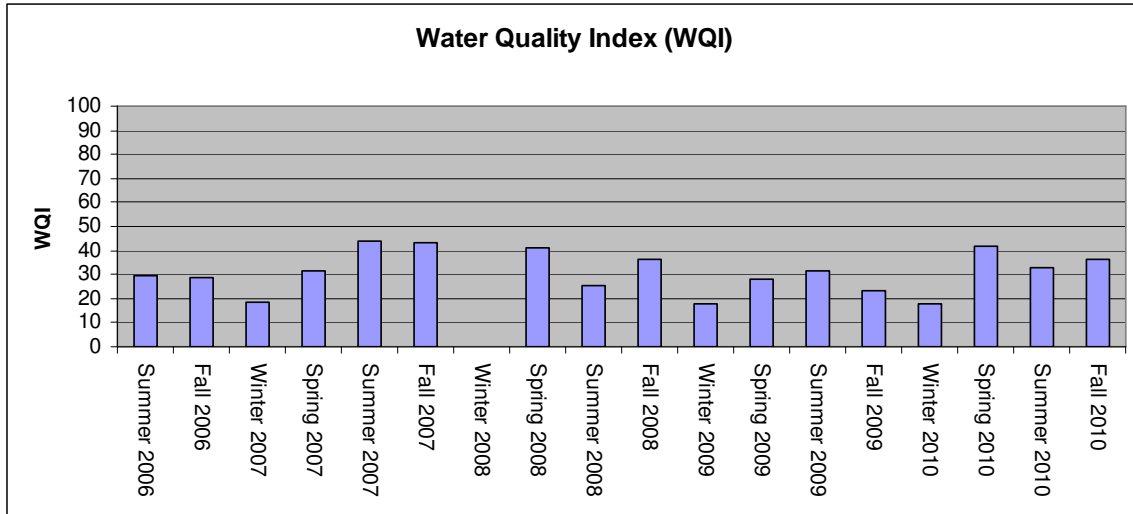


Habitat Condition:

Despite low flow conditions when habitat was assessed in 2010, CASC 1.6 still received a score of 135 of a possible 220. Overall habitat was rated as excellent with wide riparian zone widths, optimal amounts of instream cover, and minimal embeddedness.

Water Quality:

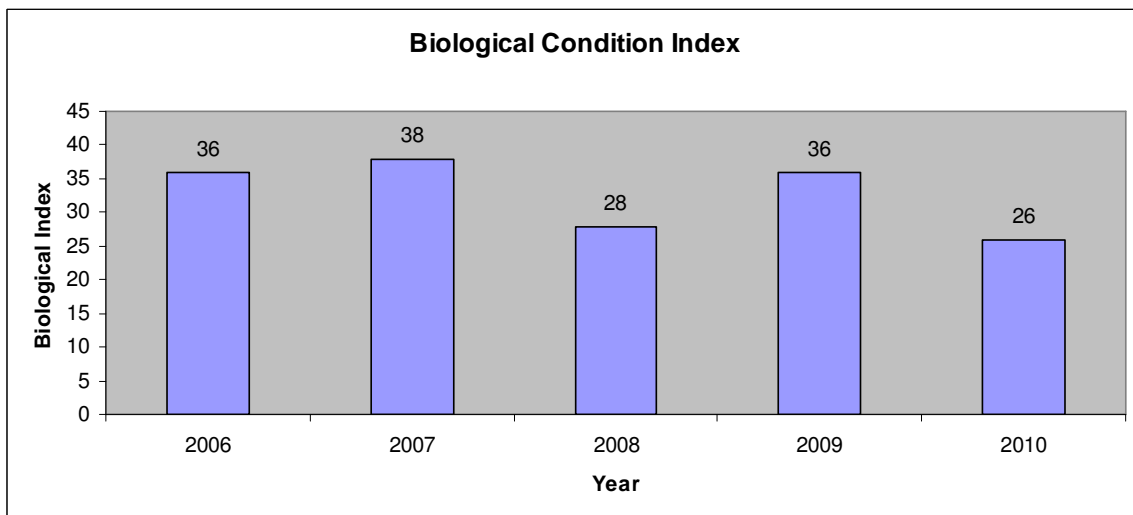
Measured alkalinity and total iron concentrations were outside of water quality thresholds when the stream was sampled in 2010.



Biological Condition:

The biological community received a classification of slightly impaired in 2010.

Biological Condition		
Year	Score	Rating
2006	36	Nonimpaired
2007	38	Nonimpaired
2008	28	Slightly Impaired
2009	36	Nonimpaired
2010	26	Slightly Impaired



Cayuta Creek at Waverly, NY (CAYT 1.7)

Group 1

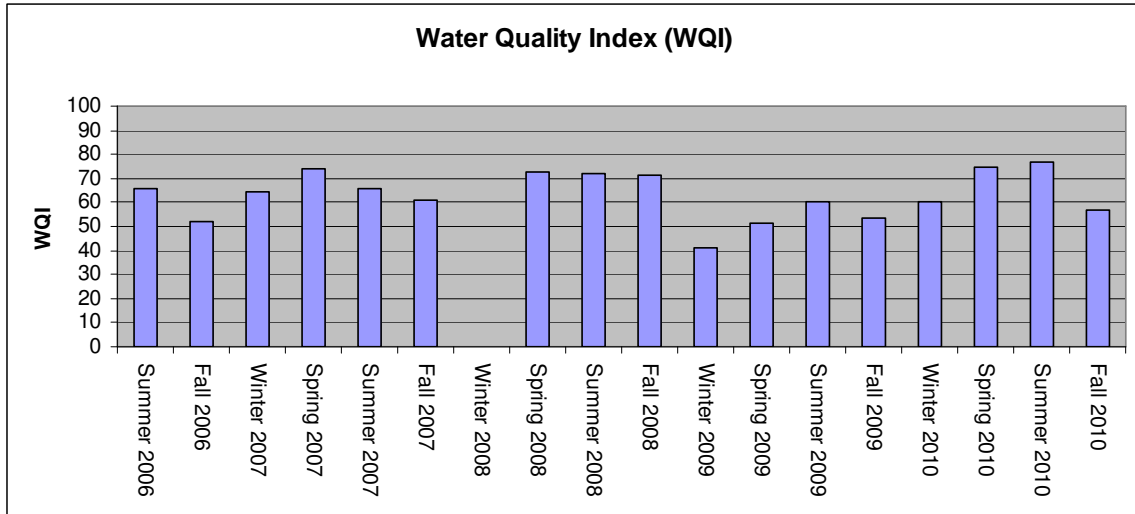


Habitat Conditions:

SRBC staff noted construction activities occurring within the vicinity of the sampling site in 2010. Physical habitat was rated as excellent, receiving a score of 136 of a possible 220. Epifaunal substrate, velocity/depth regimes, and instream cover were the best scoring habitat parameters.

Water Quality:

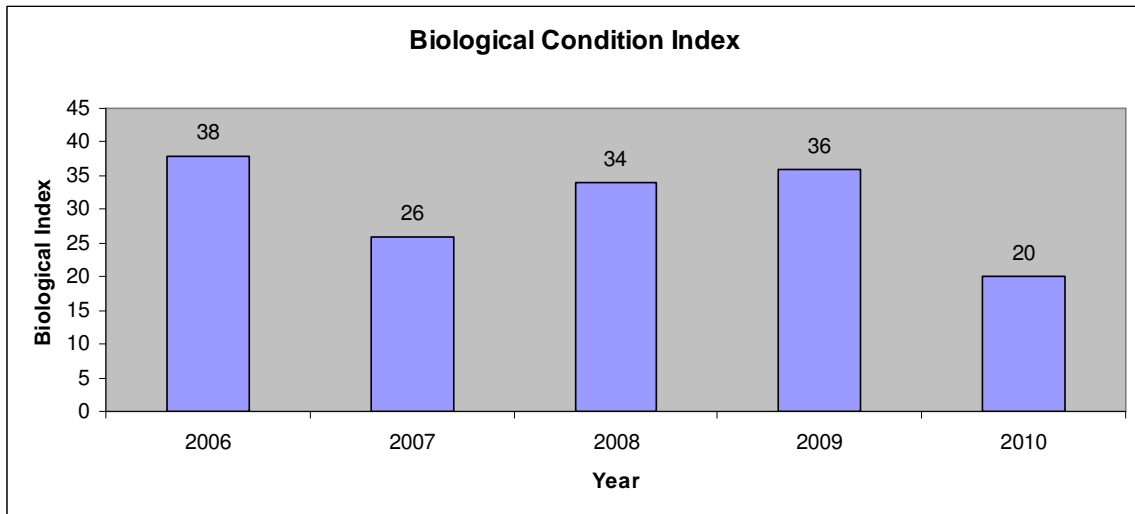
Temperature and pH exceeded water quality standards at the time of sampling.



Biological Condition:

The biological community was rated as slightly impaired in 2010.

Biological Condition		
Year	Score	Rating
2006	38	Nonimpaired
2007	26	Slightly Impaired
2008	34	Nonimpaired
2009	36	Nonimpaired
2010	20	Slightly Impaired



Choconut Creek at Vestal Center, NY (CHOC 9.1)

Group 2

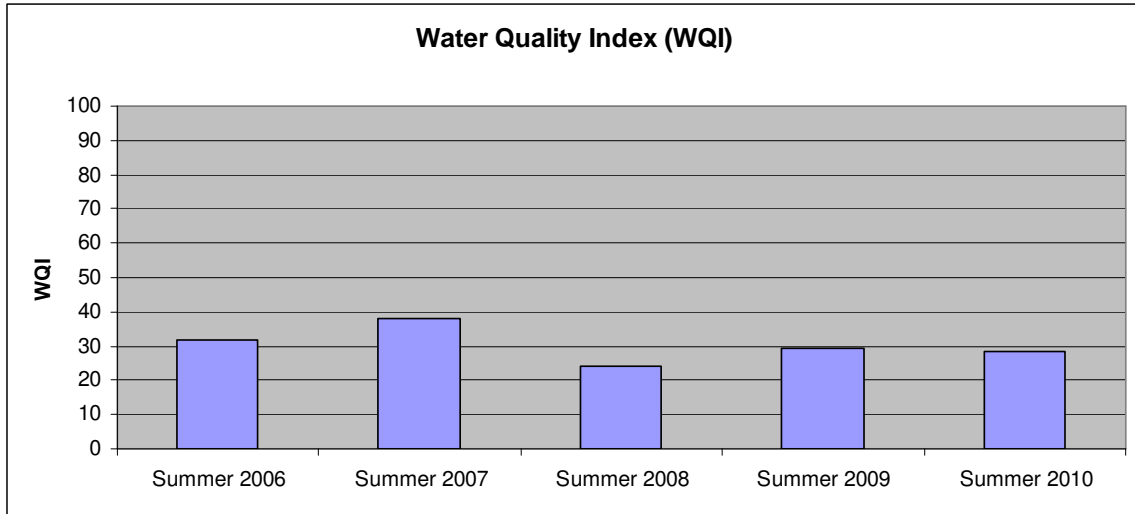


Habitat Conditions:

Physical habitat was rated as excellent, scoring 145 of a possible 220. This year marks an improvement as habitat was previously rated as supporting in 2008 and 2009.

Water Quality:

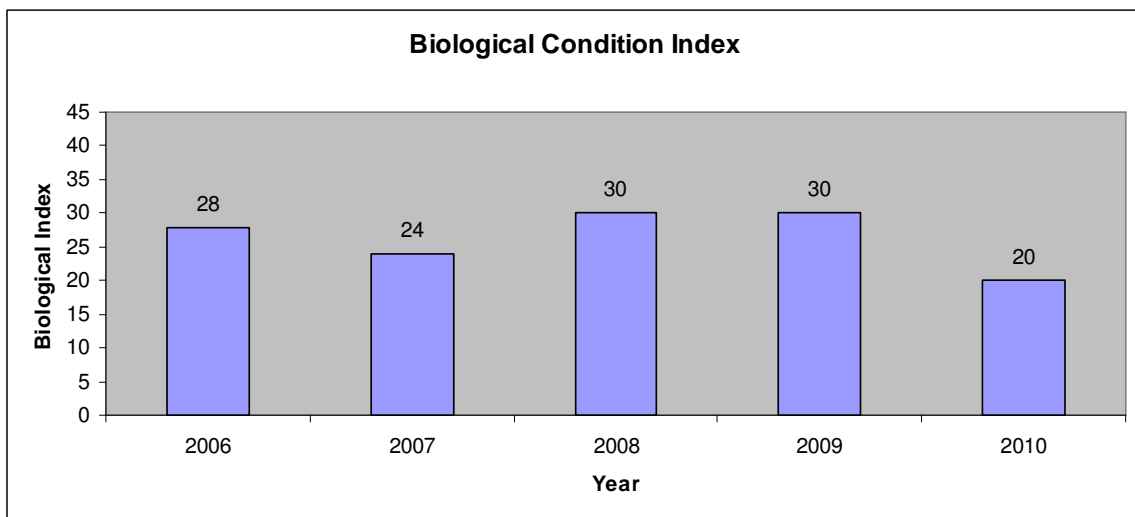
Temperature exceeded water quality standards when the stream was sampled in August 2010. Historically, Choconut Creek possesses very favorable water quality conditions and consistently low water quality indices scores.



Biological Condition:

The macroinvertebrate community was classified as slightly impaired when sampled in 2010.

Biological Condition		
Year	Score	Rating
2006	28	Slightly Impaired
2007	24	Slightly Impaired
2008	30	Slightly Impaired
2009	30	Slightly Impaired
2010	20	Slightly Impaired



Holden Creek at Woodhull, NY (HLDN 3.5)

Group 2

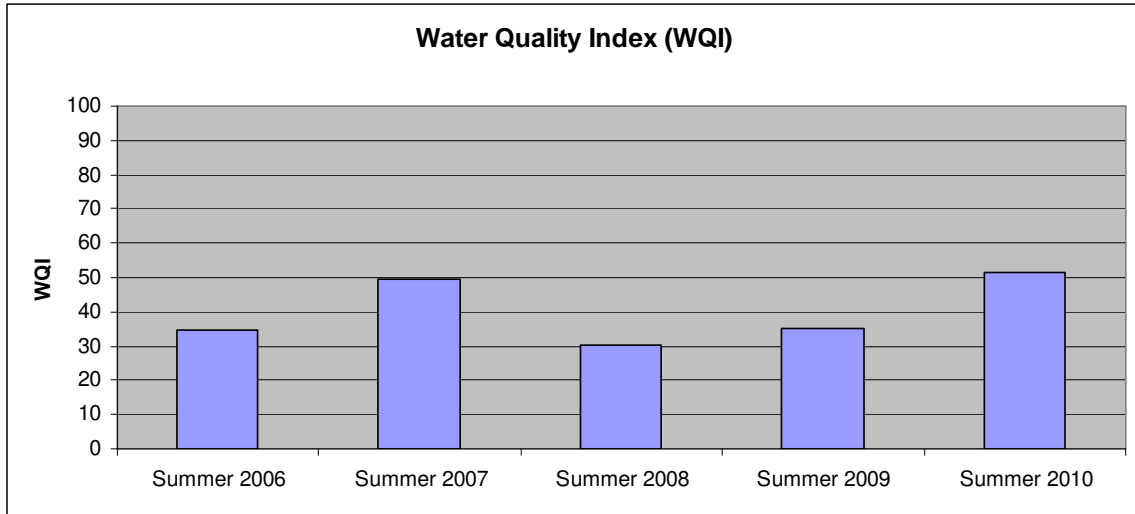


Habitat Condition:

Physical habitat was deemed partially supporting, receiving a score of only 94 of a possible 220. SRBC staff noted significant issues pertaining to excessive sediment deposition. Channel flow status was also problematic with a significant portion of the available channel being dry and exposed.

Water Quality:

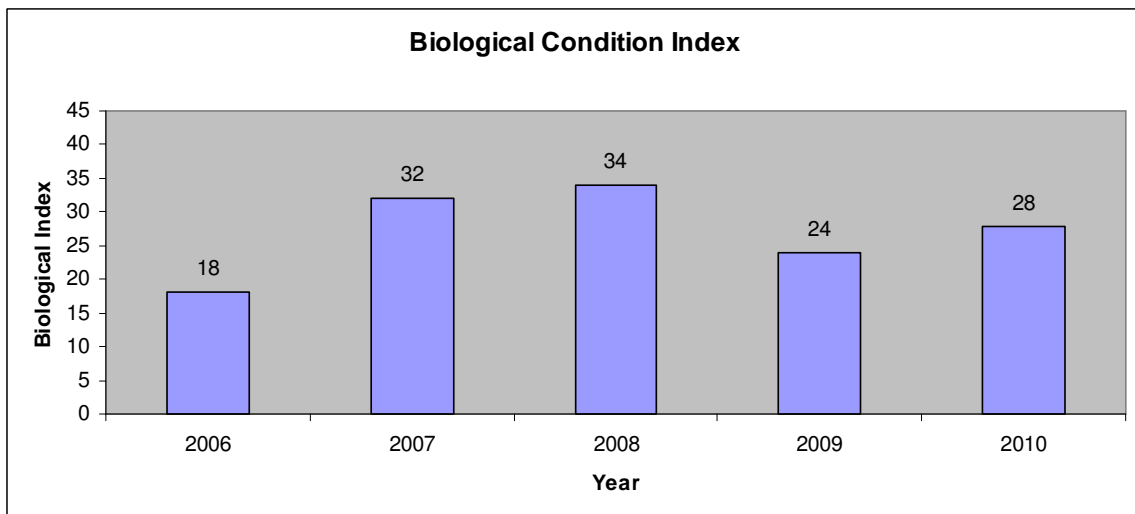
Temperature, aluminum, and iron levels all exceeded water quality standards at the time of sampling.



Biological Condition:

The macroinvertebrate community was assessed as being slightly impaired when sampled in 2010. Holden Creek received a fish IBI rating of fair with an average metric score of 3.29.

Biological Condition		
Year	Score	Rating
2006	18	Moderately Impaired
2007	32	Nonimpaired
2008	34	Nonimpaired
2009	24	Slightly Impaired
2010	28	Slightly Impaired



Little Snake Creek at Brackney, PA (SNAK 7.6)

Group 1

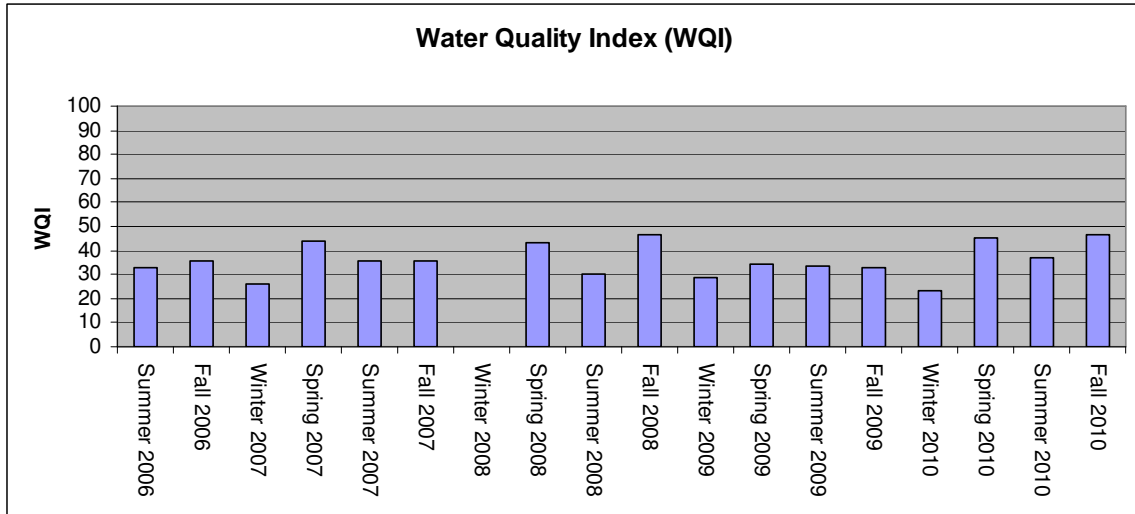


Habitat Condition:

Scoring 164 of a possible 220, available physical habitat received a rating of excellent at LSNK 7.6. Due mainly to the significant amount of surrounding forest land, Little Snake Creek had the highest habitat score of all Group 1 and 2 Pennsylvania-New York border streams assessed during the 2010 sampling year.

Water Quality:

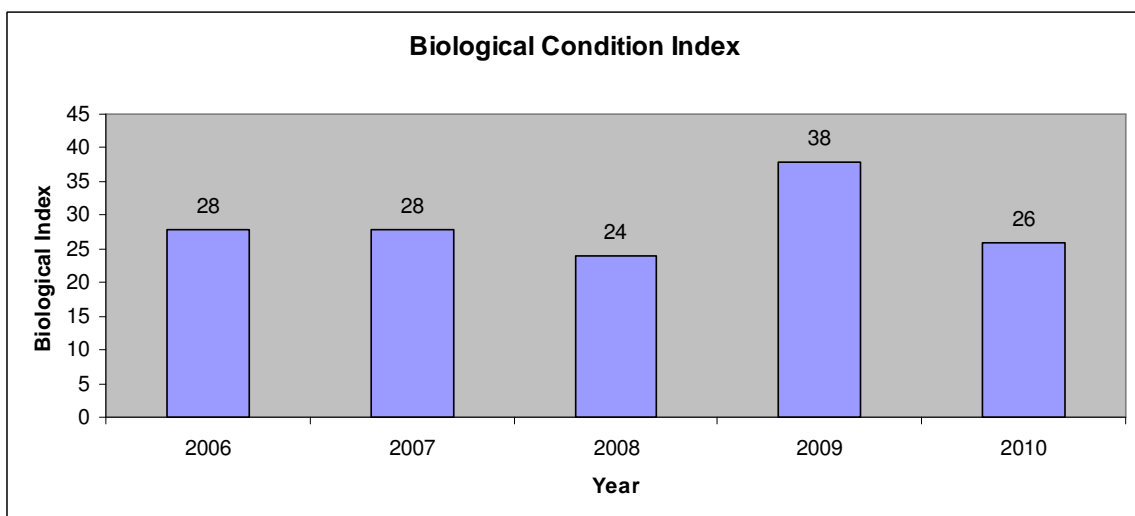
Total iron concentration exceeded water quality standards when sampled during the summer quarter of 2010.



Biological Condition:

The macroinvertebrate community was rated as slightly impaired when sampled in 2010.

Biological Condition		
Year	Score	Rating
2006	28	Slightly Impaired
2007	28	Slightly Impaired
2008	24	Slightly Impaired
2009	38	Nonimpaired
2010	26	Slightly Impaired



North Fork Cowanesque River at North Fork, PA (NFCR 7.6)

Group 2

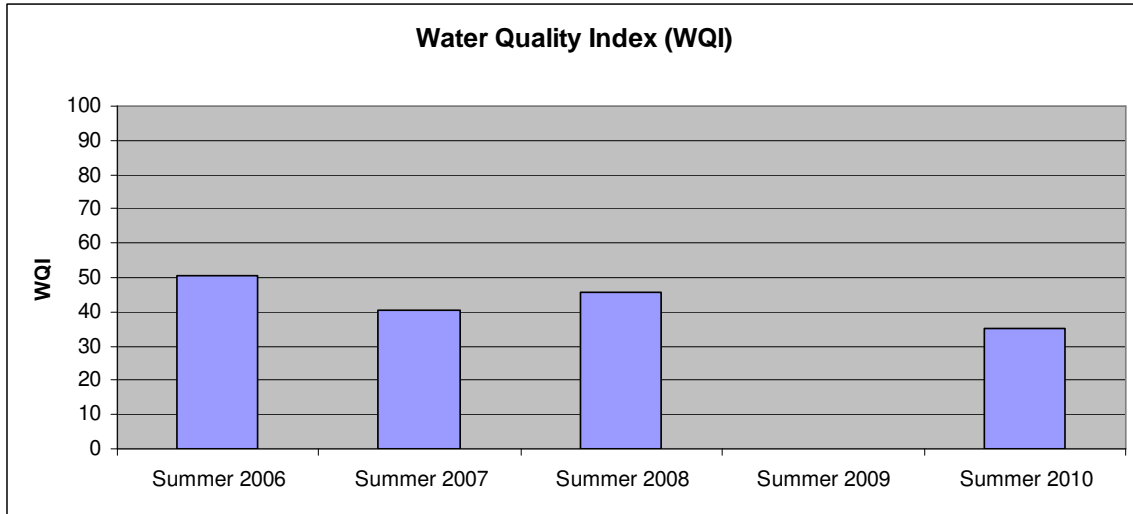


Habitat Condition:

Available physical habitat was rated excellent in 2010. NFCR 7.6 scored 147 of a possible 220 points. SRBC staff noted well-protected and stable banks but marginal channel flow status with significant amounts of exposed cobble.

Water Quality:

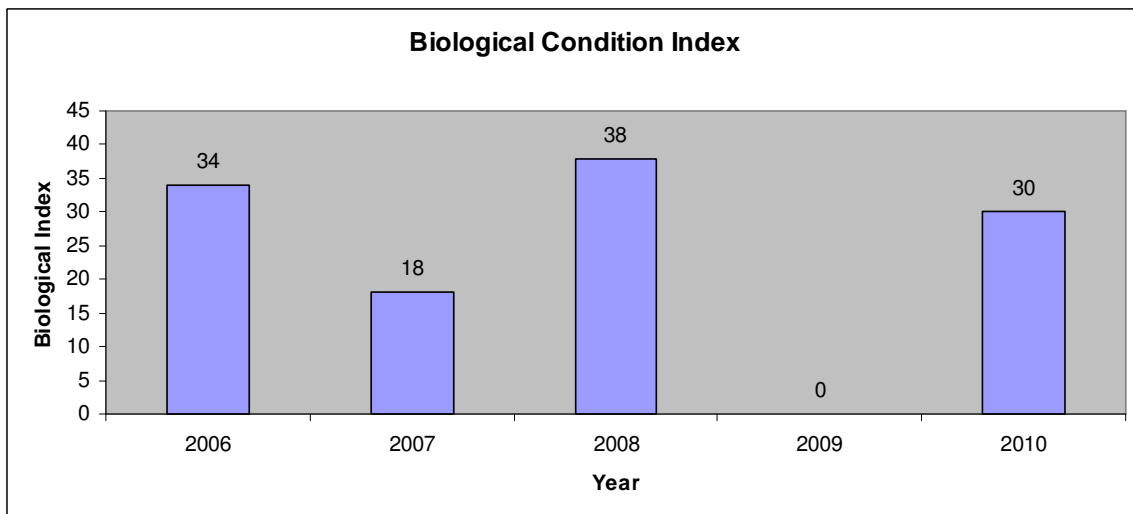
All measured water quality parameters were within acceptable limits when tested in 2010.



Biological Condition:

North Fork Cowanesque River’s macroinvertebrate community received a nonimpaired classification in 2010. The fish community received an IBI rating of fair with an average metric score of 3.29.

Biological Condition		
Year	Score	Rating
2006	34	Nonimpaired
2007	18	Moderately Impaired
2008	38	Nonimpaired
2009	NA	NA
2010	30	Nonimpaired



Seely Creek at Seely Creek, NY (SEEL 10.3)

Group 1

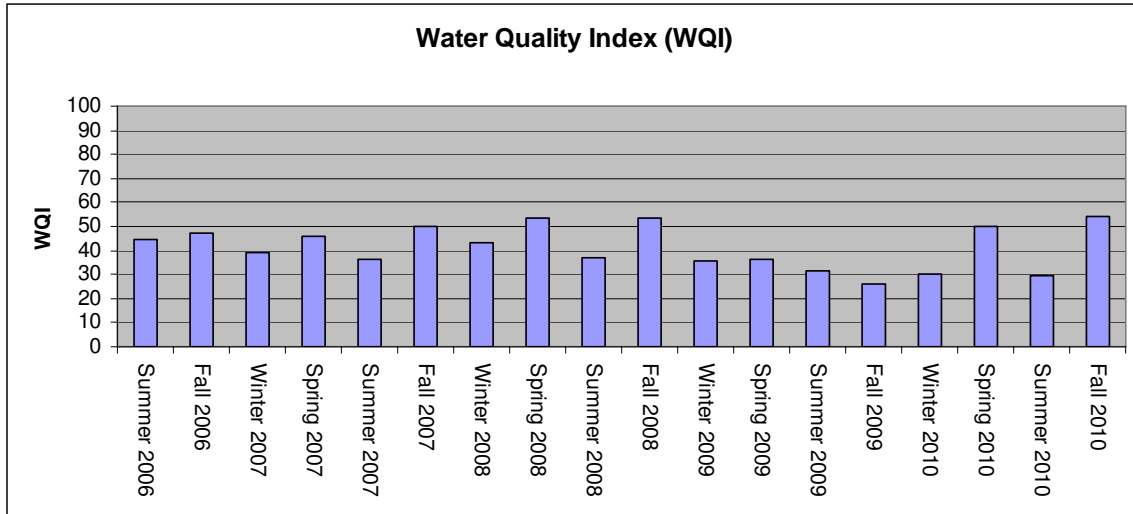


Habitat Condition:

Scoring 103 of a possible 220, Seely Creek's available physical habitat was rated as supporting in 2010. Staff noted significant channel alteration and poor channel flow status.

Water Quality:

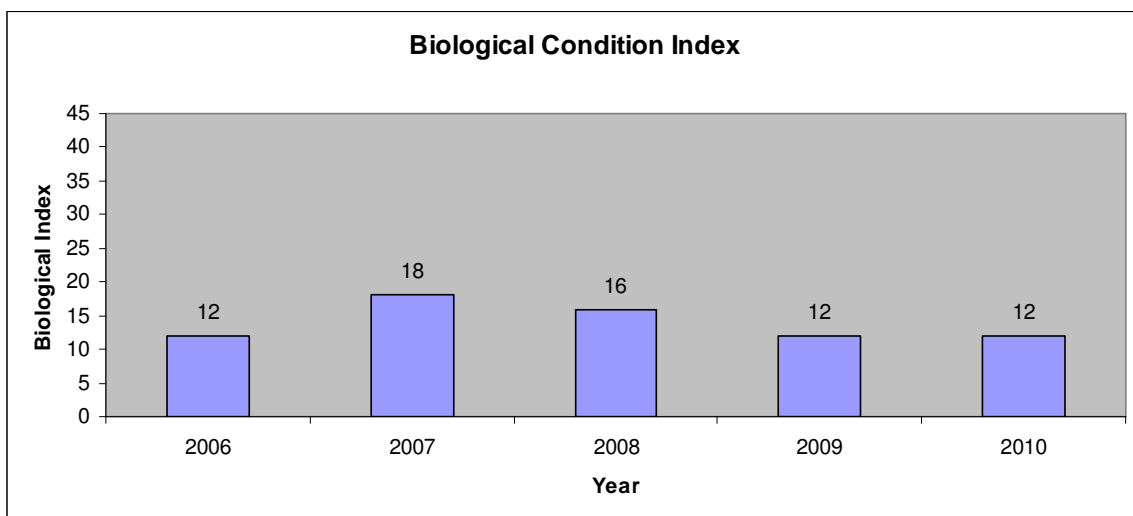
All measured water quality parameters were within acceptable limits when tested in 2010.



Biological Condition:

For the fifth consecutive year, the macroinvertebrate community of Seely Creek was classified as moderately impaired.

Biological Condition		
Year	Score	Rating
2006	12	Moderately Impaired
2007	18	Moderately Impaired
2008	16	Moderately Impaired
2009	12	Moderately Impaired
2010	12	Moderately Impaired



Snake Creek at Brookdale, PA (SNAK 2.3)

Group 2

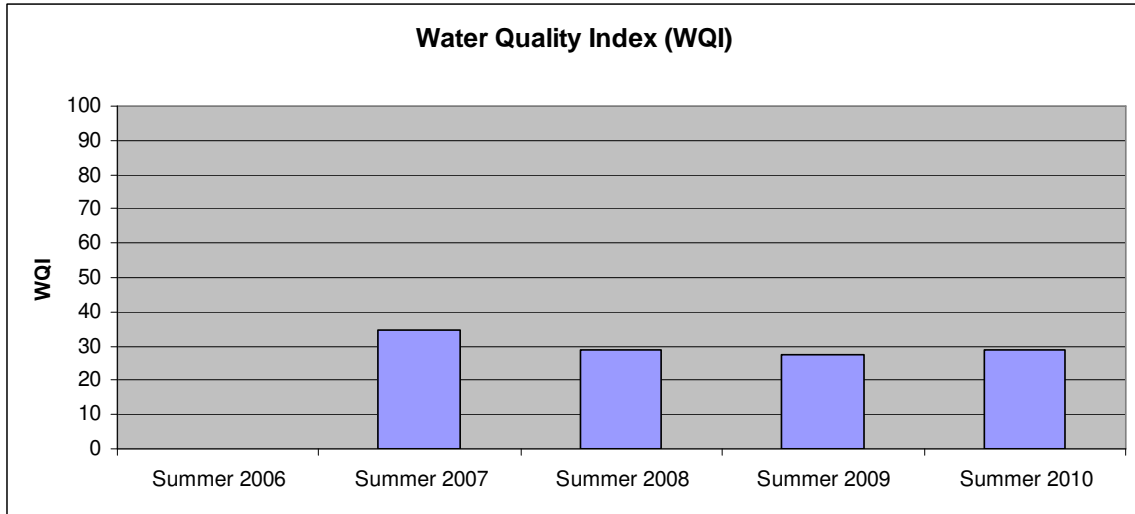


Physical Habitat:

Physical habitat at Snake Creek was rated excellent in 2010. The site scored 120 out of a possible 220. The stream was limited by poor bank conditions and a noticeably bare channel. Redeeming properties were the minimal amount sediment deposition and the lack of embeddedness of the substrate.

Water Quality:

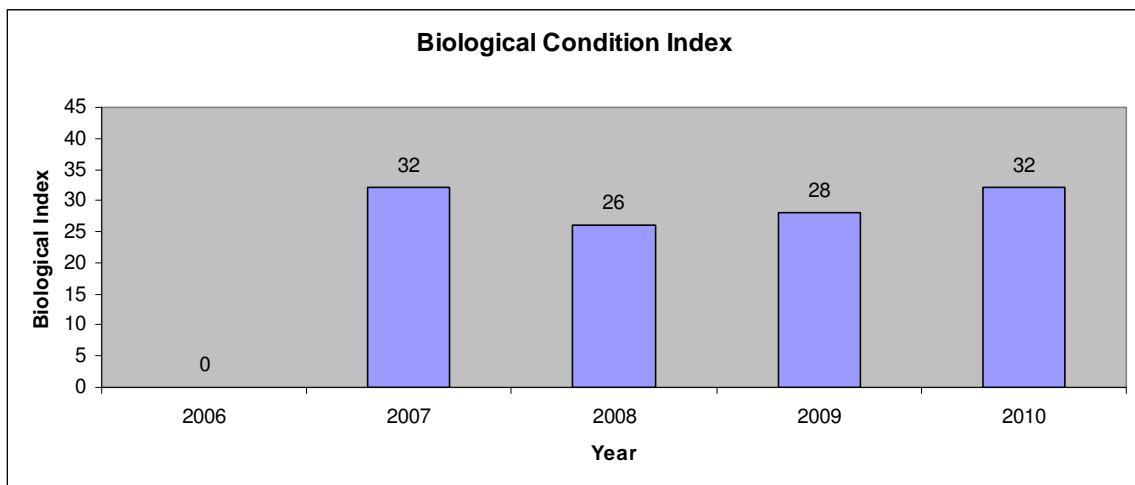
All measured water quality parameters were within acceptable limits when tested in 2010.



Biological Condition:

The macroinvertebrate community of Snake Creek was rated as nonimpaired based on 2010 sampling data.

Biological Condition		
Year	Score	Rating
2006	NA	NA
2007	32	Nonimpaired
2008	26	Slightly Impaired
2009	28	Slightly Impaired
2010	32	Nonimpaired



South Creek at Fassett, PA (SOUT 7.6)

Group 2

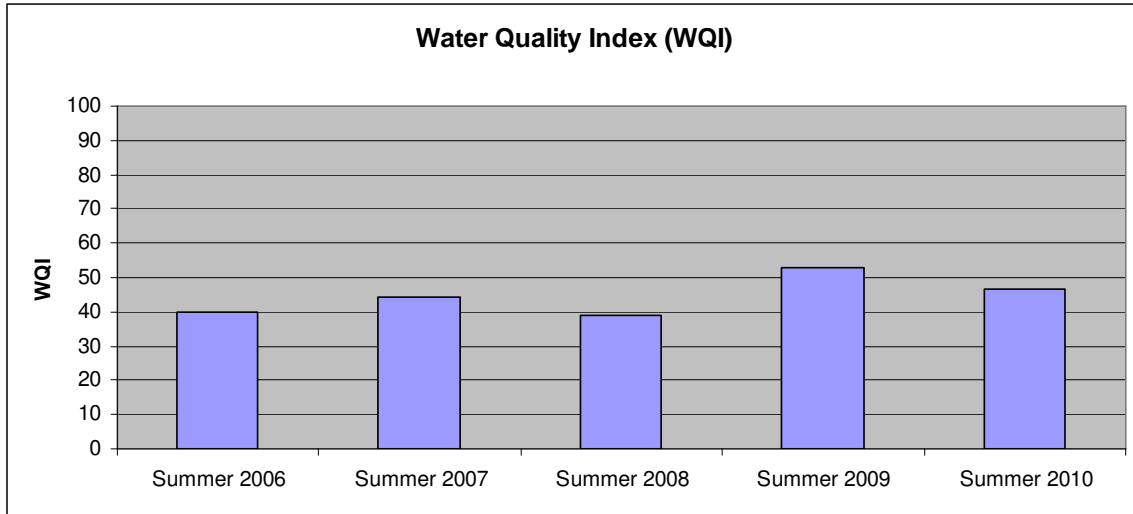


Habitat Condition:

Physical habitat was classified as excellent during 2010. South Creek scored 127 of a possible 220. Limiting habitat properties were the absence of all possible velocity/depth regimes and poor channel flow status.

Water Quality:

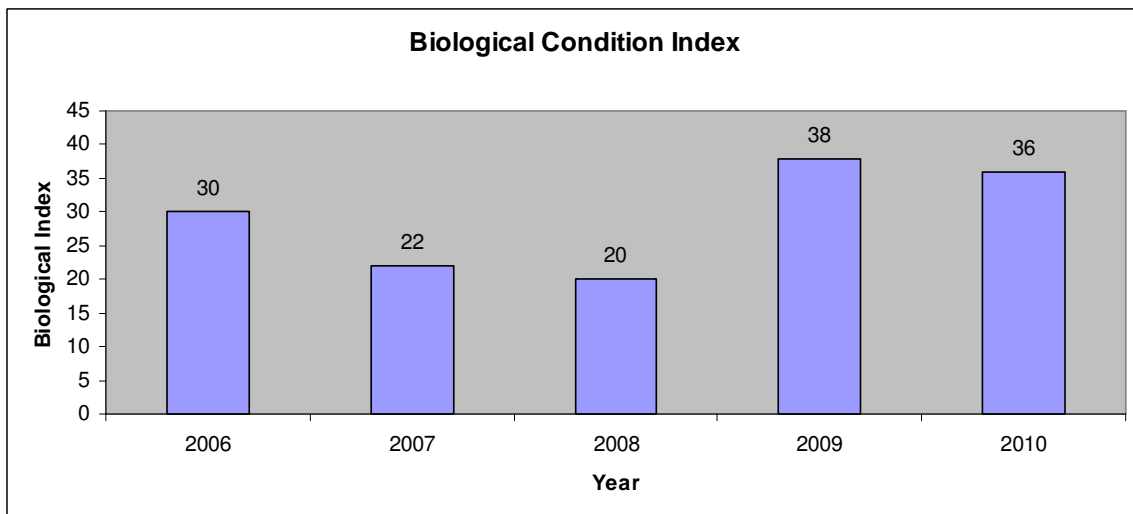
South Creek had measured levels of aluminum and iron that were outside of accepted water quality standards.



Biological Condition:

The biological condition of South Creek was rated as nonimpaired when sampled in May 2010. 2010 represents the second consecutive year a nonimpaired classification was attained.

Biological Condition		
Year	Score	Rating
2006	30	Slightly Impaired
2007	22	Slightly Impaired
2008	20	Slightly Impaired
2009	38	Nonimpaired
2010	36	Nonimpaired



Troups Creek at Austinburg, PA (TRUP 4.5)

Group 1

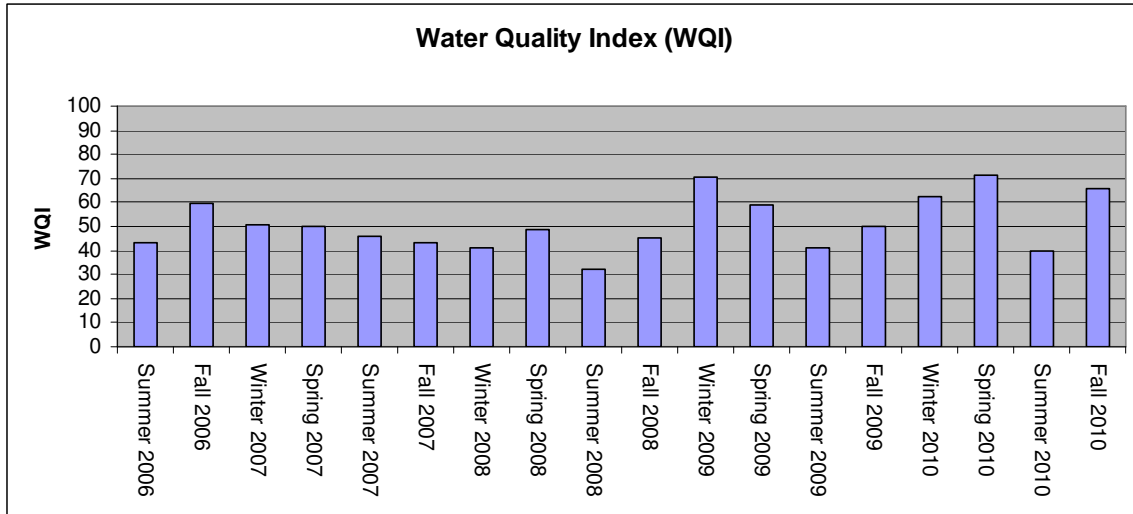


Habitat Condition:

Scoring 107 of a possible 220, physical habitat was rated as supporting in 2010. SRBC staff noted significant issues with the available habitat as evident in the site photos. The unstable and unprotected right bank scored very poorly.

Water Quality:

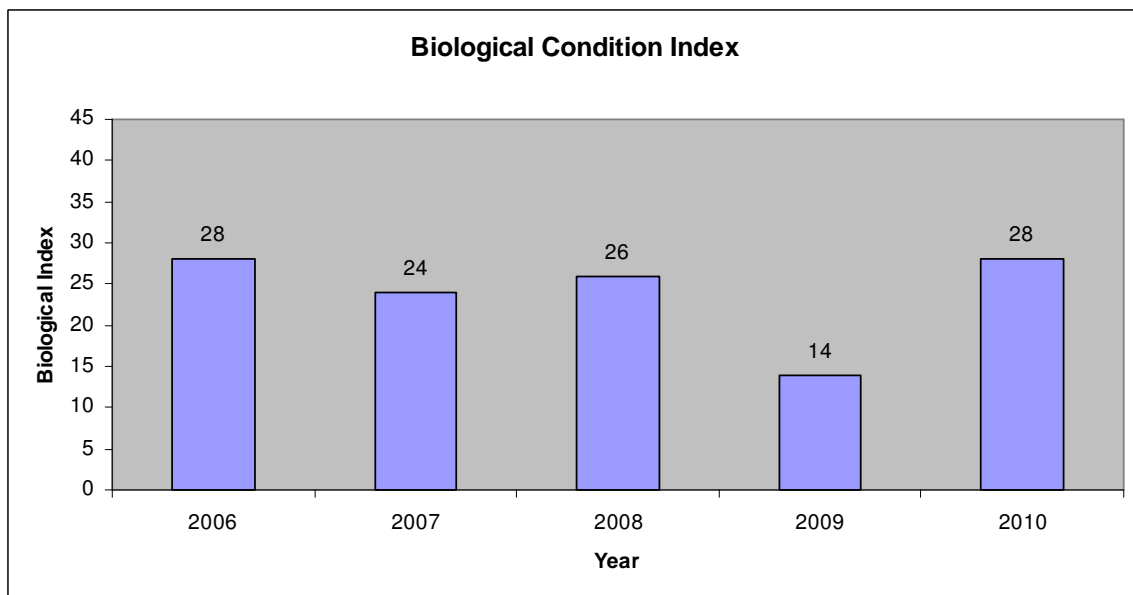
Temperature, pH, aluminum, and iron were all found to be outside of accepted water quality standards. Water quality index scores were consistently high (poor quality) across prior sampling periods.



Biological Condition:

The macroinvertebrate community was rated as slightly impaired when sampled in 2010. The classification represents an improvement from 2009 when the community was moderately impaired.

Biological Condition		
Year	Score	Rating
2006	28	Slightly Impaired
2007	24	Slightly Impaired
2008	26	Slightly Impaired
2009	14	Moderately Impaired
2010	28	Slightly Impaired



Trowbridge Creek at Great Bend, PA (TROW 1.8)

Group 2

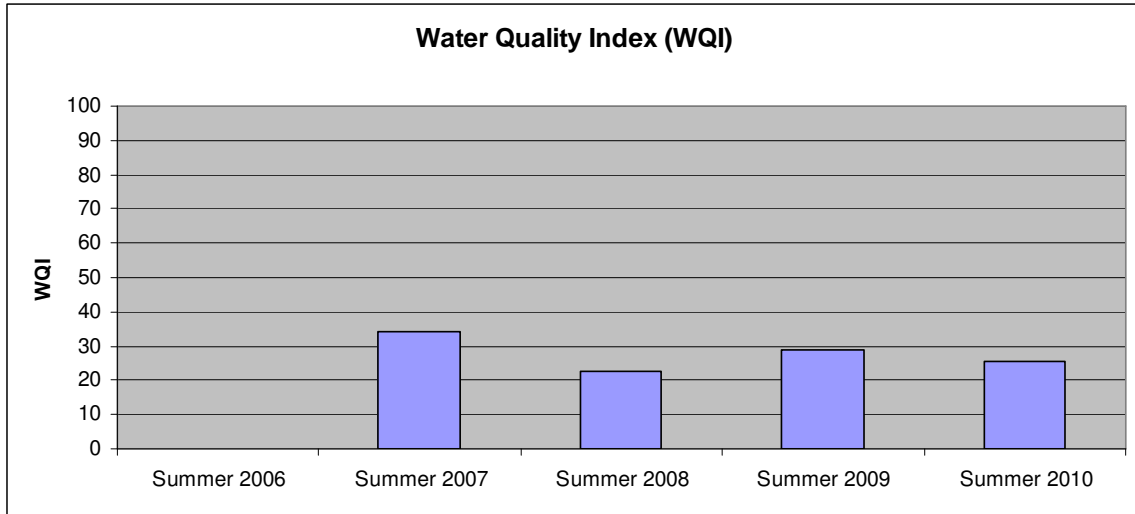


Habitat Condition:

Physical habitat was rated as partially supporting. The site scored 86 out of a possible 220. Bank conditions were very poor, with little to no vegetative protection and inadequate riparian zones.

Water Quality:

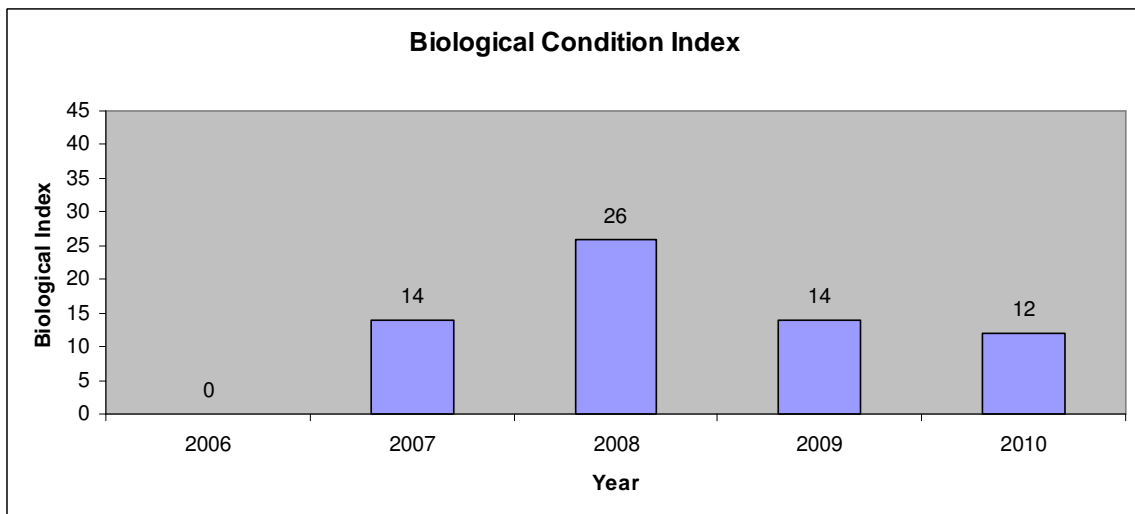
Temperature exceeded water quality standards.



Biological Condition:

The macroinvertebrate community at Trowbridge Creek was rated as moderately impaired for the third time in the past four years. The sample score of 12 represents one of the two lowest biological condition scores obtained by all Pennsylvania-New York Group 1 and 2 streams. Seely Creek (SEEL 10.3) also received a score of 12 in 2010. The fish community was rated as poor, with an average metric score of 2.71.

Biological Condition		
Year	Score	Rating
2006	NA	NA
2007	14	Moderately Impaired
2008	26	Slightly Impaired
2009	14	Moderately Impaired
2010	12	Moderately Impaired



Wappasening Creek at Nichols, NY (WAPP 2.6)

Group 2

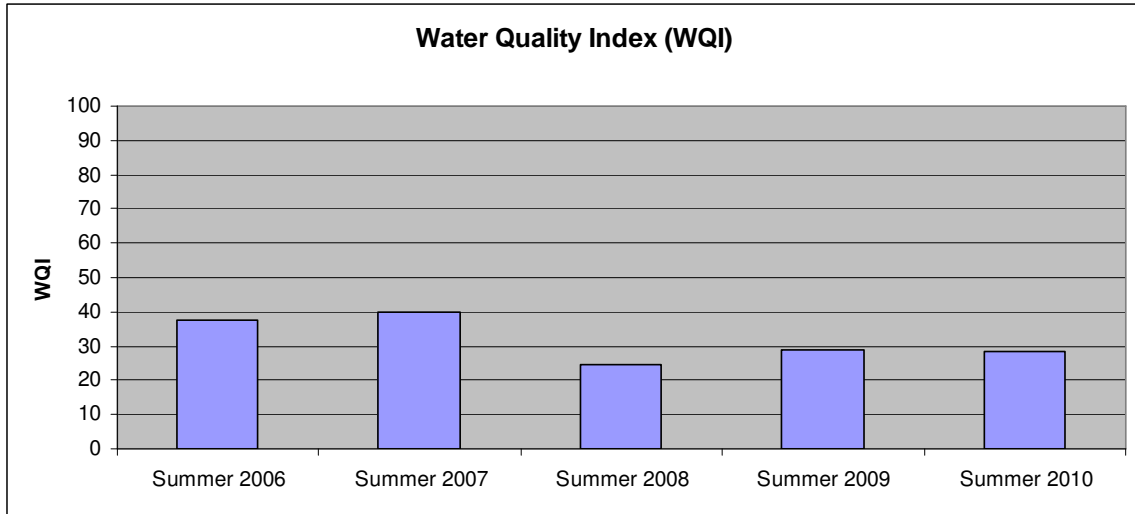


Habitat Condition:

Scoring 122 of a possible 220, physical habitat was rated as excellent at Wappasening Creek. Positive attributes were stable, well-vegetated banks, minimal sediment deposition, and an unaltered channel. Staff did note a lack of instream cover and considerable alga growth along the stream edges.

Water Quality:

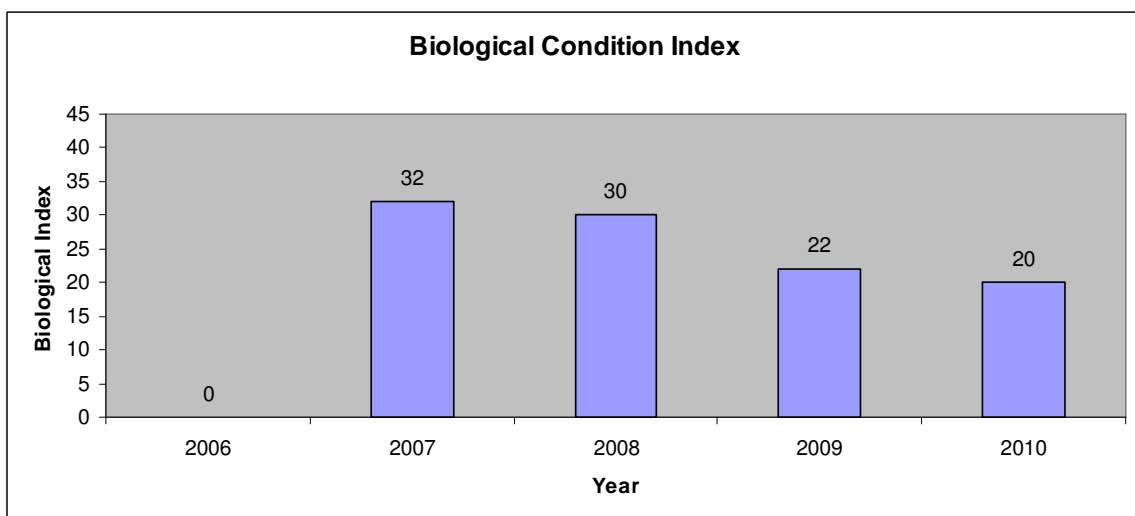
Temperature was the only measured parameter, which fell outside of water quality standards.



Biological Condition:

The biological community was rated as slightly impaired for the fourth consecutive year.

Biological Condition		
Year	Score	Rating
2006	NA	NA
2007	32	Slightly Impaired
2008	30	Slightly Impaired
2009	22	Slightly Impaired
2010	20	Slightly Impaired



Site Results for Pennsylvania-Maryland Border Sites

Big Branch Deer Creek at Fawn Grove, PA (BBDC 4.1)

Group 2

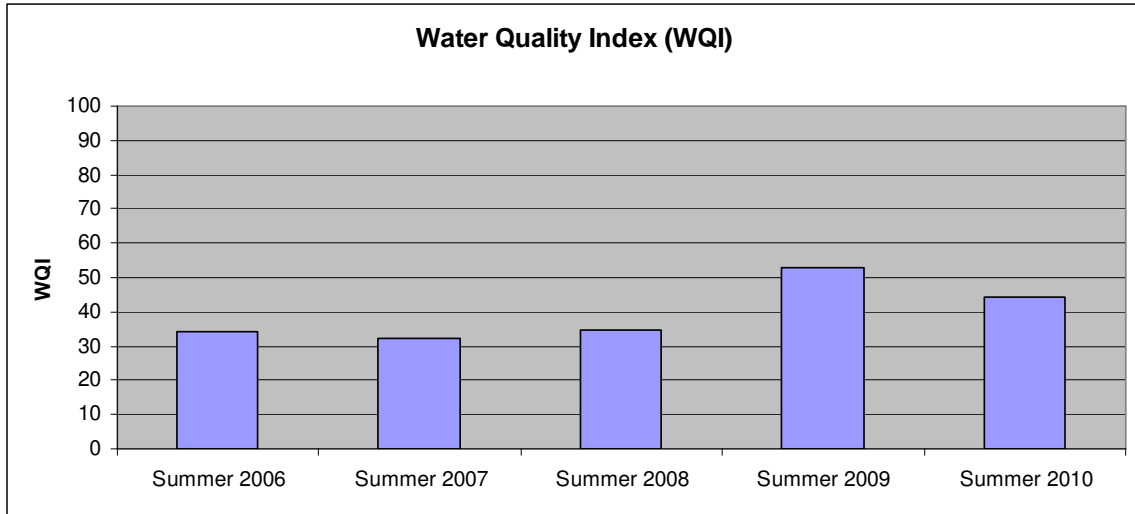


Habitat Condition:

Physical habitat was rated as excellent at the station in 2010. Scoring 149 out of a possible 220, Big Branch Deer Creek possessed stable, densely vegetated banks and had a minimally disturbed channel. Staff did note increased sediment deposition relative to previous observations.

Water Quality:

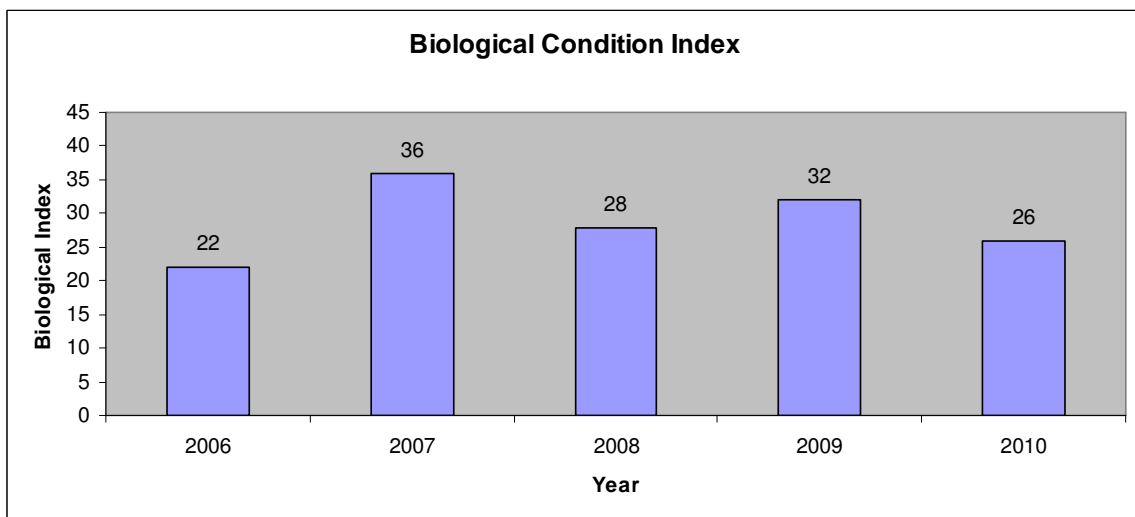
Measured alkalinity was below than the accepted threshold of 20 mg/L.



Biological Condition:

The biological community at Big Branch Deer Creek was rated as slightly impaired in 2010.

Biological Condition		
Year	Score	Rating
2006	22	Slightly Impaired
2007	36	Nonimpaired
2008	28	Slightly Impaired
2009	32	Nonimpaired
2010	26	Slightly Impaired



Conowingo Creek at Pleasant Grove, PA (CNWG 4.4)

Group 1

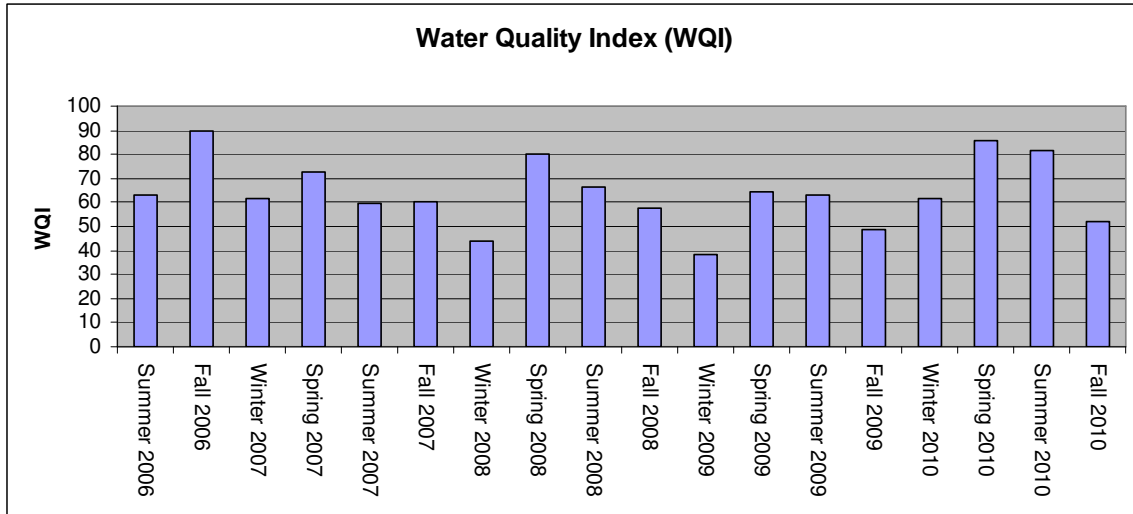


Habitat Condition:

Scoring 155 out of a possible 220, habitat was classified as excellent in 2010. Conowingo Creek was limited by marginal bank conditions but possessed good velocity/depth regimes and ample instream cover.

Water Quality:

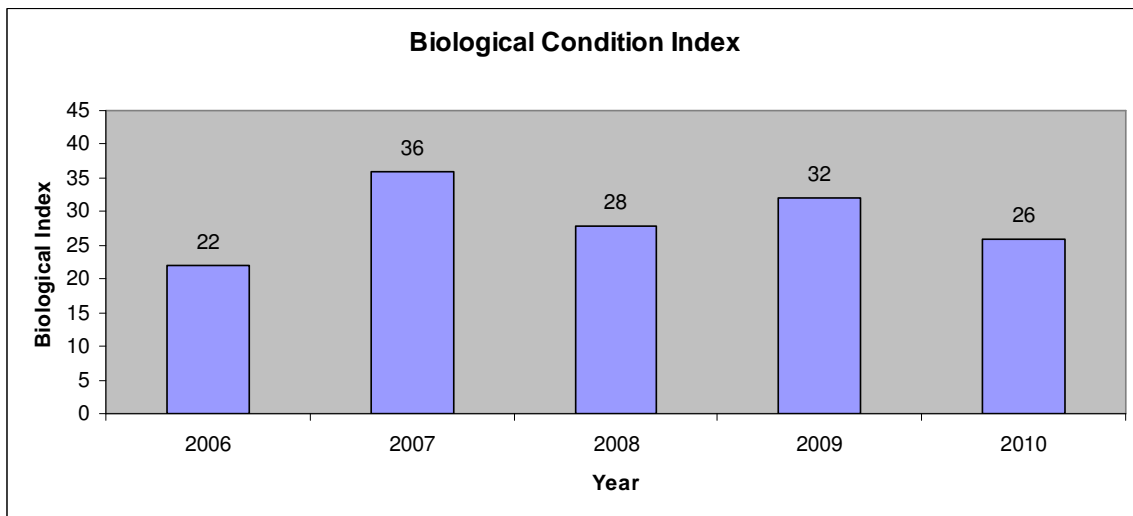
Nitrate plus nitrite was above acceptable limits during all four sampling events in 2010.



Biological Condition:

The macroinvertebrate community was classified as slightly impaired in 2010.

Biological Condition		
Year	Score	Rating
2006	22	Slightly Impaired
2007	36	Nonimpaired
2008	28	Slightly Impaired
2009	32	Nonimpaired
2010	26	Slightly Impaired



Deer Creek at Gorsuch Mills, PA (DEER 44.2)

Group 1

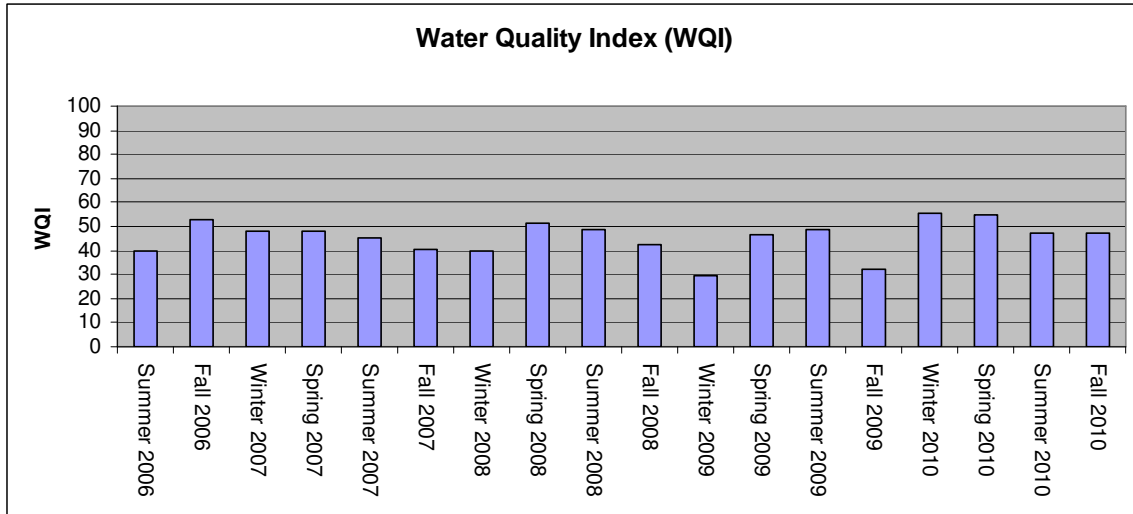


Habitat Condition:

Deer Creek possessed excellent habitat conditions, scoring 165 of a possible 220. The site scored well across most categories with high scores for velocity/depth regimes and instream cover. Erosion of the left bank was noted as potentially problematic.

Water Quality:

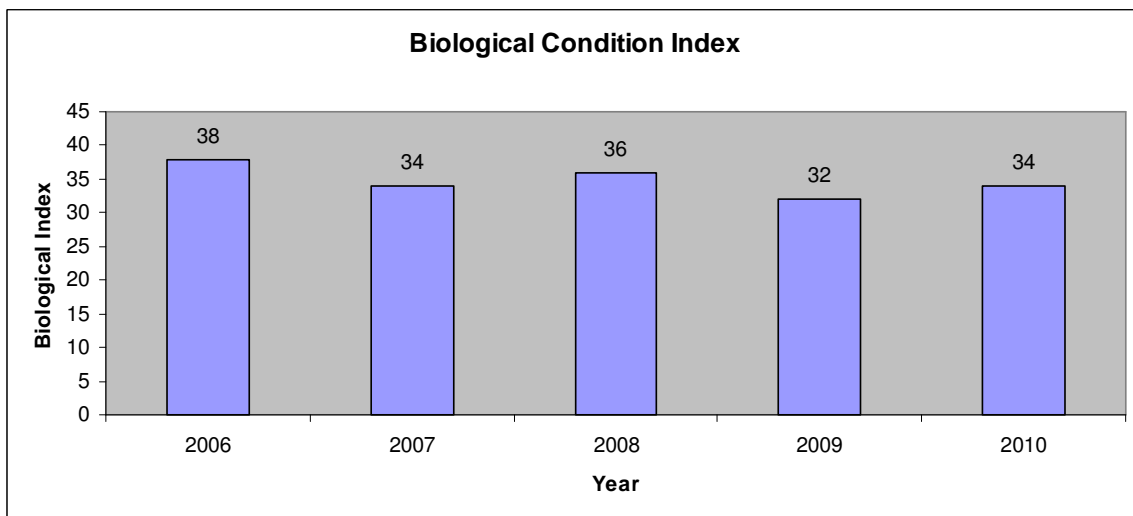
All measured water quality parameters were within acceptable limits when tested in 2010.



Biological Condition:

Deer Creek was chosen as the reference stream to which all other Pennsylvania-Maryland Group 1 and 2 streams were compared. The macroinvertebrate community was designated as nonimpaired for the fifth consecutive year. Deer Creek has consistently been one of the best interstate streams sampled by SRBC.

Biological Condition		
Year	Score	Rating
2006	38	Nonimpaired
2007	34	Nonimpaired
2008	36	Nonimpaired
2009	32	Nonimpaired
2010	34	Nonimpaired



Ebaughs Creek at Stewartstown, PA (EBAU 1.5)

Group 1

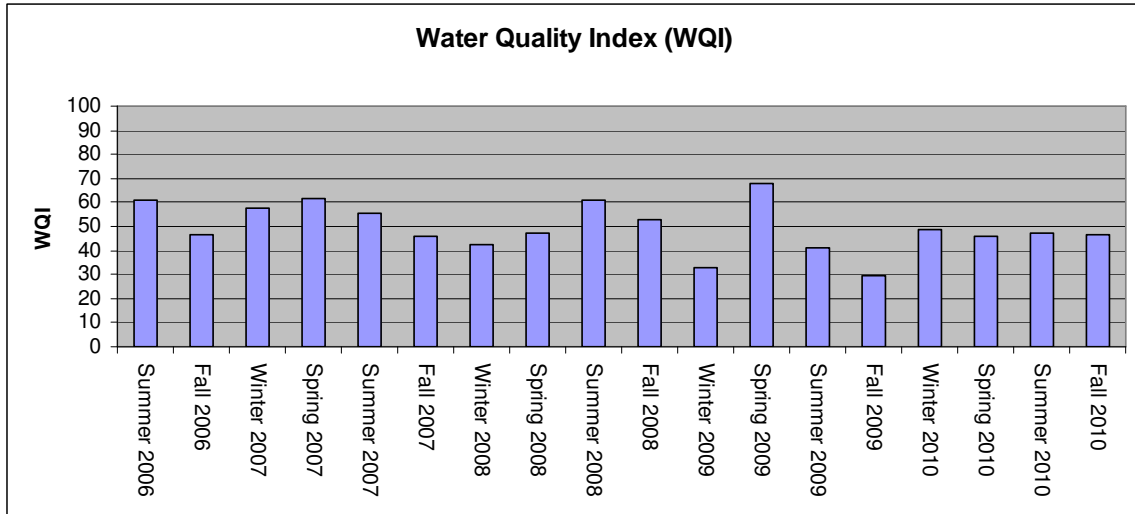


Habitat Condition:

Available physical habitat was deemed excellent at the sampling site. Ebaughs Creek possessed the highest habitat score of all Pennsylvania-Maryland border interstate streams in 2010.

Water Quality:

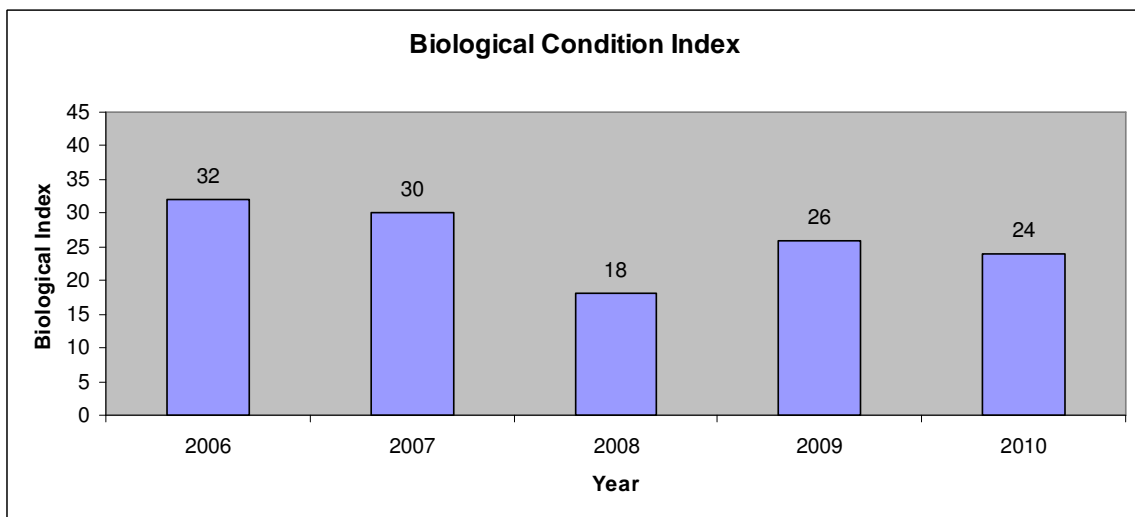
All measured water quality parameters were within acceptable limits when tested in 2010.



Biological Condition:

The biological community of Ebaughs Creek was rated as being slightly impaired for the second consecutive year.

Biological Condition		
Year	Score	Rating
2006	32	Nonimpaired
2007	30	Nonimpaired
2008	18	Moderately Impaired
2009	26	Slightly Impaired
2010	24	Slightly Impaired



Falling Branch Deer Creek at Fawn Grove, PA (FBDC 4.1)

Group 2

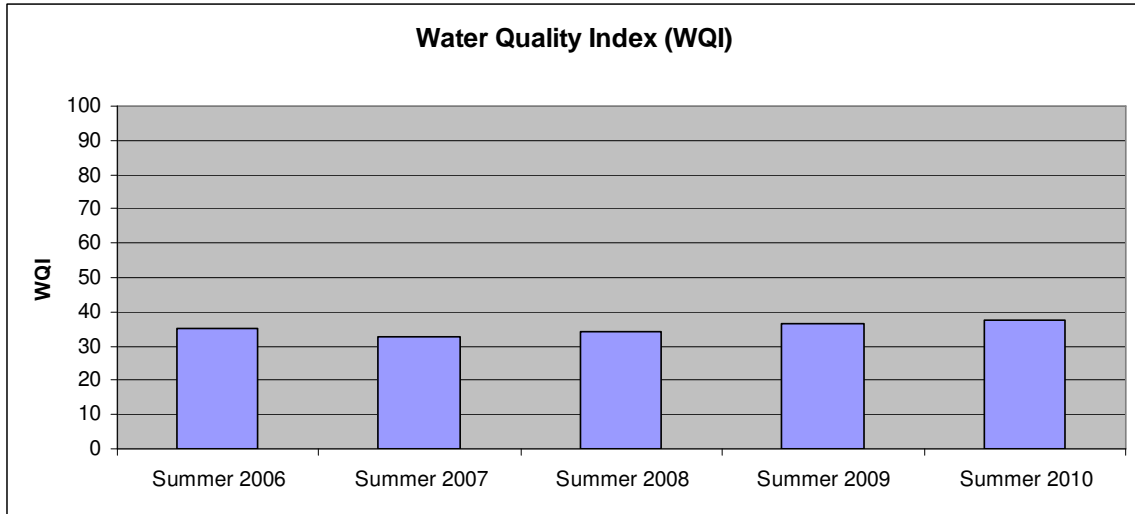


Habitat Condition:

Scoring 165 of a possible 220, available physical habitat was classified as excellent in 2010. Sediment accumulation was one parameter SRBC staff noted as being potentially problematic at the time of assessment.

Water Quality:

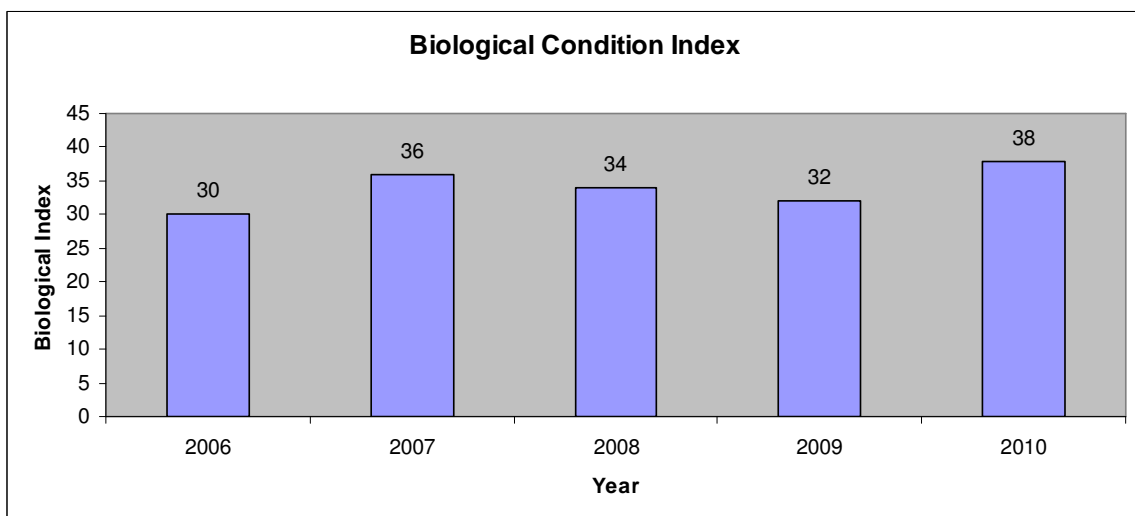
All measured water quality parameters were within acceptable limits when tested in 2010.



Biological Condition:

Falling Branch Deer Creek received a biological condition classification of nonimpaired for the fourth consecutive year in 2010.

Biological Condition		
Year	Score	Rating
2006	30	Slightly Impaired
2007	36	Nonimpaired
2008	34	Nonimpaired
2009	32	Nonimpaired
2010	38	Nonimpaired



Long Arm Creek at Bandanna, PA (LNGA 2.5)

Group 1

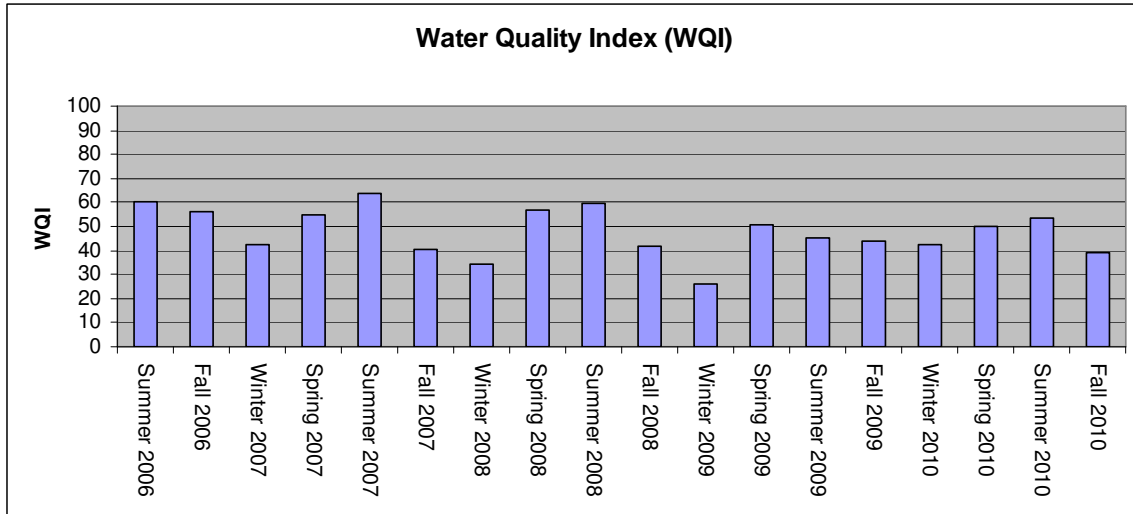


Habitat Condition:

Receiving a score of 138 out of a possible 220, Long Arm Creek's physical habitat was classified as supporting.

Water Quality:

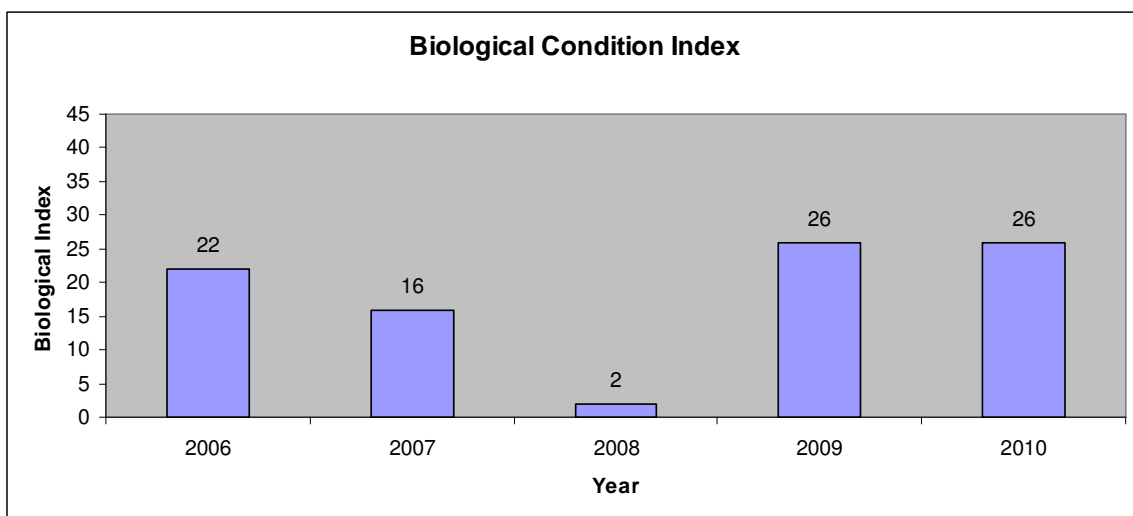
All measured water quality parameters were within acceptable limits when tested in 2010.



Biological Condition:

Long Arm Creek’s biological community was rated as slightly impaired in 2010. The fish community was rated as good with an average metric score of 3.25.

Biological Condition		
Year	Score	Rating
2006	22	Slightly Impaired
2007	16	Moderately Impaired
2008	2	Severely Impaired
2009	26	Slightly Impaired
2010	26	Slightly Impaired



Octoraro Creek at Rising Sun, MD (OCTO 6.6)

Group 1

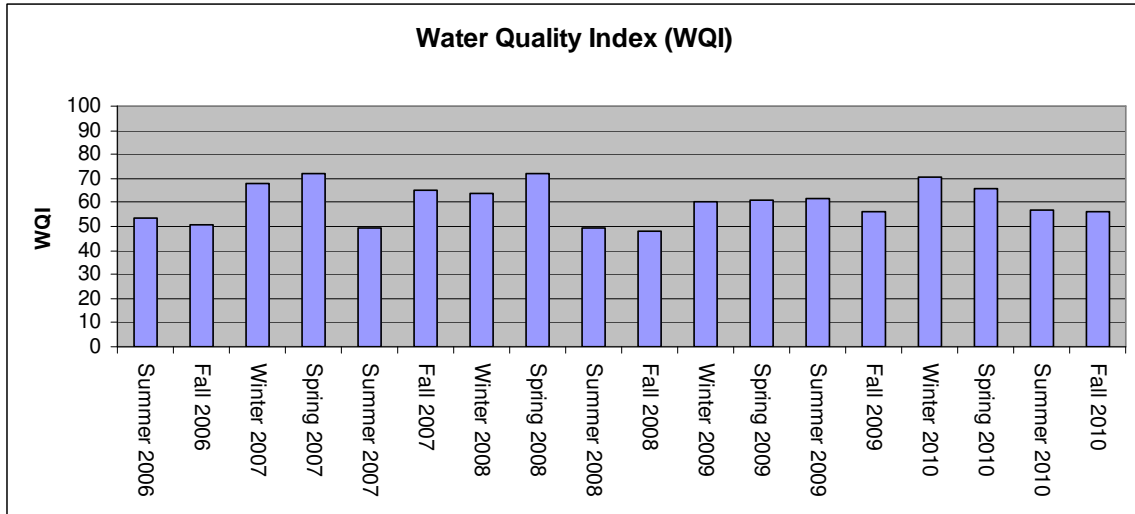


Habitat Condition:

Physical habitat at Octoraro Creek was rated as excellent, scoring 171 out of a possible 220. Optimal velocity/depth regimes, riffle frequency, and epifaunal substrate conditions were noted.

Water Quality:

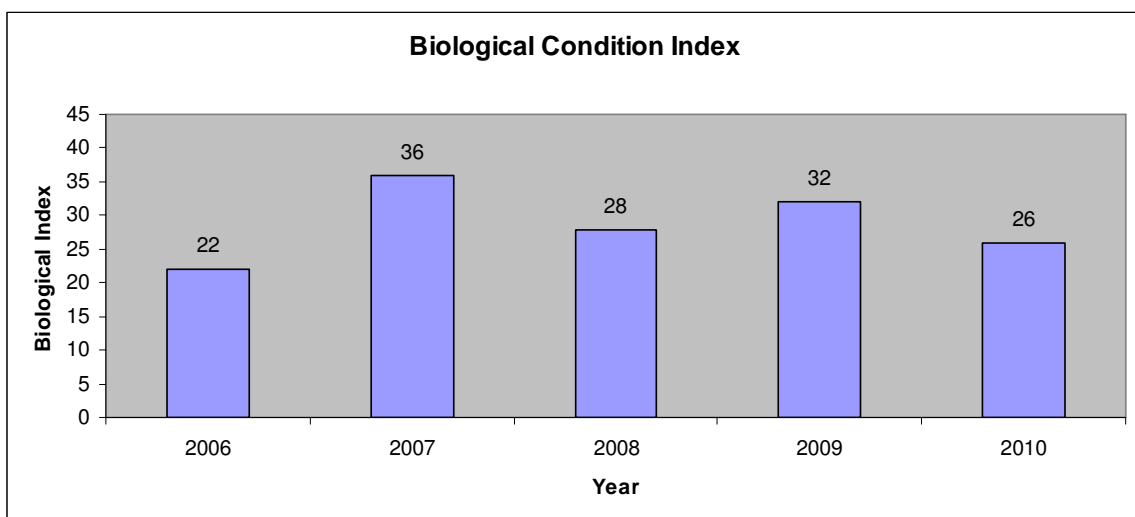
Temperature was the only water quality parameter to exceed accepted thresholds though nitrate plus nitrite levels remained elevated throughout the sampling year.



Biological Condition:

The macroinvertebrate community at Octoraro Creek was classified as slightly impaired in 2010.

Biological Condition		
Year	Score	Rating
2006	22	Slightly Impaired
2007	36	Nonimpaired
2008	28	Slightly Impaired
2009	32	Nonimpaired
2010	26	Slightly Impaired



South Branch Conewago Creek at Bandanna, PA (SBCC 20.4)

Group 2

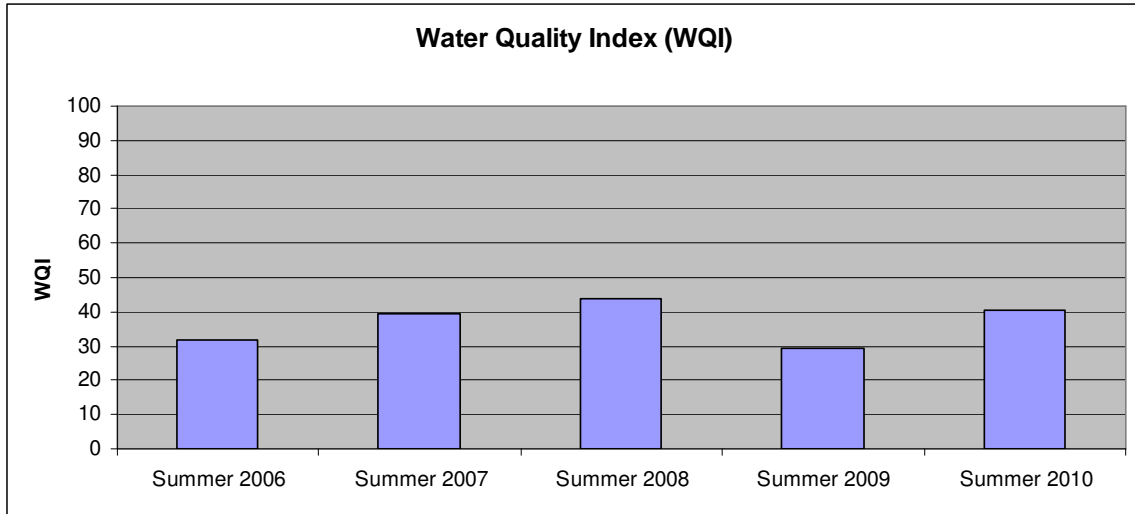


Habitat Condition:

Surrounded by primarily forested land, the South Branch Conewago Creek received a habitat rating of excellent in 2010. The site scored 173 out of a possible 220. Optimal riparian zone widths and abundant vegetation covering stable banks were noted.

Water Quality:

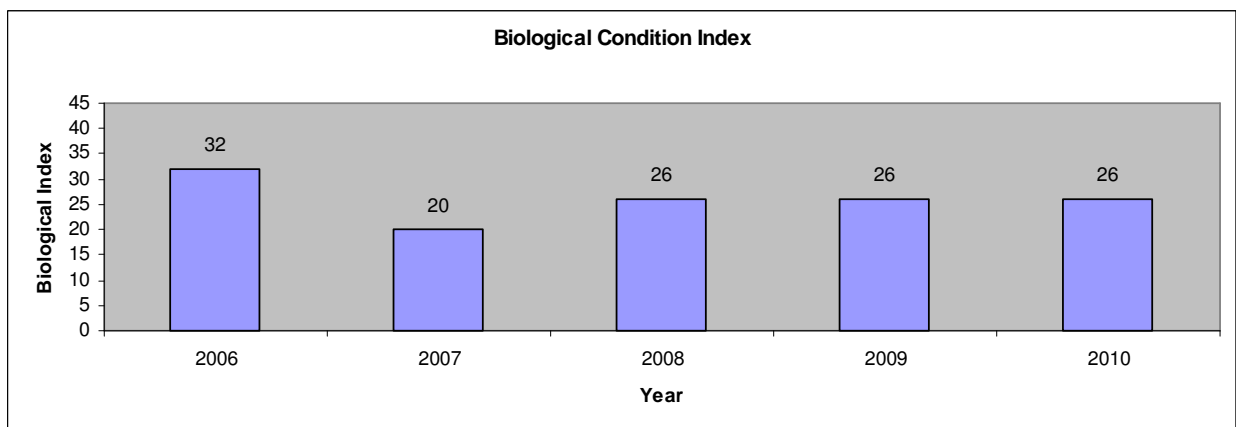
All measured water quality parameters were within acceptable limits when tested in 2010.



Biological Community:

The biological community of the South Branch of Conewago Creek was rated as slightly impaired for the fifth consecutive year.

Biological Condition		
Year	Score	Rating
2006	32	Slightly Impaired
2007	20	Slightly Impaired
2008	26	Slightly Impaired
2009	26	Slightly Impaired
2010	26	Slightly Impaired



Scott Creek at Delta, PA (SCTT 3.0)

Group 1

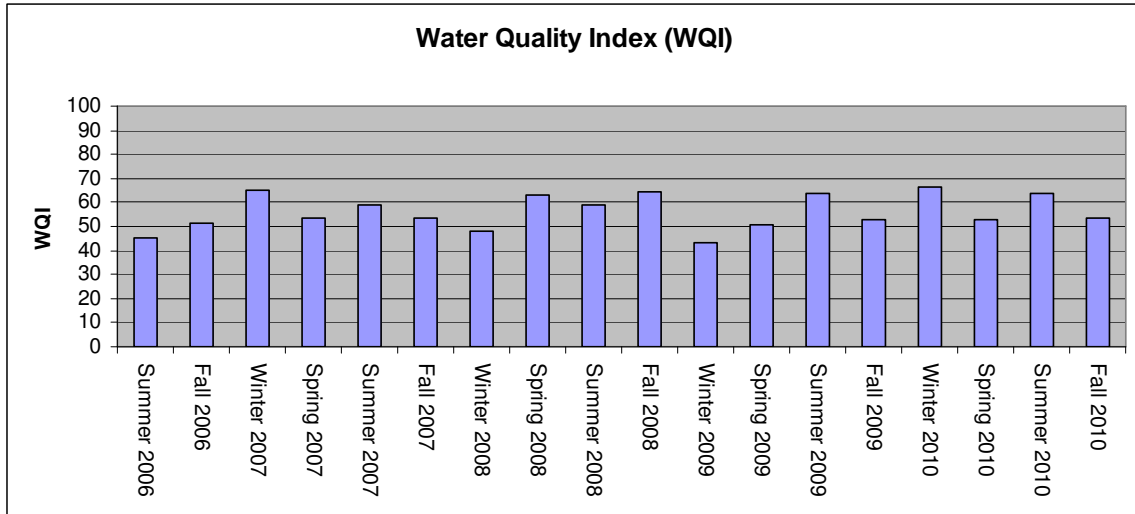


Habitat Condition:

Physical habitat at Scott Creek scored 121 out of a possible 220 and received a classification of partially supporting. Staff noted a lack of riffle habitat and overall poor bank conditions.

Water Quality:

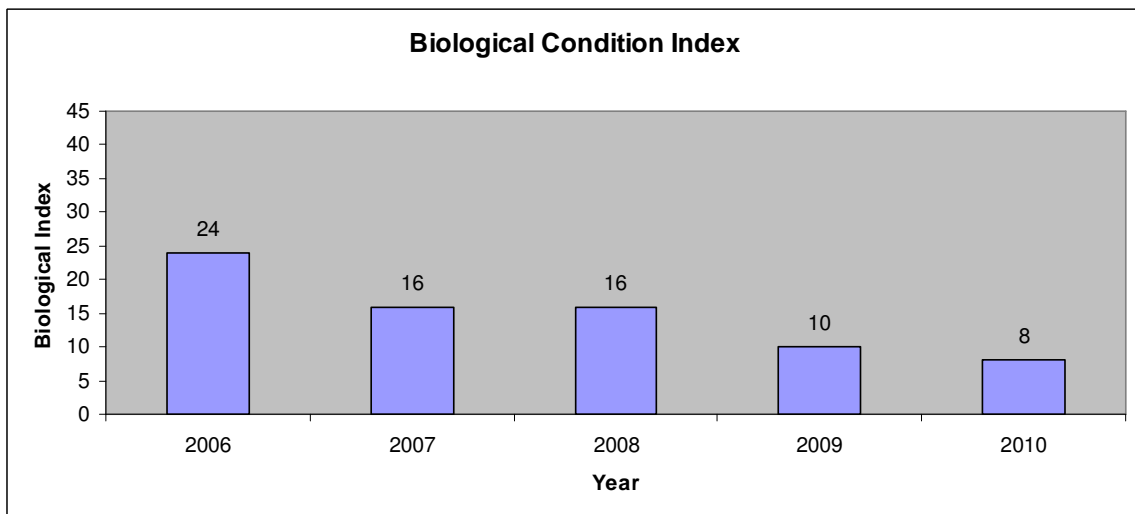
All measured water quality parameters were within acceptable limits when tested in 2010.



Biological Condition:

The macroinvertebrate community was classified as moderately impaired in 2010. Scott Creek has had a declining biological condition over the past five years. The sampled fish community was rated as poor with an average metric score of only 2.5.

Biological Condition		
Year	Score	Rating
2006	24	Slightly Impaired
2007	16	Moderately Impaired
2008	16	Moderately Impaired
2009	10	Moderately Impaired
2010	8	Moderately Impaired



Site Results for Large River Interstate Sites

Chemung River at Chemung, NY (CHEM 12.0)

Group 1

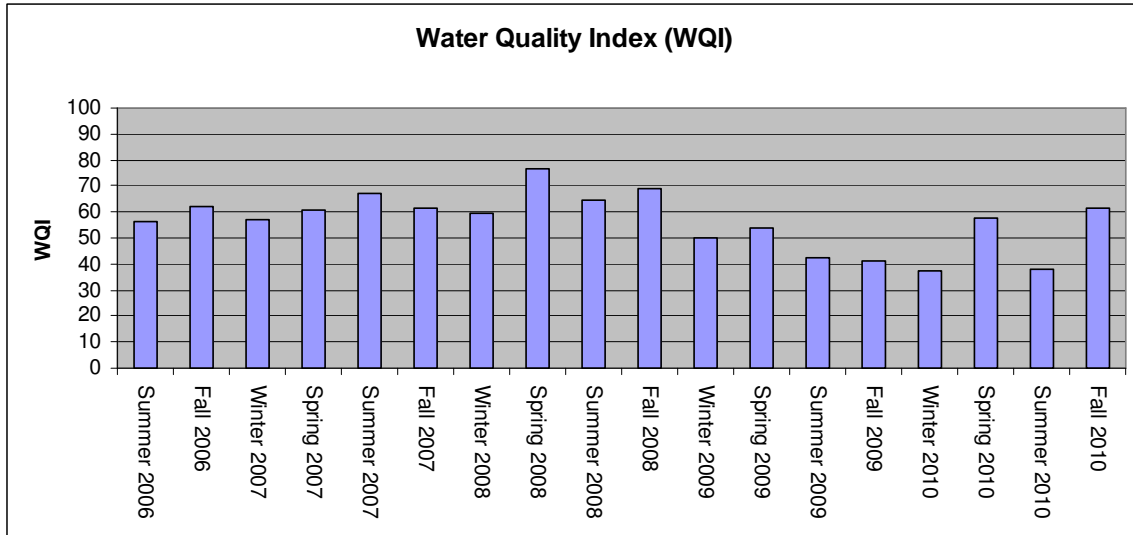


Habitat Condition:

Physical habitat was rated as excellent at CHEM 12.0. The site scored 156 out of a possible 220. Staff noted optimal channel flow status and bank conditions but was concerned about sediment deposition and a lack of pool variability.

Water Quality:

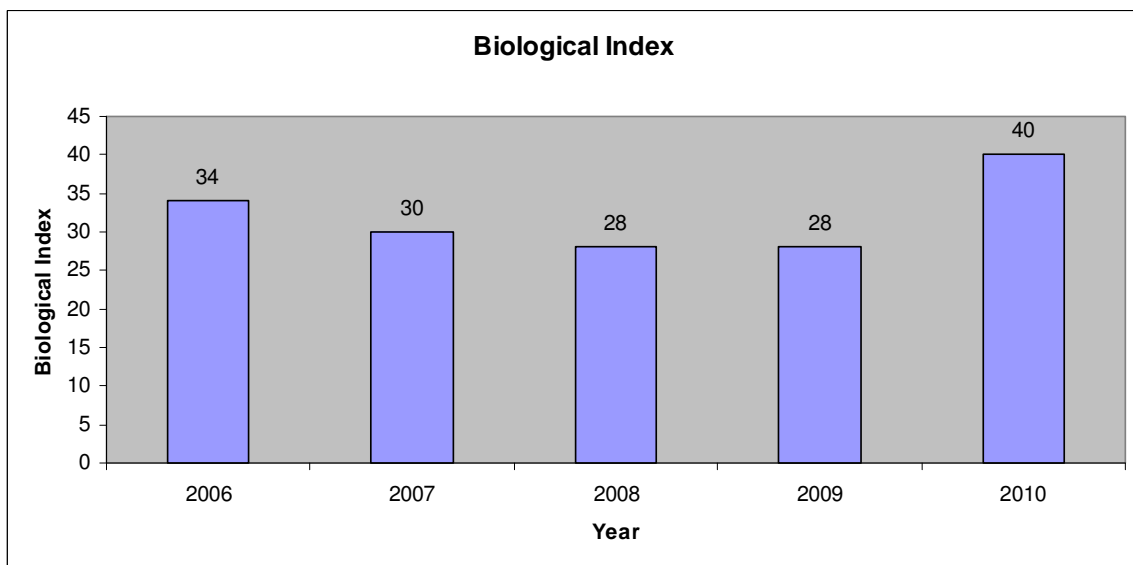
Temperature and pH measurements both fell outside of accepted water quality standards.



Biological Condition:

Classified as nonimpaired, the Chemung River received the highest biological condition score of all large river interstate sites.

Biological Condition		
Year	Score	Rating
2006	34	Nonimpaired
2007	30	Slightly Impaired
2008	28	Nonimpaired
2009	28	Slightly Impaired
2010	40	Nonimpaired



Cowanesque River at Lawrenceville, PA (COWN 1.0)

Group 1

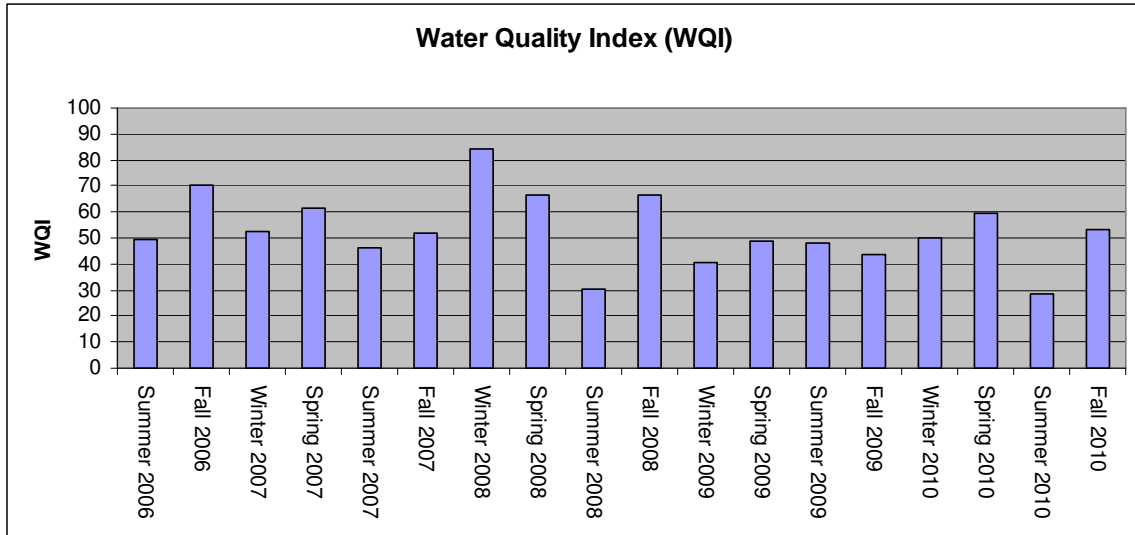


Habitat Condition:

Physical habitat was classified as supporting in 2010. The site scored 128 out of a possible 220. The assessment scored was impacted by ongoing construction activities occurring directly upstream of the sampling site.

Water Quality:

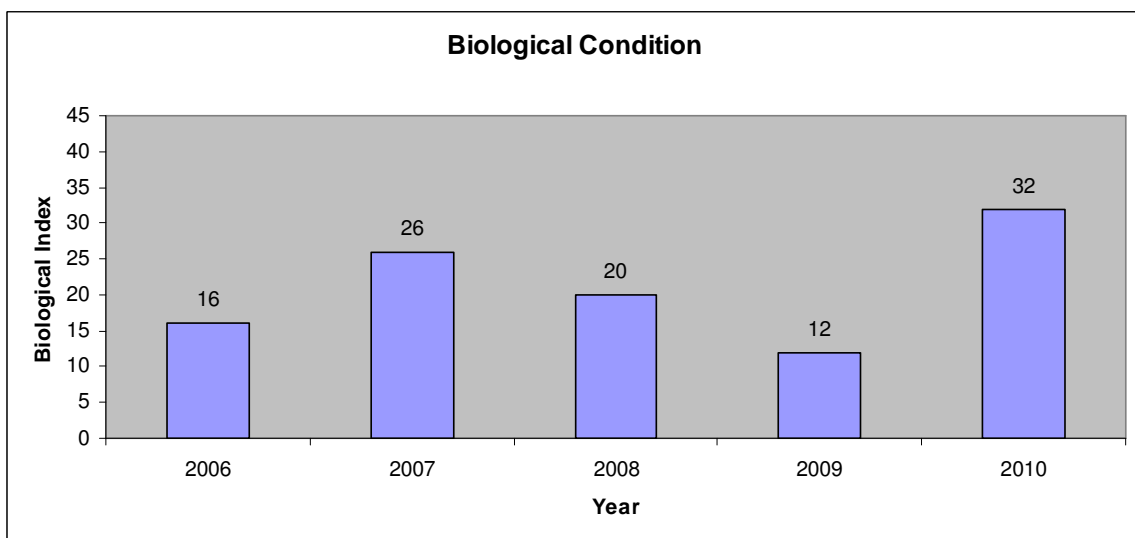
Temperature, pH, aluminum, magnesium, and iron levels were all outside of accepted water quality standards.



Biological Condition:

The biological community was classified as nonimpaired when sampled in 2010.

Biological Condition		
Year	Score	Rating
2006	16	Moderately Impaired
2007	26	Slightly Impaired
2008	20	Slightly Impaired
2009	12	Moderately Impaired
2010	32	Nonimpaired



Cowanesque River at Lawrenceville, PA (COWN2.2)

Group 1

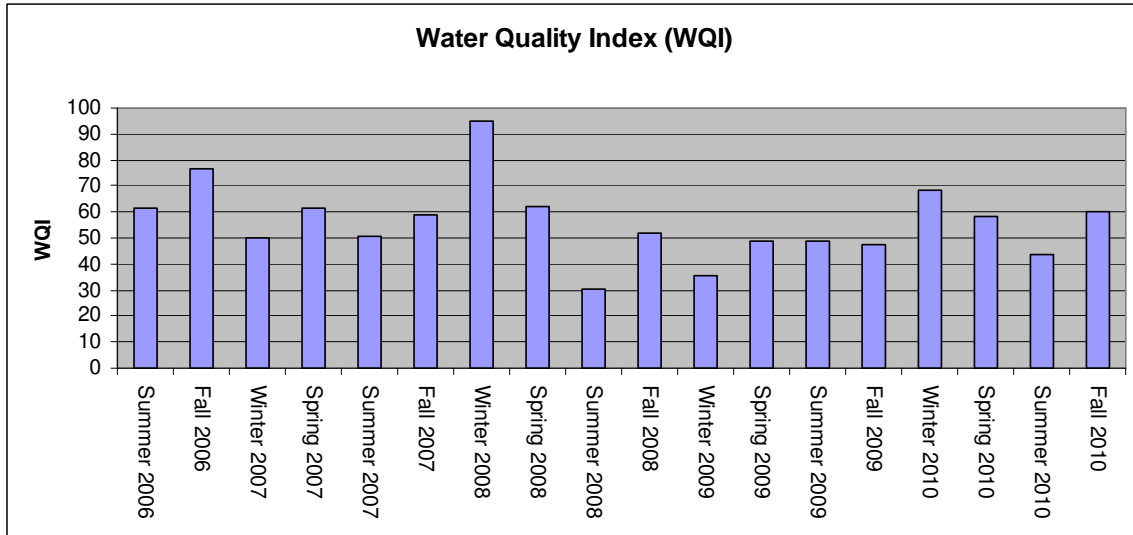


Habitat Condition:

Located directly below a major reservoir, physical habitat was designated as partially supporting. The site scored 112 out of a possible 220. Major channel alterations and an absence of instream cover significantly affected the overall habitat score and classification.

Water Quality:

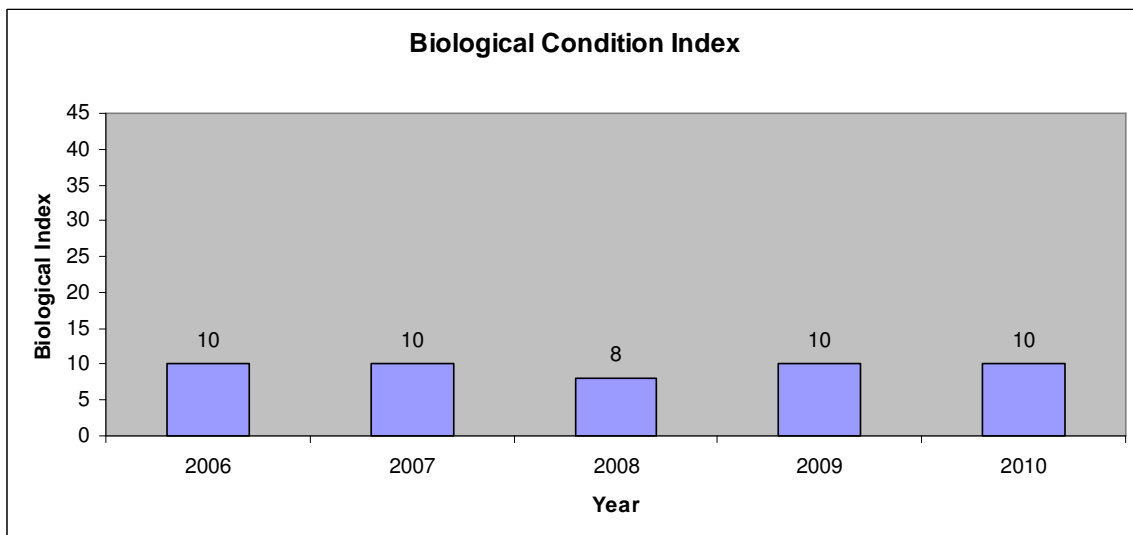
Aluminum, magnesium, and iron concentrations were all above water quality thresholds.



Biological Condition:

The biological community at COWN 2.2 was rated as moderately impaired for the fifth consecutive year. In 2010, this station received the lowest biological condition score of all large river interstate sites.

Biological Condition		
Year	Score	Rating
2006	10	Moderately Impaired
2007	10	Moderately Impaired
2008	8	Moderately Impaired
2009	10	Moderately Impaired
2010	10	Moderately Impaired



Susquehanna River at Conowingo, MD (SUSQ 10.0)

Group 1

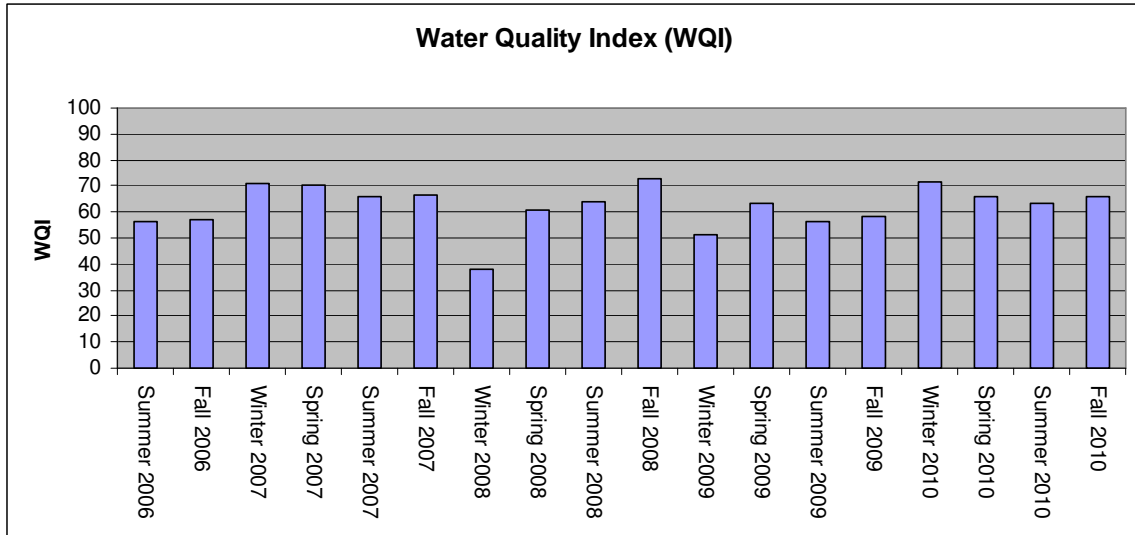


Habitat Condition:

Due to the location of this sampling station, physical habitat is not assessed. The station is located directly downstream of the Conowingo Hydroelectric dam and is subject to frequent disturbances due to plant operations.

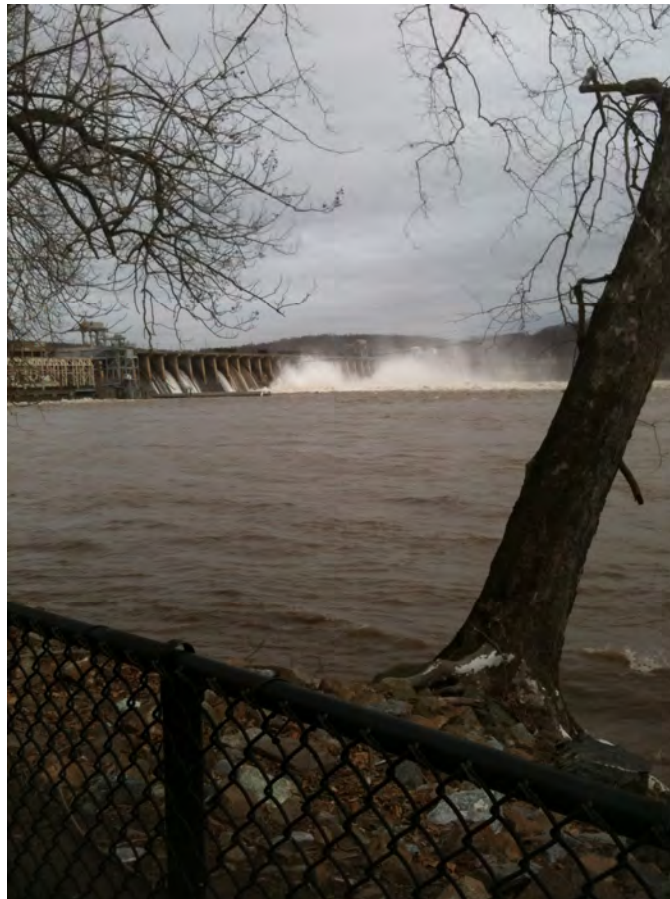
Water Quality:

Temperature exceeded water quality standards in 2010.



Biological Condition:

The macroinvertebrate community is not assessed at this sampling location.



SUSQ 10.0 during high flow conditions in March 2011.

Susquehanna River at Marietta, PA (SUSQ 44.5)

Group 1

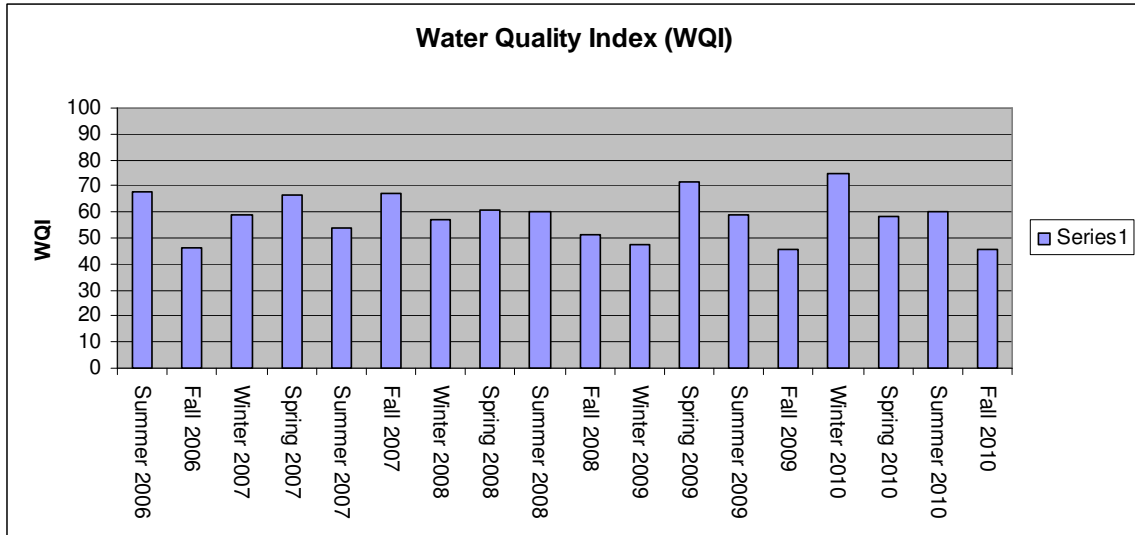


Habitat Condition:

Scoring 161 out of a possible 220, available physical habitat was deemed excellent in 2010. Despite being bracketed by hydroelectric facilities upstream and downstream of the sampling site, habitat conditions remain good. The Susquehanna River at this location is approximately one mile wide.

Water Quality:

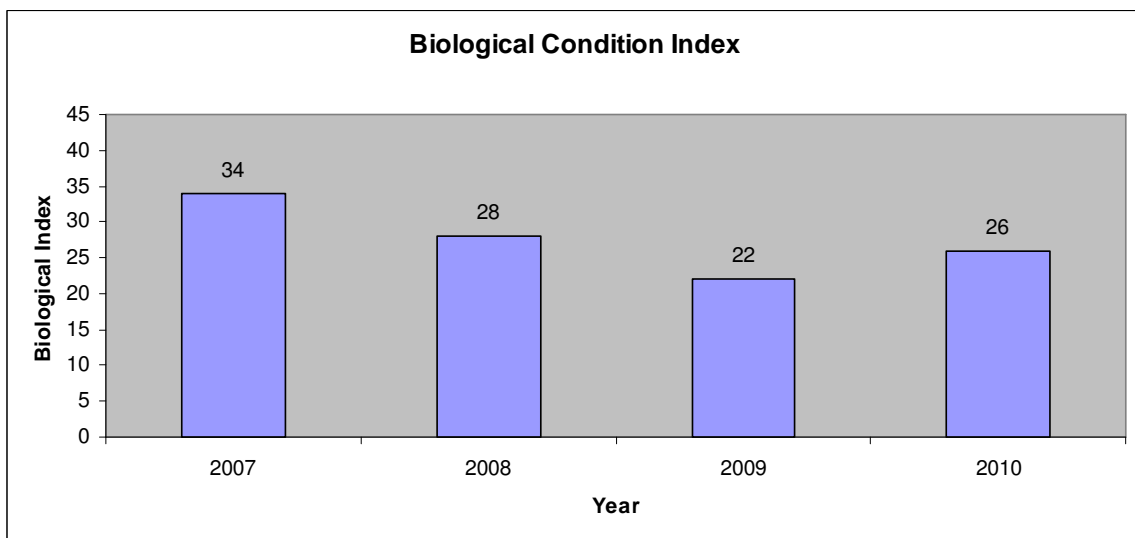
Temperature and pH were both measured outside accepted water quality standards.



Biological Condition:

The macroinvertebrate community as rated as slightly impaired when sampled in 2010.

Biological Condition		
Year	Score	Rating
2006	NA	NA
2007	34	Nonimpaired
2008	28	Nonimpaired
2009	22	Slightly Impaired
2010	26	Slightly Impaired



Susquehanna River at Sayre, PA (SUSQ 289.1)

Group 1

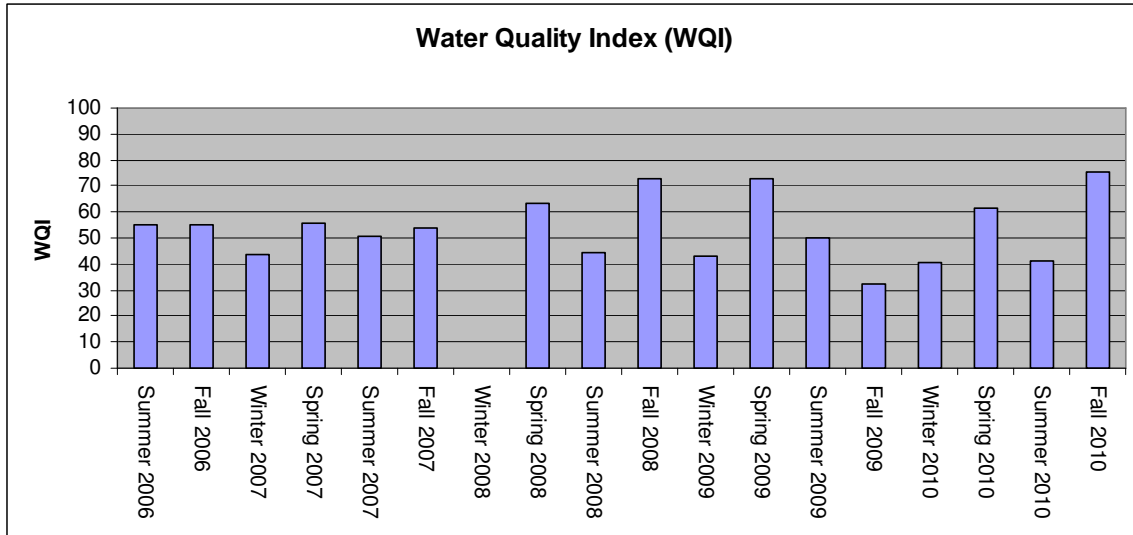


Habitat Condition:

Available physical habitat was classified as excellent in 2010. SUSQ 289.1 scored 155 out of a possible 220 points. Staff noted good epifaunal substrate and velocity/depth regimes.

Water Quality:

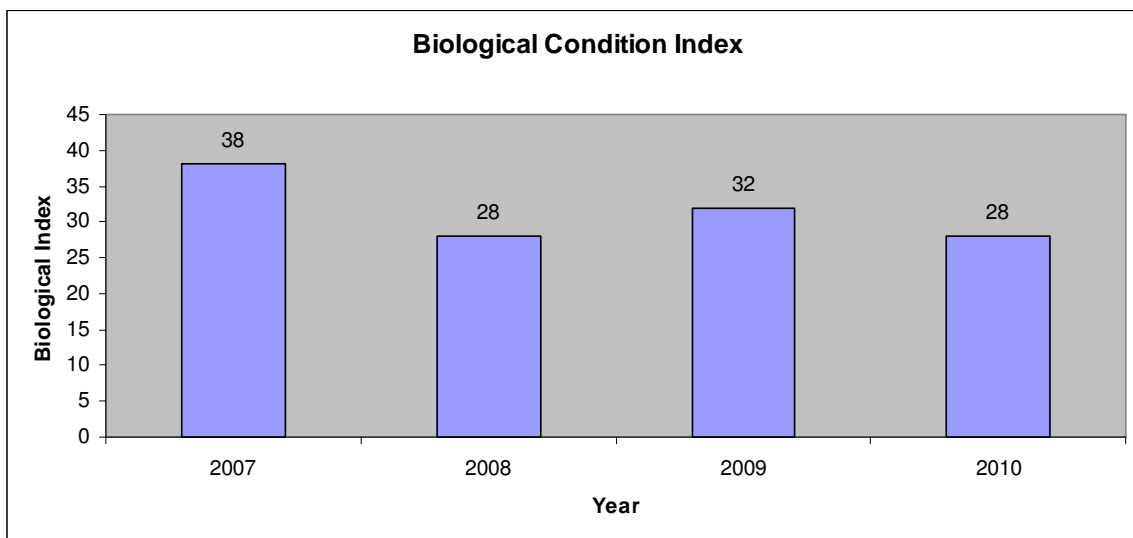
Temperature, pH, aluminum, and iron were all measured to be outside of acceptable water quality standards.



Biological Condition:

The biological condition of SUSQ 289.1 was classified as slightly impaired in 2010.

Biological Condition		
Year	Score	Rating
2006	NA	NA
2007	38	Nonimpaired
2008	28	Nonimpaired
2009	32	Nonimpaired
2010	28	Slightly Impaired



Susquehanna River at Kirkwood, NY (SUSQ 340.0)

Group 1

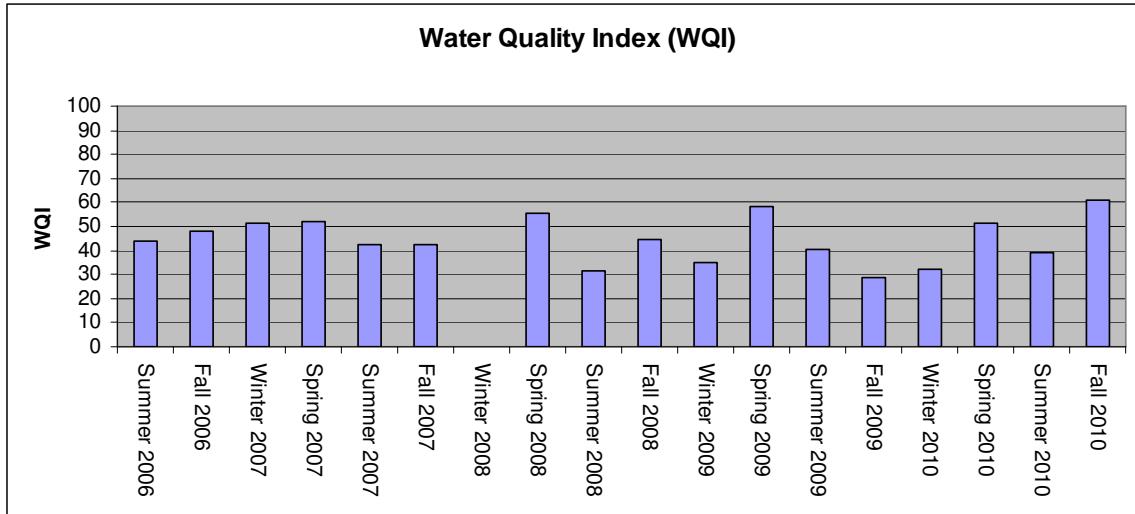


Habitat Condition:

Scoring 153 out of a possible 220, physical habitat conditions were considered excellent in 2010.

Water Quality:

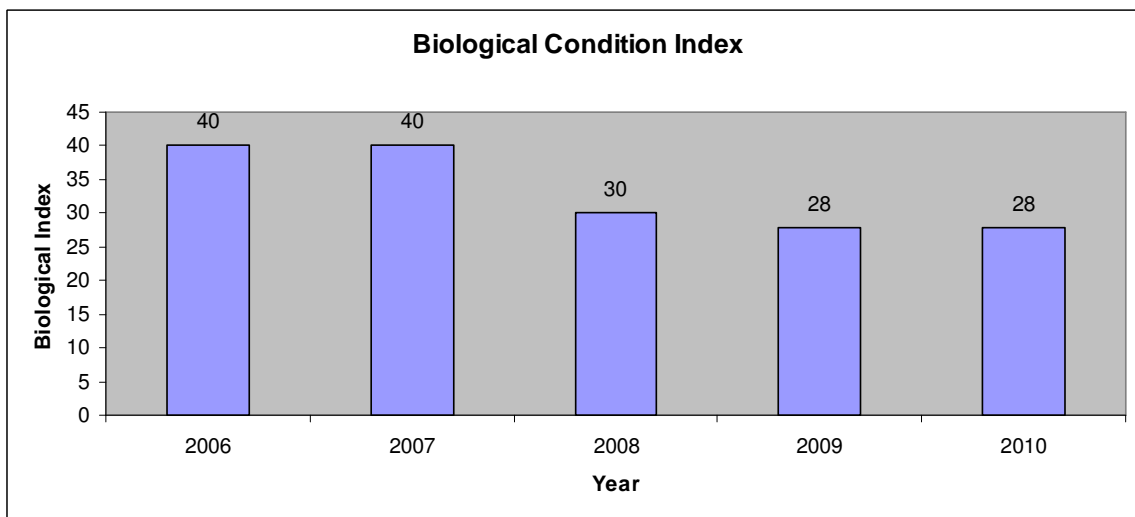
Temperature, pH, and iron levels were outside of acceptable water quality standards.



Biological Condition:

The biological community at SUSQ 340.0 was rated as slightly impaired for the second consecutive year.

Biological Condition		
Year	Score	Rating
2006	40	Nonimpaired
2007	40	Nonimpaired
2008	30	Nonimpaired
2009	28	Slightly Impaired
2010	28	Slightly Impaired



Susquehanna River at Windsor, NY (SUSQ 365.0)

Group 1

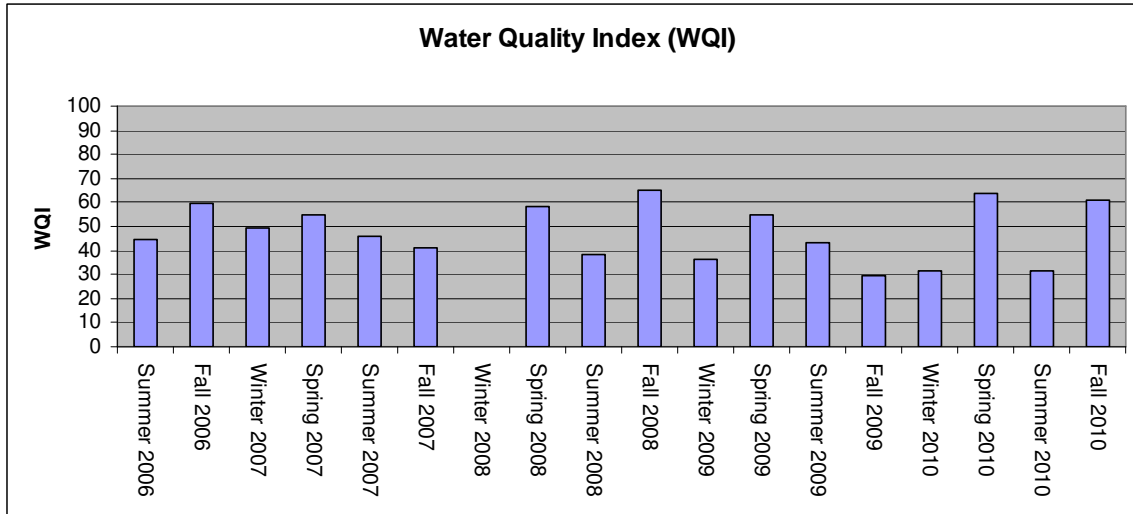


Habitat Condition:

Available physical habitat was classified as excellent in 2010. Scoring 176 out of a possible 220, SUSQ 365.0 possessed the best habitat score of all large river sites in the 2010 interstate project.

Water Quality:

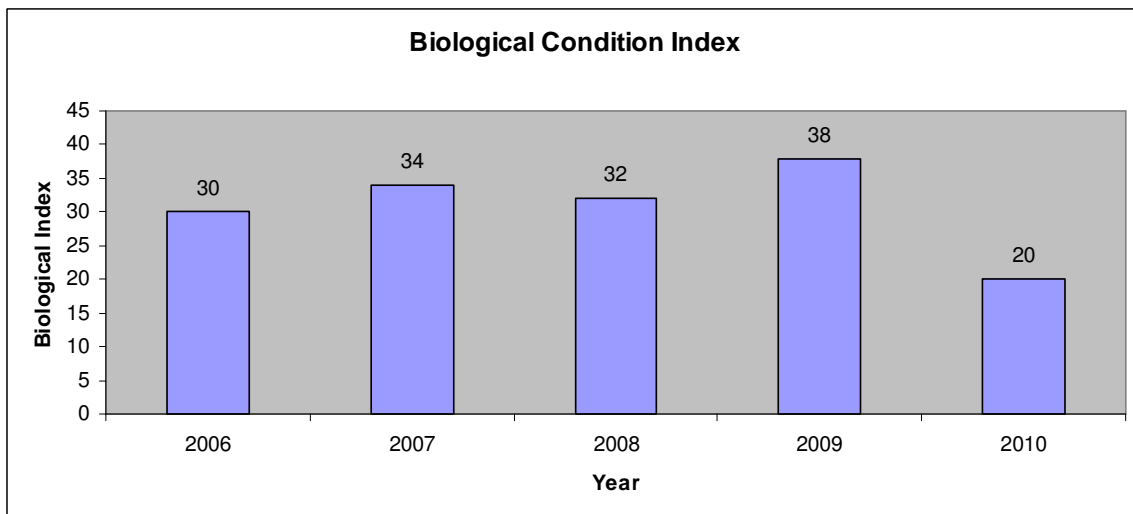
Temperature and iron levels were above established water quality standards.



Biological Condition:

SUSQ 365.0 received a biological condition classification of slightly impaired. This rating marks a decline from the four previous years when the macroinvertebrate community as designated as nonimpaired.

Biological Condition		
Year	Score	Rating
2006	30	Nonimpaired
2007	34	Nonimpaired
2008	32	Nonimpaired
2009	38	Nonimpaired
2010	20	Slightly Impaired



Tioga River at Lindley, PA (TIOG 10.8)

Group 1

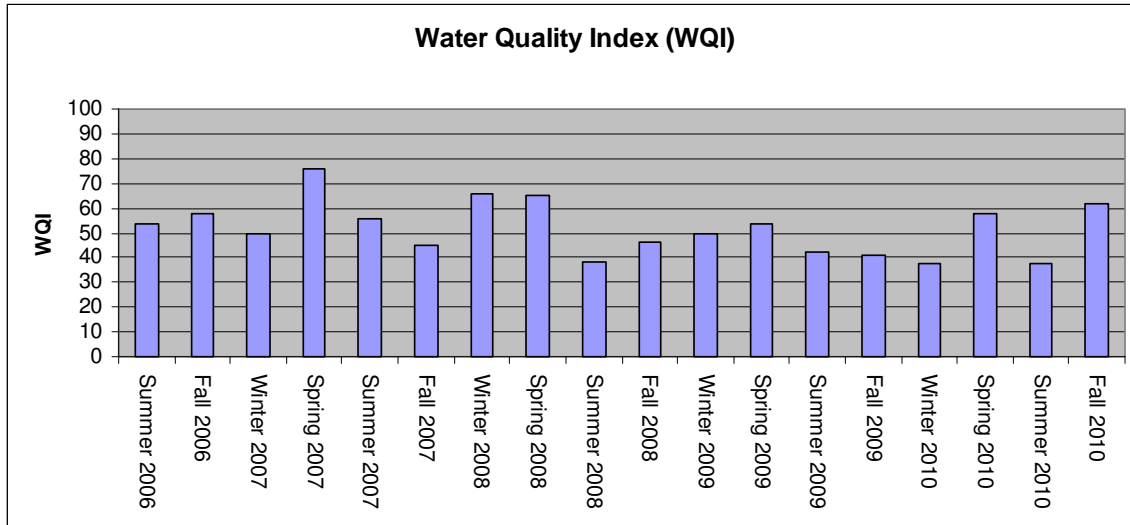


Habitat Condition:

Scoring 162 out of a possible 220, available physical habitat was rated as excellent in 2010.

Water Quality:

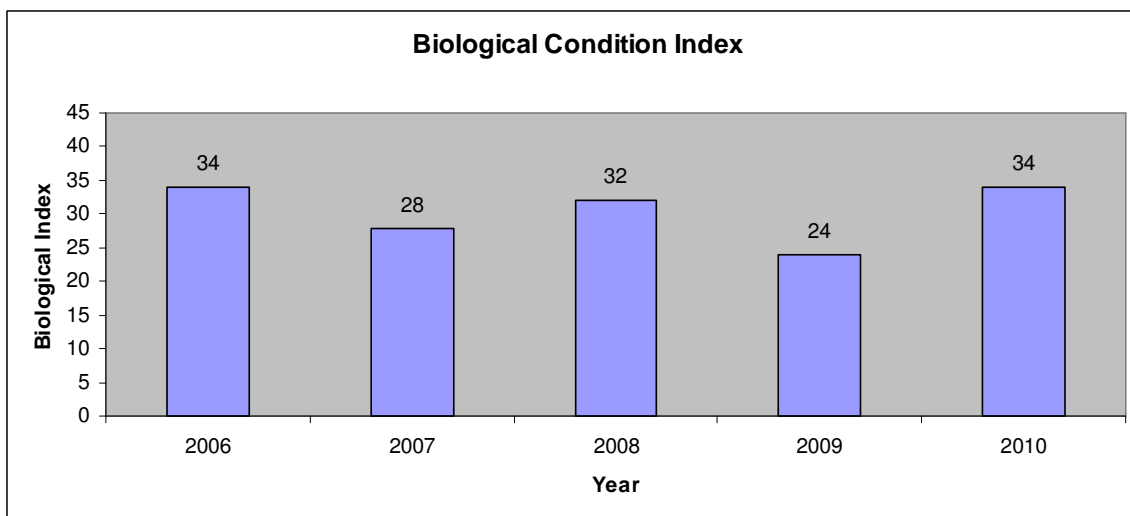
Temperature was the only measured water quality parameter found to be outside of accepted limits.



Biological Condition:

The macroinvertebrate community was classified as nonimpaired when sampled in 2010.

Biological Condition		
Year	Score	Rating
2006	34	Nonimpaired
2007	28	Slightly Impaired
2008	32	Nonimpaired
2009	24	Slightly Impaired
2010	34	Nonimpaired



Site Results for Group 3 Streams on the New York-Pennsylvania Border

Babcock Run (BABC)

Group 3



Biological Condition		
Year	Score	Rating
2006	12	Moderately Impaired
2007	26	Slightly Impaired
2008	22	Slightly Impaired
2009	24	Slightly Impaired
2010	28	Slightly Impaired

In May 2010, SRBC staff assessed Babcock Run near Cadis, Pa. Overall physical habitat was rated as excellent with the stream supporting a well-developed channel with ample instream cover, riffle frequency, and a minimal amount of embeddedness and sediment deposition. The macroinvertebrate community was rated as slightly impaired as overall taxonomic richness remained low, although 51 percent of the subsample was represented by the pollution sensitive mayfly family Ephemeroptera. All water quality parameters tested within acceptable limits.

Bill Hess Creek (BILL)

Group 3



Biological Condition		
Year	Score	Rating
2006	18	Moderately Impaired
2007	16	Moderately Impaired
2008	16	Moderately Impaired
2009	22	Slightly Impaired
2010	28	Slightly Impaired

Bill Hess Creek near Route 49 in Nelson, Pa., received a classification of slightly impaired in 2010. The macroinvertebrate community showed good diversity with 27 total taxa, of which 21 were in the pollution sensitive EPT orders. Physical habitat was classified as supporting with abundant instream cover but poor bank conditions. Water quality parameters all tested within acceptable limits.

Bird Creek (BIRD)

Group 3



Biological Condition		
Year	Score	Rating
2006	34	Nonimpaired
2007	28	Slightly Impaired
2008	28	Slightly Impaired
2009	30	Nonimpaired
2010	30	Nonimpaired

For the second consecutive year, the biological condition of Bird Creek, near Webb Mills, N.Y., was rated as nonimpaired. The stream scored highly in the Shannon Diversity index and the EPT index and had a substantial proportion (57.5 percent) of the subsample represented by members of the order Ephemeroptera. The assessed physical habitat was classified as supporting with ample riffles and minimal sediment deposition. Channel flow status and instream cover were the lowest scoring habitat parameters. Staff noted strongly undercut banks exposing the channel's cobble and boulder substrate. All measured water quality parameters tested within acceptable limits.

Biscuit Hollow (BISC)

Group 3



Biological Condition		
Year	Score	Rating
2006	28	Slightly Impaired
2007	22	Slightly Impaired
2008	NA	NA
2009	10	Moderately Impaired
2010	24	Slightly Impaired

Biscuit Hollow was rated as slightly impaired in 2010, showing a significant improvement from 2009. Physical habitat was deemed excellent despite the agricultural use in the surrounding area. Riparian zone width is problematic as well as the lack of instream cover. Measured water quality parameters all fell within accepted limits.

Briggs Hollow Run (BRIG)

Group 3



Biological Condition		
Year	Score	Rating
2006	26	Slightly Impaired
2007	24	Slightly Impaired
2008	26	Slightly Impaired
2009	26	Slightly Impaired
2010	30	Nonimpaired

Briggs Hollow Run near Nichols, N.Y., received a nonimpaired rating of its biological community in 2010. The macroinvertebrate sample contained a high percentage of pollution sensitive Ephemeroptera taxa and a low percentage of pollution tolerant Chironomidae taxa. Measured water quality parameters were all within acceptable limits. Physical habitat was rated as partially supporting. Briggs Hollow Run scored poorly due to highly eroded banks and limited instream cover. Channel flow status was also problematic with a significant portion of the available channel being exposed substrate.

Bulkley Brook (BULK)

Group 3



Biological Condition		
Year	Score	Rating
2006	28	Slightly Impaired
2007	12	Moderately Impaired
2008	NA	NA
2009	26	Slightly Impaired
2010	32	Nonimpaired

Bulkley Brook, located near Knoxville, Pa., had a nonimpaired biological community when sampled in May 2010. Factors contributing to the nonimpaired rating were a high contribution of Ephemeroptera taxa and high EPT and Shannon-Wiener indices scores. Considerable physical habitat issues were noted at the time of assessment leading to a rating of partially supporting. Staff noted rapidly erosion of strongly undercut banks. Within the last year, significant erosion of the left bank has resulted in the loss of protective vegetation. All field chemistry parameters were within acceptable limits at the time of measurement.

Camp Brook (CAMP)

Group 3



Biological Condition		
Year	Score	Rating
2006	38	Nonimpaired
2007	26	Slightly Impaired
2008	24	Slightly Impaired
2009	8	Moderately Impaired
2010	12	Moderately Impaired

Camp Brook, in the vicinity of Osceola, Pa., received a moderately impaired rating of its biological community in 2010. Camp Brook was one of two Group 3 streams to receive this rating in 2010. The macroinvertebrate sample was dominated by pollution tolerant Chironomidae taxa and scored poorly in the Hilsenhoff and EPT indices. Physical habitat was assessed as supporting with good velocity/depth regimes and a well-developed channel. SRBC staff noted abundant alga growth. All field chemistry parameters were within acceptable limits though dissolved oxygen was measured at 7.23 mg/L, approaching the state lower threshold of 6.0 mg/L.

Cook Hollow (COOK)

Group 3



Biological Condition		
Year	Score	Rating
2006	20	Slightly Impaired
2007	28	Slightly Impaired
2008	26	Slightly Impaired
2009	24	Slightly Impaired
2010	28	Slightly Impaired

Camp Hollow Brook, near Austinburg, Pa., had a slightly impaired biological community when sampled in May 2010. Overall taxa richness scored very well with 29 groups being represented, of which 21 were EPT taxa. Camp Hollow Brook had one of the highest EPT indices of all Group 3 streams assessed. Conversely, it also had one of the poorest scoring Hilsenhoff indices, suggesting excessive organic pollution within the watershed. Physical habitat was rated as excellent with ample instream cover and well-developed riffle areas. All field chemistry parameters measured within acceptable limits.

Deep Hollow Brook (DEEP)

Group 3



Biological Condition		
Year	Score	Rating
2006	34	Nonimpaired
2007	40	Nonimpaired
2008	26	Slightly Impaired
2009	30	Nonimpaired
2010	30	Nonimpaired

Deep Hollow Brook received a nonimpaired biological condition rating for the fourth time in the last five years it has been assessed. The macroinvertebrate community had the greatest taxa richness of all Group 3 streams in 2010 with 35 different groups being identified. Deep Hollow Brook also received a physical habitat rating of excellent due in part to its undisturbed channel and broad riparian vegetative zone widths on both banks. Field chemistry measurements revealed pH and alkalinity to be outside of acceptable limits. Alkalinity was measured to be 8 mg/L and the recorded pH value was 6.0. Pennsylvania's alkalinity threshold requires at least 20 mg/L while New York has an acceptable pH range of 6.5 to 8.5.

Denton Creek (DENT)

Group 3



Biological Condition		
Year	Score	Rating
2006	12	Moderately Impaired
2007	20	Moderately Impaired
2008	22	Slightly Impaired
2009	18	Slightly Impaired
2010	14	Moderately Impaired

Denton Creek near Hickory Grove, Pa., had a moderately impaired biological community in 2010. Both the Hilsenhoff and EPT indices scored poorly as did percentage contribution of Chironomidae individuals. Physical habitat was deemed as supporting. An upstream impoundment limits the impact of high water events on the instream habitat. Denton Creek had two field chemistry parameters measure outside of acceptable limits. A pH value of 6.05 and an alkalinity reading of 8 mg/L exceeded the New York state pH standard and Pennsylvania alkalinity standard of 6.5-8.5 and <20 mg/L, respectively.

Dry Brook (DRYB)

Group 3



Biological Condition		
Year	Score	Rating
2006	8	Moderately Impaired
2007	2	Severely Impaired
2008	8	Severely Impaired
2009	10	Moderately Impaired
2010	26	Slightly Impaired

Dry Brook, sampled in Waverly, Pa., exhibited a slightly impaired biological community in 2010. Heavily influenced by urban development, Dry Brook has consistently scored poorly in both biological and physical habitat conditions. All measured field chemistry parameters were within acceptable limits. Dry Brook was the lone Group 3 interstate stream to receive a physical habitat classification of nonsupporting. A significantly altered channel and an absence of instream cover were two notable habitat limitations. Also negatively contributing to the condition of the stream were narrow riparian vegetative zones consisting mainly of the invasive plant Japanese knotweed.

Little Wappasening Creek (LWAP)

Group 3



Biological Condition		
Year	Score	Rating
2006	30	Nonimpaired
2007	NA	NA
2008	30	Slightly Impaired
2009	28	Nonimpaired
2010	36	Nonimpaired

Little Wappasening Creek near Nichols, N.Y., received a biological condition rating of nonimpaired for 2010. The stream had an excellent macroinvertebrate community that scored equivalent to the reference stream for this group. The EPT, Hilsenhoff, and Shannon Diversity indices all scored highly for the stream. Physical habitat was again rated as excellent due in part to the abundance of forested area in watershed. At the time of assessment, Little Wappasening Creek had wide riparian vegetative zones and an undisturbed channel with ample riffle habitat. This high gradient stream lacked all velocity/depth regimes and had exposed substrate in the channel. All field chemistry parameters tested within acceptable limits.

Parks Creek (PARK)

Group 3



Biological Condition		
Year	Score	Rating
2006	26	Slightly Impaired
2007	24	Slightly Impaired
2008	26	Slightly Impaired
2009	26	Slightly Impaired
2010	24	Slightly Impaired

Parks Creek near Litchfield, N.Y., was designated as having a slightly impaired biological community for the sixth consecutive year. Parks Creek's biological community received a good Hilsenhoff index score and had a high percentage of Ephemeroptera taxa present. Physical habitat was rated as supporting with good frequency of riffles and minimal sediment deposition. Evidence of high water impacts are clearly shown in the degraded state of both banks and the significant portion of bare channel exposed. All measured field chemistry parameters were within acceptable limits.

Prince Hollow Run (PRIN)

Group 3



Biological Condition		
Year	Score	Rating
2006	22	Slightly Impaired
2007	8	Moderately Impaired
2008	14	Moderately Impaired
2009	16	Moderately Impaired
2010	20	Slightly Impaired

Prince Hollow Run near Cadis, Pa., received a biological condition rating slightly impaired when sampled in May 2010. The stream scored poorly in the Hilsenhoff index, suggesting organic pollution impacting the macroinvertebrate community. SRBC staff noted active farming occurring immediately adjacent to the streambank. Physical habitat was rated as supporting. As evident in the site photo, a significant portion of the channel was exposed leaving large cobble bars to divide the channel. Bank condition was also noted as problematic. The right bank abuts active cropland while the left bank is eroded and unstable. A pH value of 6.4 was recorded on May 5, 2010. New York's aquatic life use criteria for pH ranges from 6.5 to 8.5 units.

Redhouse Run/Beagle Hollow (REDH)

Group 3



Biological Condition		
Year	Score	Rating
2006	26	Slightly Impaired
2007	22	Slightly Impaired
2008	NA	NA
2009	22	Slightly Impaired
2010	34	Nonimpaired

Redhouse Run (Beagle Hollow) located near Osceola, Pa., received a biological condition rating of nonimpaired in 2010. All metrics scored well except the Hilsenhoff index, which indicated organic pollution impacts. SRBC staff previously noted poor Hilsenhoff index scores and excessive brown alga growth. Physical habitat was classified as supporting with good riffle frequency and adequate epifaunal substrate. Limiting habitat conditions include a left bank supported by rip rap to protect the adjacent roadbed from erosion. All field chemistry parameters were within acceptable limits at the time of measurement.

Russell Run (RUSS)

Group 3



Biological Condition		
Year	Score	Rating
2006	30	Nonimpaired
2007	22	Slightly Impaired
2008	28	Slightly Impaired
2009	24	Slightly Impaired
2010	24	Slightly Impaired

Russell Run near Windham, Pa., had a slightly impaired biological community when sampled in May 2010. The macroinvertebrate community had a strong proportion of Ephemeroptera taxa but a relatively low taxonomic diversity overall. Russell Run also scored poorly in the Hilsenhoff index, a common indicator of organic pollutants. Overall physical habitat was assessed as being supporting. Poor velocity/depth regimes and channel flow status were noted at the time of assessment. Additionally, the right bank showed evidence of destabilization. SRBC staff measured alkalinity at a level of 8 mg/L, under the Pennsylvania aquatic life threshold of 20 mg/L.

Sackett Creek (SACK)

Group 3



Biological Condition		
Year	Score	Rating
2006	20	Slightly Impaired
2007	28	Slightly Impaired
2008	28	Slightly Impaired
2009	32	Nonimpaired
2010	26	Slightly Impaired

Sackett Creek near Nichols, N.Y., was designated as having a slightly impaired biological community in 2010. Macroinvertebrate analysis revealed low percentages of pollution tolerant Chironomidae taxa and high proportions of members of the mayfly order, Ephemeroptera. The sample scored poorly in the EPT and Hilsenhoff indices as well as overall taxa richness. Physical habitat was assessed as being supporting. The lowest scoring habitat parameters were instream cover and channel flow status. Sediment deposition and wide riparian vegetative zone widths were parameters scoring in the highest classification. All field chemistry parameters were within acceptable limits at the time of measurement.

Smith Creek (SMIT)

Group 3



Biological Condition		
Year	Score	Rating
2006	38	Nonimpaired
2007	34	Nonimpaired
2008	38	Nonimpaired
2009	26	Slightly Impaired
2010	36	Nonimpaired

Smith Creek near East Lawrence, Pa., had an unimpaired biological community when sampled in May 2010. Smith Creek also served as the reference site to which all other Group 3 streams were compared. Smith exhibited the best combination of biological, physical, and water quality conditions. EPT and Shannon Diversity indices were the best scoring of all Group 3 streams assessed in 2010. Overall taxonomic richness placed second among all streams in the group. Physical habitat was rated excellent with stable banks, abundant instream cover, and frequent riffle habitat. No measured field chemistry parameter tested outside of accepted limits.

Strait Creek (STRA)

Group 3



Biological Condition		
Year	Score	Rating
2006	36	Nonimpaired
2007	26	Slightly Impaired
2008	30	Slightly Impaired
2009	18	Slightly Impaired
2010	30	Nonimpaired

Strait Creek near Nelson, Pa., had a nonimpaired biological community when sampled in May 2010. The macroinvertebrate community scored well with a high percentage of Ephemeroptera taxa and good overall taxa diversity. Physical habitat was rated as partially supporting, mainly due to channel alteration issues. Staff noted a lack of varied velocity/depth regimes and insufficient instream cover. All field chemistry parameters were within acceptable limits at the time of measurement.

White Branch Cowanesque River (WBCO)

Group 3



Biological Condition		
Year	Score	Rating
2006	10	Moderately Impaired
2007	2	Severely Impaired
2008	6	Severely Impaired
2009	8	Moderately Impaired
2010	0	Severely Impaired

The White Branch Cowanesque River possessed a severely impaired biological community when sampled in May 2010. The sampling location is located immediately downstream of a flood control dam which has been undergoing a rehabilitation project since 2005. The biological community was dominated by Chironomidae taxa (83 percent) and absent of any Ephemeroptera taxa. While physical habitat was rated as excellent, the biological community was believed to be impaired by upstream activities. SRBC staff noted higher than normal flow conditions as the upstream reservoir was being drawn down at the time of sampling. All measured field chemistry parameters were within acceptable limits.

White Hollow (WHIT)

Group 3



Biological Condition		
Year	Score	Rating
2006	26	Slightly Impaired
2007	36	Nonimpaired
2008	23	Slightly Impaired
2009	24	Slightly Impaired
2010	22	Slightly Impaired

White Hollow near Wellsburg, N.Y., received a biological condition rating of slightly impaired when sampled in May 2010. White Hollow possessed the best Hilsenhoff index score of all Group 3 sites yet scored very low in the EPT index. Overall taxonomic richness scored poorly as well. Physical habitat was rated as excellent, receiving the second highest score of all Group 3 sites assessed in 2010. Measured water quality parameters were all within acceptable limits.

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