BIOLOGICAL STREAM SURVEY

# ROCKLAND COUNTY, NEW YORK LOTIC SCENE INVESTIGATION (LSI) 2006 STREAM BIOMONITORING WATER QUALITY PROJECT



J. KELLY NOLAN

PREPARED FOR HUDSON BASIN RIVER WATCH EAST GREENWICH, NEW YORK

BY WATERSHED ASSESSMENT ASSOCIATES, LLC SCHENECTADY, NEW YORK

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Prepared for Hudson Basin River Watch 3570 Route 29 East Greenwich NY 12865

By J. Kelly Nolan Watershed Assessment Associates 28 Yates St. Schenectady, NY 12305

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### ROCKLAND COUNTY LOTIC SCENE INVESTIGATION (LSI) 2006 STREAM BIOMONITORING WATER QUALITY PROJECT

Principal Investigator: J. Kelly Nolan, Watershed Assessment Associates

#### **Project Overview**

The purpose of this study was to sample stream sites within Rockland County for benthic (bottom dwelling) invertebrates and to determine both water quality and impact source, if any, affecting a site based on the invertebrate community structure.

The project also provided an undergraduate student applied research training in rapid watershed assessment technique and analysis under the direct guidance of a professional aquatic biologist. The student completed side-by-side data collection with the aquatic biologist at 4 stations and compiled a separate student analytic report.

The data and analysis obtained from this project can be used by county planning and development agencies for planning purposes. In addition, the results of the surveyed stations located within Municipal Separate Storm Sewer Systems (MS4) communities can be used by the MS4 community in meeting several requirements set forth in the US EPA MS4 regulations.

#### Background

Rockland County encompasses approximately 210 miles of streams and rivers and more than 600 lakes and ponds, comprising a drainage area of about 114,000 acres. It is the smallest New York County outside of New York City. According to the Rockland County Planning Department, the most recent (2003/2004) percentages of land use within the county are: 32% residential, 5% commercial/office/industrial, 8% institutional/utilities, 0.2% agricultural, 38% parks/open space, 8% transportation, 9% vacant/not yet classified. A detailed definition for each category is available from the Rockland County Planning Department.

Threats to water quality of the streams and rivers in Rockland County include wastewater and runoff from public sewage treatment facilities, human impact from increasing land use and urbanization, runoff from urban and residential areas, industrial discharges, and water withdrawal (both surface and ground) for its public water supply.

The Rockland County Soil and Water Conservation District (RC SWCD) endeavors to develop responsible soil and water conservation programs in order to protect and conserve soil and water resources, as well as to educate the community on the importance of conservation measures. To that end, the RC SWCD has retained Hudson Basin River Watch (HBRW), through its Lotic Scene Investigation (LSI) program, to provide water quality data and educational services to municipalities and agencies that will guide relevant water supply planning, watershed protection, stormwater management, economic development, and aquatic habitat protection, and fulfill Municipal Separate Storm Sewer Systems (MS4) mandated requirements.

The HBRW program was developed with the intent of providing state agencies, counties, municipalities, and organizations with water quality reports that mirror a state

Department of Environmental Conservation's stream biomonitoring methodology, while providing educational research opportunities to students. The course instructor, a professional aquatic biologist, generates a survey report on data that he obtains as he and the students collect side-by-side samples for analysis. This provides confirmation of student data, ensuring that the LSI assessment report is valuable for water quality and watershed planning and protection. Dependent upon station selection, assessment results provide either baseline information against which future changes in water quality can be compared or trend monitoring.

Biological assessments are a cost effective method for assessing water quality and can identify stressors to a water body, detect impaired waters, determine restoration priorities, help set protection and restoration goals, track restoration progress, and support water discharge permit enforcement.

#### **Methods and Rational**

The methods, rational, and data analysis used for this study adhered to procedures outlined in the Hudson Basin River Watch Hudson River Estuary Watershed Assessment and Outreach Water Quality Biomonitoring Project Quality Assurance Project Plan (Gruber, 2006) and the Quality Assurance Work Plan for Biological Stream Monitoring in New York State (Bode et al., 2002). Both documents are available upon request from Hudson Basin River Watch (HBRW). A brief explanation of methods and rationale of data collected follow. A glossary of selected terms is provided in appendix I.

#### Biological

In this study, biological refers to benthic macroinvertebrate larvae that make up the community in stream habitats. Because benthic macroinvertebrates are constantly exposed to the effects of various stressors, these communities reflect not only current conditions, but also the cumulative impact of stressors over time. Ascertaining the benthic macroinvertebrate community structure at a station can determine the level of water quality and, perhaps more importantly, the most likely stressors affecting the station.

Biological samples were collected at each station using an 800-900 micron mesh kick net (9 by 18 inch). Samples were collected by disturbing the substrate by foot upstream of the net and continuing over a five-meter transect for five minutes as described in the Quality Assurance Work Plan for Biological Stream Monitoring in New York State (Bode et al., 2002). Samples were separately preserved in 95% ethyl alcohol and were then sub-sampled in the lab by randomly selecting 15 cc of detritus from the sample and examining it under a dissecting microscope. Invertebrates larger than 1.5 mm were removed until 100 organisms were obtained for each sample. Macroinvertebrates were identified to genus level to determine the water quality category for each station. Identification to the required taxonomic level was conducted for each sub sample to determine the Impact Source Determination (ISD) described by Riva-Murry et al. (2002). The metrics used to determine water quality were those recommended by the NYS DEC Stream Biomonitoring Unit with the exception that an all genera level identification was used instead of a combination of genera and species level identification. Identification to genera has been shown to have 100 percent accuracy in properly categorizing water quality in the NYS DEC four tiered method of assessment (Nolan, unpublished data).

The expected variability of single sample macroinvertebrate sampling results is stated in Smith and Bode (2004).

The four community metrics utilized for both genera level were: Richness (Plafkin et al. 1989), EPT richness (Lenat, 1987), Hilsenhoff's Biotic Index (Hilsenhoff, 1987), and Percent Model Affinity (PMA) (Novak and Bode, 1992).

The score for each particular metric from each station was used to calculate each station's Biological Assessment Profile (BAP) by converting each metric score to a common scale of 0 - 10. The BAP score categorizes the overall water quality assessment into one of four categories: non-, slightly, moderately, or severely impacted (Bode et al. 2002). The NYS DEC surmises the ability of each of the above water qualities to support fish and their propagation, but a particular family or species of fish is not identified. This is significant because trout are sensitive to small amounts of pollutants and slight ecological changes, whereas bass or carp, having a higher tolerance to pollutants and ecological changes, are not. See appendix II for complete definitions of each category.

Impact Source Determination (ISD) was calculated for each station. ISD compares test station communities to model communities empirically derived from macroinvertebrate data; the greater the similarity of a test station community to a model community, the more likely a particular impact source is affecting the test community. Data is most conclusive if a test community exhibits at least 50% similarity to a model community (Bode et al., 2002). Riva-Murray et al. (2002) found that ISD correlated well with impairment sources inferred from chemical, physical, and watershed characteristics, and biomonitoring results.

Appendix III contains the macroinvertebrate taxa list and ISD results for each station.

#### **Physical**

Benthic macroinvertebrate community structure normally varies dependent on physical habitat. Multi-metrics used to determine water quality and impact source are based on divergence from the expected community and have been calibrated for a specific habitat. In general, stations are to be a "wadeable riffle" habitat with physical attributes that are consistent with the habitat comparability criteria outlined in Bode et al. (1990). Each station is therefore evaluated for percent canopy cover, current speed, and percent of rock, rubble, gravel, sand, and silt, and the embeddedness of the substrate. The depth and width of the stream were also measured and site photos were taken of the upstream and downstream areas to be included with the physical and chemical data.

An optimal macroinvertebrate collection site has a velocity between 0.45 and 0.75 meter/second. Velocity was taken using a Global Water Flow probe (range: 0.3-15 FPS, accuracy: 0.1 FPS) following the manufacturer calibration guidelines.

Water temperature directly affects both the nature of aquatic fauna and species diversity; temperature tolerance is organism specific, and the reproductive cycle (including timing of insect emergence and annual productivity) will vary within different temperature ranges. Temperature can also affect organisms indirectly as a consequence of oxygen saturation levels. As water temperature rises, the metabolism of aquatic organisms increases, with an attendant increase in their oxygen requirements. At higher water temperatures, however, the oxygen carrying capacity of water decreases because of a diminished affinity of the water for oxygen.

Optimal water temperature ranges and lethal limits of water temperature vary among different organisms. The ratio of Plecoptera to Ephemeroptera (individuals and numbers of species) has been found to drop as the annual range of temperature increases (Hynes, 1970). The optimal temperature range for brook trout is 11-16 ° Celsius with an upper lethal limit of 240 ° Celsius (Hynes, 1970). The NYS DEC does not have a water quality standard for water temperature.

Temperature was recorded using a Hydrolab Quanta probe (accuracy  $\pm 0.2^{\circ}$  C) following the manufacturer calibration guidelines.

#### Chemical

Dissolved oxygen (DO) level is a function of water turbulence, diffusion, and plant respiration. A significant drop in DO concentration can occur over a 24-hour period, particularly if a water body contains a large amount of plant growth. Oxygen is released into the water as a result of plant photosynthesis during daylight; dense plant growth within a stream can therefore elevate the DO level significantly. At night photosynthesis ceases and DO may drop to levels maintained by diffusion and turbulence. A pre-dawn DO level will, in this case, reflect the lowest DO concentration in a 24 hour period, and thus provide important data on the overall health of the system.

DO was measured using a Hydrolab Quanta Probe (range: 0 to 50 mg/L, accuracy:  $\pm 0.2$  mg/L) following the manufacturer calibration guidelines.

It is also important to consider percent oxygen saturation, since dissolved oxygen levels vary inversely with water temperature. Percent saturation is the ratio of dissolved oxygen present in the water at a specific temperature to the maximum dissolved oxygen for a given temperature. (The calculation is also standardized to altitude or barometric pressure.) Percent oxygen saturation falls when something other than temperature, such as dissolved solids or bacterial decomposition, affects oxygen levels. It can rise to supersaturated level secondary to photosynthetic activity of abundant algae growth.

A healthy stream contains near 100 percent oxygen saturation at any given temperature (Hynes, 1970). Trout are particularly sensitive to even a slight drop in oxygen saturation and will migrate away from streams when oxygen saturation falls. Similarly, certain macroinvertebrates are sensitive to varying saturation levels and because the inability of these organisms to migrate away from the changing conditions, a drop in saturation can be lethal.

Specific conductance or conductivity is a measure of the ability of an electrical current to pass through a stream; it is dependent on both the concentration of dissolved electrolytes within the water and water temperature. Conductivity increases when inorganic ions are dissolved in water. Organic ions, such as phenols, oil, alcohol and sugar, can decrease conductivity (EPA, 1987). Warmer water is also more conductive and, therefore, conductivity is reported for a standardized water temperature of 25 degrees Celsius. Measurements are reported in micro Siemens per centimeter ( $\mu$ S/cm) following the manufacturer calibration guidelines.

In the United States, freshwater stream conductivity readings vary greatly from  $50-1,500\mu$ S/cm. The given conductivity of a particular stream remains relatively constant, however, unless an extraneous source of contamination is present. A failing septic system would raise conductivity because of its chloride, phosphate, and nitrate content, while an oil spill would lower conductivity.

A Hydrolab Quanta probe was used to measure conductivity (range of 0 - 100 mS with a resolution of 4 digits) following the manufacturer calibration guidelines.

The pH is a measure of a stream's acidity. A desirable pH for salmonid is 6.5-8.5. A Hydrolab Quanta probe was used to obtain pH (range: 2 to 12 units, accuracy:  $\pm 0.2$  units) following the manufacturer calibration guidelines.

For physical and chemical data see appendix III.

#### **Results and Discussion**

An examination of all possible relationships between land use and water quality is beyond the scope of this project, but some general correlations are evident from the data collected.

Based on the analysis of the invertebrate communities at each station the water quality of the test sites ranged from non-impacted to moderately impacted (see figure I). A breakdown by each category of the 20 stream stations assessed showed that 4 stations were non-impacted, 14 were slightly impacted and 2 were moderately impacted. For definitions of impact categories see appendix II.

Similar to the 2002 NY DEC statewide assessment, which found that 52% of the impacted stations were affected by non-point source nutrient enrichment (Bode et al., 2004), the most likely impairment in this present survey, by Impact Source Determination, is non-point source nutrient enrichment, affecting 60% of the impacted stations (see figure V). The remaining impacted stations are influenced by toxic or complex municipal/industrial discharge or sewage effluent/organic inputs.

This survey demonstrated a correlation between increasing specific conductance and declining water quality, based on resident benthic macroinvertebrates (figure II). Land use and the percent of impervious surface area have clearly been shown to affect water quality, and specific conductance can be used as an indicator of land use contaminants. Changes in conductivity begin to occur when impervious surface area in a catchment area reaches greater than ten percent. This type of calculation is beyond the scope of our current study, but figure III demonstrates land use in relationship to the study test sites (GIS data obtained from the USGS, NY Land Cover Data Set).

A correlation also occurred between specific conductance and decline in EPT richness (figure IV). With declining EPT richness there is a corresponding loss of sensitive fishes (Miltner and Rankin, 1998; Kilgour and Barton, 1999), and this may occur in waters assessed as slightly impacted.

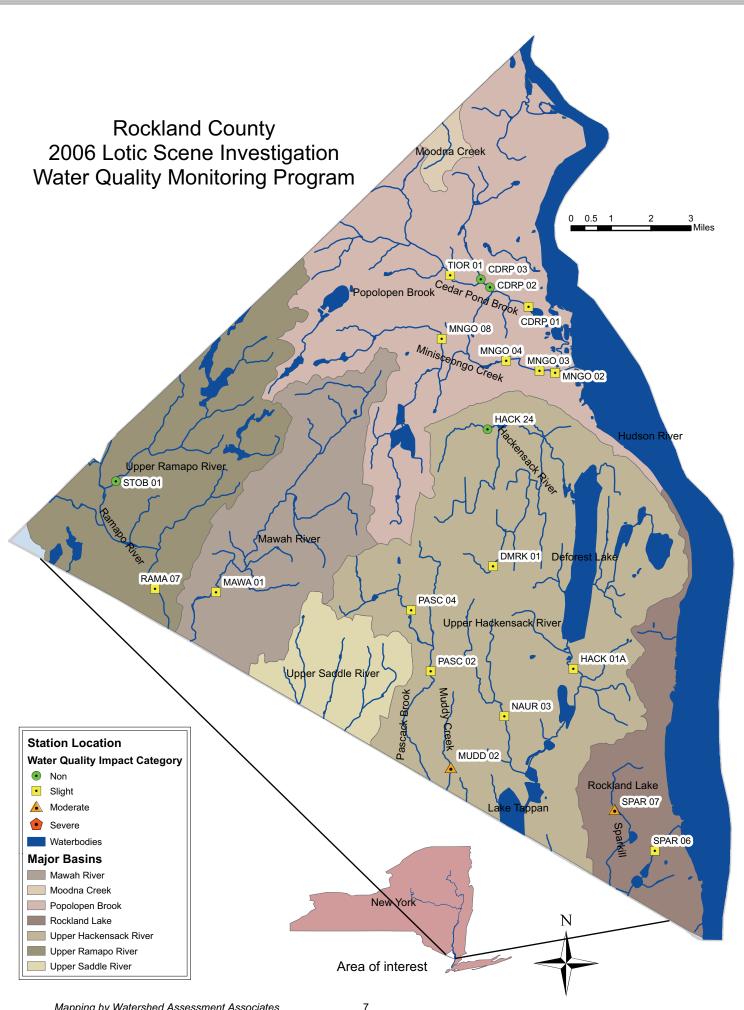
NYS DEC SBU has conducted numerous water quality assessments within Rockland County, providing valuable historical documentation of the county's water quality for longitudinal water quality trend monitoring. Several stations assessed during this survey were previously assessed by NYS DEC; when feasible, the data from NYS DEC assessments were incorporated into this survey to provide trend analysis. It may be a worthwhile project for Rockland County Soil and Water District to produce a county water quality trend report utilizing all available macroinvertebrate data.

#### **Description of Remaining Sections of this Report**

An overview map of Rockland County containing all sites assessed in 2006, with corresponding steam name, station number, and water quality category, precedes narrative descriptions and BAP graphs for each major watershed basin in Rockland

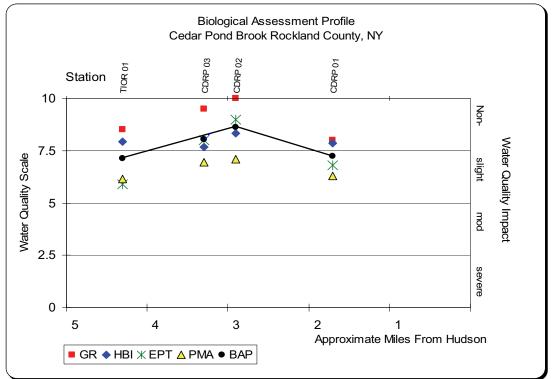
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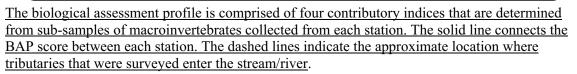
Following this, the physical and chemical data page and macroinvertebrate community data page for each individual station sampled within the particular watershed is provided, which includes: site location, number, sampling date, physical and chemical data obtained, taxa identified, multi metric scores, biological assessment profile score, and ISD scores.



Mapping by Watershed Assessment Associates

#### **Cedar Pond Brook**





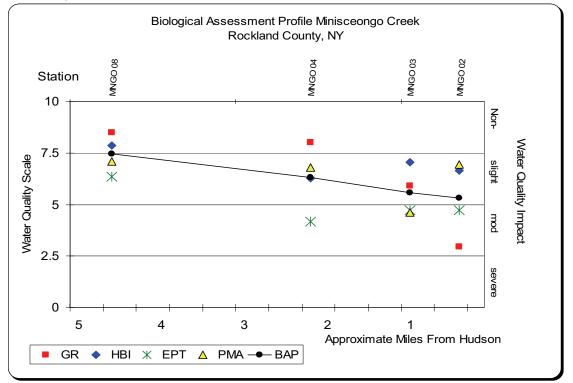
Station TIOR 01 is located just above the CR 106/210 Bridge. Based on the benthic macroinvertebrate sub-sample, water quality is slightly impacted and impact source determination is most similar to a natural, non-impacted community structure. This station was previously assessed by NYS DEC in 2002 as non-impacted.

Station CDRP 03 is located just above the West Main Street Bridge. This tributary of Cedar Pond Book enters approximately 0.9 miles downstream from station TIOR 01. Water quality, based on the benthic macroinvertebrate community, is non-impacted. ISD however, indicates a community structure most similar to one affected by non point source nutrients and complex inputs.

Station CDRP 02 is located just above Reservoir Road Bridge and approximately 2.4 miles below the upper most station, TIOR 01. Based on the benthic macroinvertebrate sub-sample, water quality is non-impacted and impact source determination is most similar to a natural, non-impacted community structure. Of note, this station had the highest BAP score (8.6) of all the stations assessed in Rockland County for this project.

Station CDRP 01 is located approximately 1.1 miles below Station CDRP 02 and just above Lowland Hill Road Bridge. Based on the benthic macroinvertebrate sub-sample, water quality dropped into the slightly impacted category compared to station CDRP 02. ISD is most similar to a natural, non-impacted community structure.

#### **Minisceongo** Creek

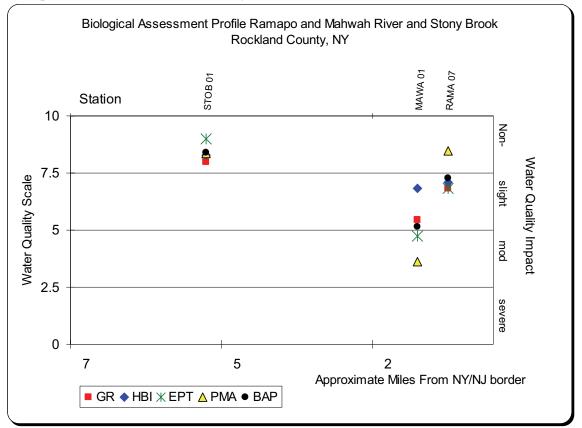


Station MNGO 08 is located approximately 5.6 miles above the confluence with the Hudson River just above Storrs Rd. Bridge. By benthic macroinvertebrate community structure, water quality is slightly impacted. ISD indicated a community structure most similar to one affected by non point source nutrient inputs.

Located approximately 2.2 miles below station MNGO 08, just off Church Street, station MNGO 04 is slightly impacted, based on the benthic macroinvertebrate community structure. The most likely cause of water quality impairment, by ISD, is complex municipal and industrial inputs.

Station MNGO 03 is located approximately 1.2 miles below station MNGO 04. Based on the benthic macroinvertebrate community structure, water quality is slightly impacted. ISD indicates a community structure affected by multiple stressors, including non point source, organic, and complex inputs. The ISD for impoundment is spurious, as no impound exists.

Station MNGO 02 is located approximately 0.9 miles below station MNGO 03, and water quality is slightly impacted by macroinvertebrate community structure. ISD indicates a community structure affected by multiple stressors, including non point source, organic, and complex inputs. The ISD for impoundment is spurious, as no impound exists.



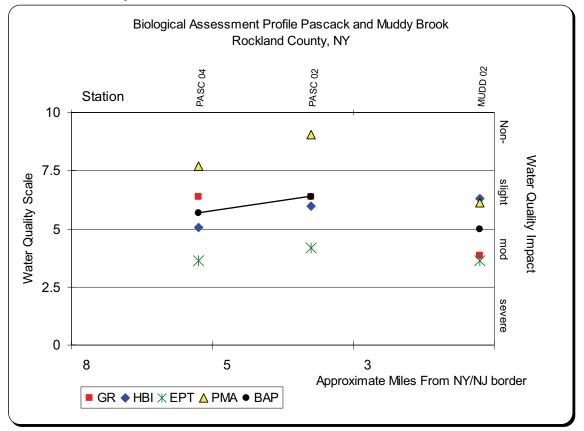
### Ramapo and Mahwah River and Stony Brook

Located just above Seven Lakes Road Bridge, station STOB 01 water quality is non-impacted and most similar to a natural community by macroinvertebrate community structure and ISD. The NYS DEC also assessed water quality here as non-impacted in 2002.

Station MAWA 01, located approximately 100 meters above Montebello Road Bridge, was slightly impacted, but the benthic macroinvertebrate community structure was close to the moderately impacted category. ISD indicated a community structure most affected by non point source nutrient enrichment. NYS DEC assessed this station as slightly impacted in 2001.

Located just above the Fourth Street Bridge, station RAMA 07 was slightly impacted, though near the non-impacted category, based on the benthic macroinvertebrate community structure. ISD indicated a community structure most similar to a natural community and one affected by non point source nutrient additions. NYS DEC assessed this station in 1991, 1993, 1997, 1998, 2002, and 2003. Compared to those years, the water quality shows improvement, based on the benthic macroinvertebrate community structure.

#### **Pascack and Muddy Brook**

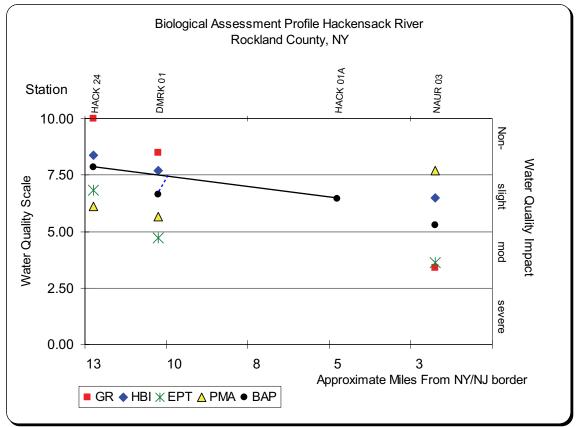


PASC 04 is located approximately 5.4 miles above the NY/NJ border, just off Memorial Park Drive. Water quality, based on the benthic macroinvertebrate community structure, is slightly impacted and the ISD indicates a community structure affected by multiple stressors, including non point source nutrients, toxins, and organic and complex municipal industrial inputs.

Station PASC 02 is located approximately 1.4 miles below station PASC 04. Water quality, based on the benthic macroinvertebrate community structure is slightly impacted and ISD indicates a community structure most similar to a natural community or one affected by non point source nutrients and toxic inputs.

MUDD 02 is located just below the West Washington Avenue Bridge. Water quality is moderately impacted, falling just outside the slightly impacted category by macroinvertebrate community structure. ISD indicated a community structure most similar to one affected by toxic inputs.

#### **Hackensack River**



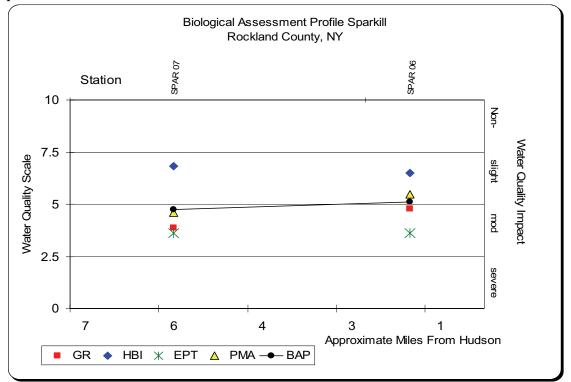
Station HACK 24 is located approximately 13 miles above the NY/NJ border and just above the Old Route 304 Bridge. Water quality, based on the benthic macroinvertebrate community structure, is non-impacted. This station had the highest genera richness of any station assessed, with 30 taxa identified in the sub-sample. ISD indicated a natural non-impacted community structure.

Located just above Sittle Torr Road Bridge, station DMRK 01 was slightly impacted. ISD indicated a community most likely affected by non point source nutrients, complex inputs, and impoundment effects. While the station is located below a small wetland, the dominant surrounding land use is residential and the immediate adjacent land use is a commercial nursery.

Located just below the railroad bridge at the end of Fulton Avenue, station HACK 01A is moderately impacted based on the benthic macroinvertebrate community structure. ISD indicated multiple stressors, including: non point source nutrients, toxins, complex inputs and impoundment effects. The station is located below Lake de Forest, which likely has a major influence on the community structure at this station. Therefore, as outlined in the QAWP (Bode et al., 2002), the BAP was adjusted up one category to reflect genuine water quality and was categorized as slightly impacted.

Station NAUR 03 is located just below the Town Line Road Bridge and the water quality is slightly impacted, though nearing the moderately impacted category. ISD indicates a community most similar to one affected by non point source nutrients and complex municipal and industrial inputs. In 2002, the NYS DEC assessed the stream well below this station as moderately impacted.

#### Sparkill



Station SPAR 07 is located approximately 4.3 miles above the confluence with the Hudson River, just below the Route 340 Bridge. Based on the benthic macroinvertebrate community structure, water quality is moderately impacted. ISD indicates the community is most likely affected by non point source nutrients and complex municipal and industrial inputs. ISD for impoundment is considered spurious.

Located approximately 4 miles downstream from station SPAR 07 and just below the New Street Bridge, station SPAR 06 is slightly impacted and close to the moderately impacted category. ISD indicates a benthic macroinvertebrate community structure most similar to one affected by toxic and organic inputs. The NYS DEC assessed this station in 2003 and determined the water quality was moderately impacted.

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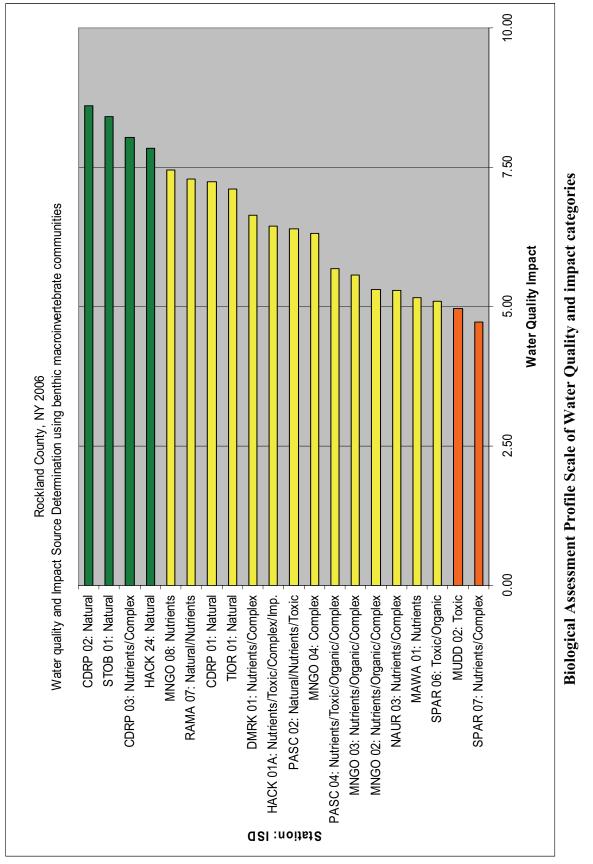
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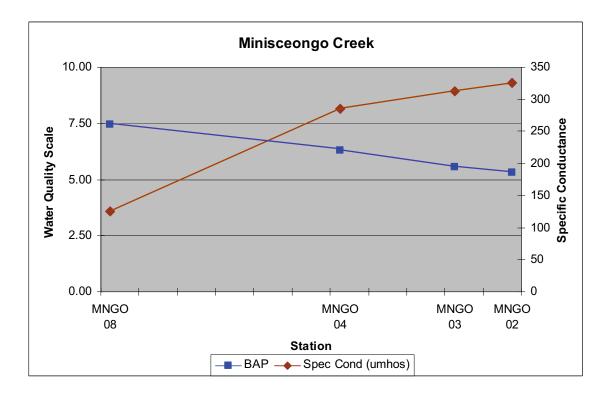
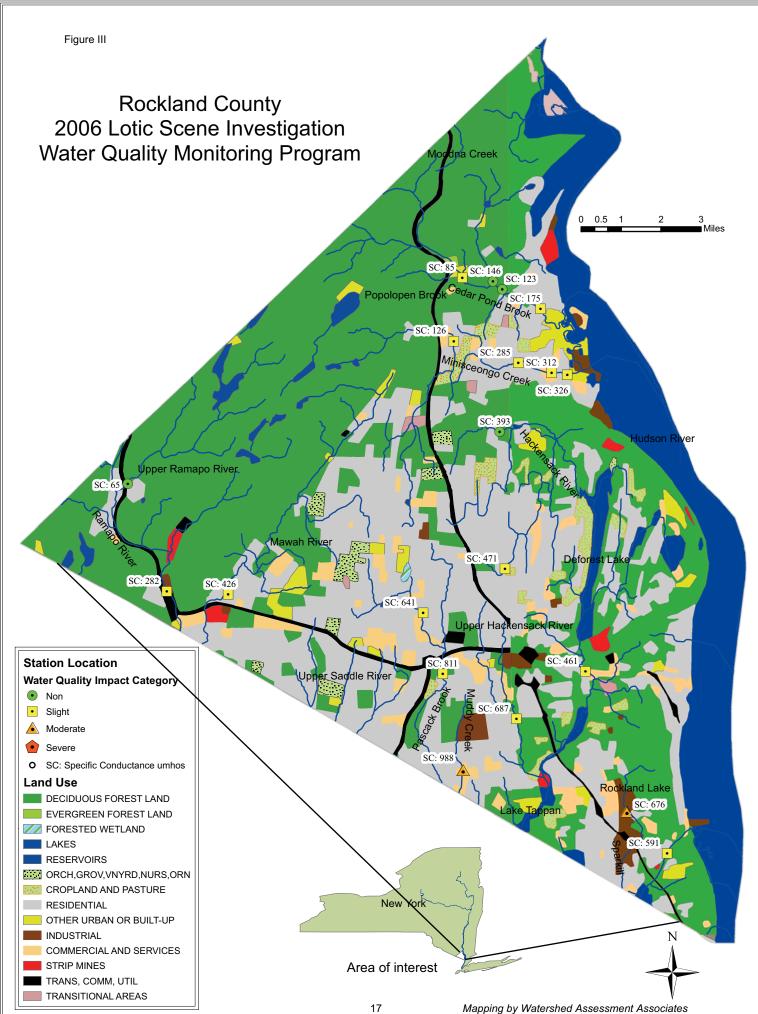


Figure II. Graph depicts the inverse relationship between specific conductance and BAP scores for Minisceongo Creek surveyed in Rockland County, NY during 2006.



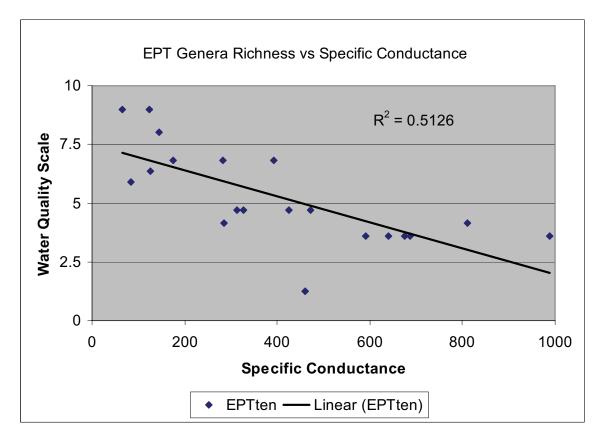
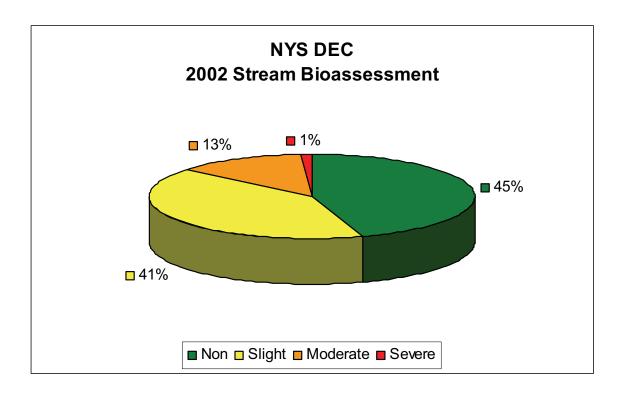


Figure IV. Graph depicts the inverse relationship between specific conductance and EPT richness for 20 stream sites surveyed in Rockland County, NY during 2006. A log trend line r2 = 0.51 is shown in black. Benthic macroinvertebrates can be used as a surrogate measure for the fish community; because loss of EPT taxa corresponds with a decreasing number of sensitive fishes (Kilgour and Barton, 1999: Miltner and Rankin, 1998), it can be used to predict their decline. There is no evidence that specific conductance exerts a negative effect on macroinvertebrates, but instead is a marker of anthropogenic effects within the watershed.



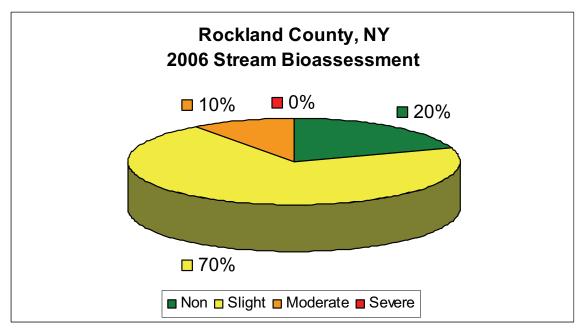


Figure V. Water quality categories of all NY State sites surveyed by NYS DEC in 2002 and all Rockland County sites surveyed by HBRW in 2006.

#### Glossary

Anthropogenic: caused by man

Assessment: a diagnosis or evaluation of water quality

**Benthic**: located on the bottom of a body of water or in the bottom sediments or pertaining to bottom-dwelling organisms

Benthos: organisms occurring on or in the bottom substrate of a waterbody

Biomonitoring: the use of biological indicators to measure water quality

Diel cycle: referring to the 24 hr day

Impact: a change in the physical, chemical, or biological condition of a waterbody

Impairment: a detrimental effect caused by an impact

**Index**: a number, metric, or parameter derived from sample data used as a measure of water quality

Intolerant: unable to survive poor water quality

**Macroinvertebrate**: a larger-than-microscopic invertebrate animal that lives at least part of its life in aquatic habitats

**Non point source**: diffuse pollution sources (i.e., without a single point of origin or not introduced into a receiving stream from a specific outlet)

**Periphyton**: are algae that grow on a variety of submerged substrates, such as rocks, plants or debris, in lakes or streams

**Point source**: a stationary location or fixed facility from which pollutants are discharged or emitted. Also, any single identifiable source of pollution, e.g., a pipe, ditch, ship, ore pit, factory smokestack

**Rapid bioassessment**: a biological diagnosis of water quality using field and laboratory analysis designed to allow assessment of water quality in a short turn-around-time; usually involves kick sampling and laboratory subsampling of the sample

Station: a sampling site on a waterbody

**Stenotherms**: organisms having a very narrow thermal tolerance and preferring cooler temperatures

Survey: a set of sampling conducted in succession along a stretch of stream

Tolerant: able to survive poor water quality

#### Biological Assessment Profile: Conversion of Index Values to Common 10-Scale.

The Biological Assessment Profile of index values, developed by Phil O'Brien, Division of Water NYS DEC, is a method of plotting biological index values on a common scale of water quality impact. Values from the four indices defined previously are converted to a common 0-10 scale using the formulae in the NYS DEC Quality Assurance document (Bode *et al.*, 2002).

#### Water Quality Impact Categories

- **Non-impacted**: Indices reflect very good water quality. The macroinvertebrate community is diverse, usually greater than 13 families in riffle habitats. Mayflies, stoneflies, and caddisflies are well represented; EPT family richness is greater than 7. The biotic index value is 4.50 or less. Percent model affinity is greater than 64. Water quality should not be limiting to fish survival or propagation. This level of water quality includes both pristine habitats and those receiving discharges which minimally alter the biota.
- **Slightly impacted**: Indices reflect good water quality. The macroinvertebrate community is slightly but significantly altered from the pristine state. Family richness usually is 10 -13. Mayflies and stoneflies may be restricted, with EPT values of 3-7. The biotic index value is 4.51-5.50. Percent model affinity is 50-64. Water quality is usually not limiting to fish survival, but may be limiting to fish propagation.
- **Moderately impacted**: Indices reflect poor water quality. The macroinvertebrate community is altered to a large degree from the pristine state. Family richness usually is 7-9. Mayflies and stoneflies are rare or absent, and caddisflies are often restricted; EPT richness is 1-2. The biotic index value is 5.51-7.00. The percent model affinity value is 35-49. Water quality often is limiting to fish propagation, but usually not to fish survival.
- **Severely impacted**: Indices reflect very poor water quality. The macroinvertebrate community is limited to a few tolerant Families. Family richness is less than 7. Mayflies, stoneflies, and caddisflies are rare or absent; EPT richness is 0. The biotic index value is greater than 7.01-10. Percent model affinity is less than 35. The dominant species are almost all tolerant, and are usually midges and worms. Often 1-2 species are very abundant. Water quality is often limiting to both fish propagation and fish survival.

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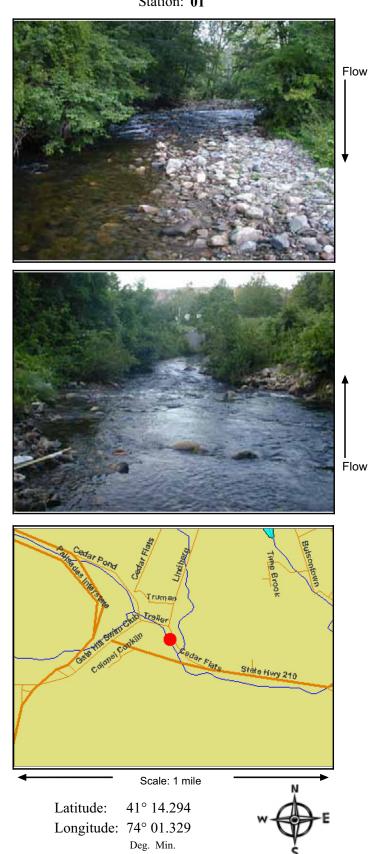
#### NYS DEC Methods for Impact Source Determination

- **Definition**: Impact Source Determination (ISD) is the procedure for identifying types of impacts that exert deleterious effects on a waterbody. While the analysis of benthic macroinvertebrate communities has been shown to be an effective means of determining severity of water quality impacts, it has been less effective in determining what kind of pollution is causing the impact. Impact Source Determination uses community types or models to ascertain the primary factor influencing the fauna.
- Development of methods: The method found to be most useful in differentiating impacts in New York State streams was the use of community types, based on composition by family and genus. It may be seen as an elaboration of Percent Model Affinity (Novak and Bode, 1992), which is based on class and order. A large database of macroinvertebrate data was required to develop ISD methods. The database included several sites known or presumed to be impacted by specific impact types. The impact types were mostly known by chemical data or land use. These sites were grouped into the following general categories: agricultural nonpoint, toxic-stressed, sewage (domestic municipal), sewage/toxic, siltation, impoundment, and natural. Each group initially contained 20 sites. Cluster analysis was then performed within each group, using percent similarity at the family or genus level. Within each group four clusters were identified, each cluster usually composed of 4-5 sites with high biological similarity. From each cluster a hypothetical model was then formed to represent a model cluster community type; sites within the cluster had at least 50 percent similarity to this model. The method was tested by calculating percent similarity to all the models, and determining which model was the most similar to the test site. New models are developed when similar communities are recognized from several streams.
- **Use of ISD methods**: Impact Source Determination is based on similarity to existing models of community types. The model that exhibits the highest similarity to the test data denotes the likely impact source type, or may indicate "natural", lacking an impact. In the graphic representation of ISD, only the highest similarity of each source type is identified, and similarities that are within 5% of the highest. Similarities less that 50% are considered less conclusive. The determination of impact source type is used in conjunction with assessment of severity of water quality impact to provide an overall assessment of water quality.
- **Limitations**: These methods were developed for data derived from 100-organism subsamples of traveling kick samples from riffles of New York State streams. Application of the methods for data derived from other sampling methods, habitats, or geographical areas would likely require modification of the models.

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Stream name: Cedar Pond Brook	Watersh	ned: Hudson
Location: Just above CR 106/210	bridge	
Municipality: Stony Point	<b>Rockland Co. NY</b>	
Date sampled: Friday, July 14, 20	06	10 10 1
Arrival time at station: <b>5:55</b> AM		
	Nalan	
Field personnel involved: J. Kelly	Nolan	1000
Physical Characteristics		1000
Width (meters)	6.6 0.2	
Depth (meters)	0.2	1
Current (cm/sec) Substrate (%)	1.2	1
Rock (>25.4 cm or bedrock)	10	1002
Rubble (6.35 - 25.4 cm)	10 60	
Gravel (0.2 - 6.35 cm)	15	
Sand (0.06 - 2.0 cm)	10	
Silt (0.004 - 0.06 cm)	5	-
Embeddedness (%)	25	57
Chemical Measurements	-0	
Temperature (C)	19.31	1.5
Specific conductance (umhos)	85	
DO (mg/l)	8.42	Section of the
DO % saturation	91.2	
Baro pressure (mm)	756	Bannin
pH	7	
Salinity (PSS)	0.04	De August
<b>Biological Attributes</b>		
Canopy (%)	60	200
Aquatic vegetation		Sec.
Algae suspended		-
Algae filamentous	<b></b>	
Diatoms	Y	
Macrophytes		and the second second
Occurance of macroinvertebrates	V	_
Ephemeroptera Blacentera	Y Y	
Plecoptera Trichoptera	Y V	
Trichoptera Coleoptera	1	
Megaloptera		
Odonata		
Chironomidae		
Simuliidae		
Decapoda		
Gammaridae		
Mollusca		F
Oligochaeta		1 Y
Other macroinvertebrates	Diptera	/
<b>Fig14 Come 1 11/1</b>	<b>X</b> 7 <b>•</b>	
Field faunal condition	Very good	-
Notes/observations:		
		I
		т

ID: TIOR Station: 01



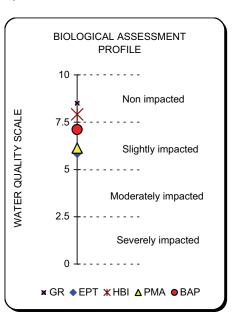
Watershed Assessment Associates Field Report

Appendix III

STREAM SITE: LOCATION: DATE: SAMPLE TYPE: SUBSAMPLE:	Cedar Pond Brook Just above CR 106/21 14 July 2006 Kick sample 100	TIOR 01 0 bridge
ANNELIDA OLIGOCHAETA		
	Sphaariidaa	Undetermined Oligochaeta
ARTHROPODA INSECTA	Sphaeriidae	Undetermined Sphaeriidae
EPHEMEROPTERA	Baetidae	Baetis sp.
	Ephemerellidae	Ephemerella sp.
PLECOPTERA	Perlidae	Acroneuria sp.
	Pteronarcidae	Perlesta sp. Pteronarcys sp.
COLEOPTERA	Psephenidae	Psephenus herricki
	1 Sephenidae	Ectopria nervosa
TRICHOPTERA	Philopotamidae	Dolophilodes sp.
	Hydropsychidae	Hydropsyche sp.
DIPTERA	Tipulidae	Hexatoma sp.
	Chironomidae	Thienemannimyia gr. spp.
		Undetermined Orthocladiinae
		Rheocricotopus sp.
		Thienemanniella xena
		Microtendipes pedellus gr.
		Microtendipes rydalensis gr.
		Polypedilum aviceps Polypedilum flavum
		Undetermined Chironomini
		Rheotanytarsus sp.
		Tanytarsus sp.

# BIOLOGICAL ASSESSMENT PROFILE (BAP)GENERA RICHNESS:23BIOTIC INDEX:4.09EPT RICHNESS:7MODEL AFFINITY:56ASSESSMENT:7.11 (Slightly impacted)

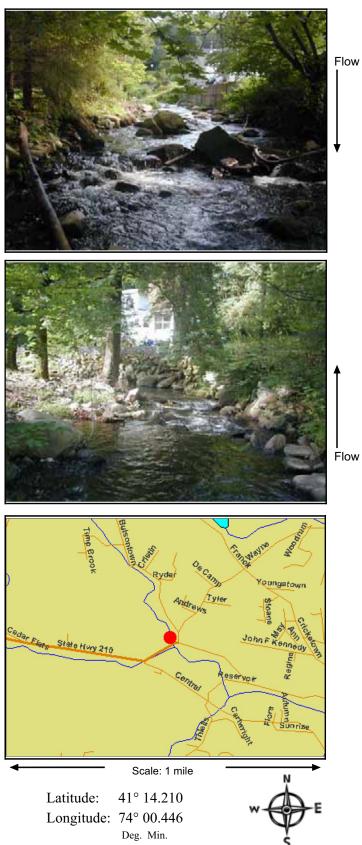
IMPACT SOURCE DETERMINATION (ISD)			
NATURAL	52		
NUTRIENT ADDITIONS	34		
TOXIC	24		
ORGANIC	26		
COMPLEX	26		
SILTATION	26		
IMPOUNDMENT	25		



Stream name: Cedar Pond Brook	Waters	hed: Hudson
Location: Just above W. Main St	treet bridge	
Municipality: Stony Point	Rockland Co. NY	11 PM
Date sampled: Friday, July 14, 20		
Arrival time at station: 8:18 AM	000	1 COLOR
Field personnel involved: J. Kelly	y Nolan	- 244
Physical Characteristics		
Width (meters)	4	
Depth (meters)	0.25	100
Current (cm/sec)	98	
Substrate (%)	20	Sec. Stre
Rock (>25.4 cm or bedrock) Rubble (6.35 - 25.4 cm)	20 50	
Gravel (0.2 - 6.35 cm)	30 15	1-0-
Sand (0.06 - 2.0 cm)	10	
Silt (0.004 - 0.06 cm)	5	
Embeddedness (%)	25	
Chemical Measurements		
Temperature (C)	22.78	
Specific conductance (umhos)	146	
DO (mg/l)	8.09	
DO % saturation	93.6	54
Baro pressure (mm)	759	15
pH	7.13	
Salinity (PSS)	0.07	
Biological Attributes	=0	and the second second
Canopy (%)	70	-
Aquatic vegetation Algae suspended		
Algae filamentous		William .
Diatoms	Y	DY.
Macrophytes	1	
Occurance of macroinvertebrates	5	
Ephemeroptera	Y	/
Plecoptera	Y	
Trichoptera	Y	
Coleoptera		5
Megaloptera	Y	·
Odonata	Y	
Chironomidae		C.
Simuliidae		Cedar Flars
Decapoda Gammaridae		
Mollusca		
Oligochaeta	Y	
Other macroinvertebrates	1	
Field faunal condition	Very good	
Notes/observations:		
		I



Station: 03



Appendix III

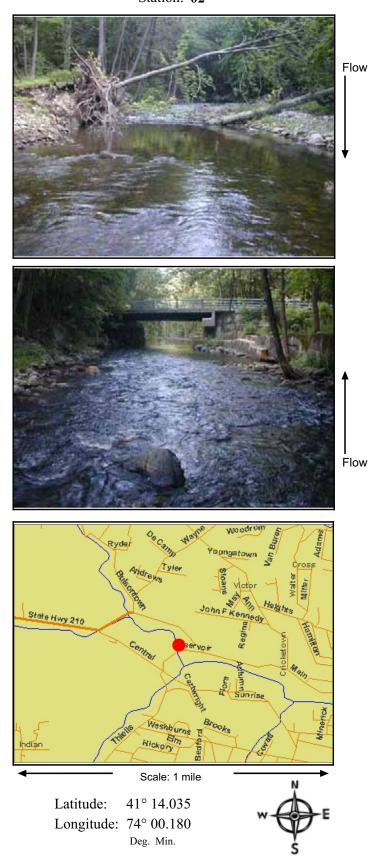
STREAM SITE: LOCATION: DATE: SAMPLE TYPE: SUBSAMPLE:	Timp Mtn. Brook Just above W. Main S 14 July 2006 Kick sample 100	CDRP 03 treet bridge		
ARTHROPODA INSECTA EPHEMEROPTERA PLECOPTERA ODONATA MEGALOPTERA TRICHOPTERA	Isonychiidae Baetidae Ephemerellidae Perlidae Gomphidae Corydalidae Philopotamidae	Isonychia s Acentrella s Baetis sp. Ephemerella Acroneuria Undetermin Corydalus c Chimarra sp	sp. a sp. sp. ed Gon cornutus o.	5
DIPTERA	Hydropsychidae Rhyacophilidae Hydroptilidae Lepidostomatidae Tipulidae Empididae Chironomidae	Cheumatop Hydropsych Rhyacophila Hydroptila s Undetermin Antocha sp. Dicranota s Hexatoma s Undetermin Undetermin Thieneman Diamesa sp Microtendip Microtendip Polypedilum Rheotanyta	ne sp. a sp. sp. ed Lep p. ed Tipu ed Emp nimyia o. es pede es ryda n avicep n flavun	idostomatidae ulidae bididae gr. spp. ellus gr. alensis gr. os n
BIOLOGICAL ASSESSI GENERA RICHNESS: BIOTIC INDEX: EPT RICHNESS: MODEL AFFINITY: ASSESSMENT:	/ENT PROFILE (BAP) 25 4.32 11 61 8 (Non impacted)		SCALE	BIOLOGICAL ASSESSMENT PROFILE 10 T Non impacted 7.5
IMPACT SOURCE DET NATURAL NUTRIENT ADDITIONS TOXIC ORGANIC COMPLEX SILTATION IMPOUNDMENT	51		WATER QUALITY SCALE	Slightly impacted 5 2.5 0 0

× GR ♦ EPT ¥HBI ▲PMA ●BAP

Stream name: Cedar Pond Brook		ned: Hudson
Location: Just above Reservoir R	ld. bridge	
Municipality: Stony Point	<b>Rockland Co. NY</b>	STATISTICS.
Date sampled: Friday, July 14, 20	006	
Arrival time at station: <b>7:30 AM</b>		
Field personnel involved: J. Kelly	Nolan	TAKE WERE
Physical Characteristics		Seatt - The
Width (meters)	9	Construction of
Depth (meters)	0.25	
Current (cm/sec)	95	at the
Substrate (%)		and the second se
Rock (>25.4 cm or bedrock)	10	and the second
Rubble (6.35 - 25.4 cm)	60	
Gravel (0.2 - 6.35 cm)	15	- 17 I
Sand (0.06 - 2.0 cm)	10	1.1
Silt (0.004 - 0.06 cm)	5	-
Embeddedness (%)	25	2000 103
Chemical Measurements		1.1.28.78
Temperature (C)	19.94	1. 1.
Specific conductance (umhos)	123	
DO (mg/l)	8.39	
DO % saturation	91.9	
Baro pressure (mm)	760	1122 C
pH	7.14	
Salinity (PSS)	0.06	and the second second
<b>Biological Attributes</b>		1. A. S.
Canopy (%)	75	The second
Aquatic vegetation		
Algae suspended		
Algae filamentous		1990 A. 199
Diatoms	Y	
Macrophytes		
Occurance of macroinvertebrates		
Ephemeroptera	Y	
Plecoptera	Y	
Trichoptera	Y	
Coleoptera Megaloptera	Y Y	
Odonata	I	1.1
Chironomidae		State H
Simuliidae		
Decapoda		
Gammaridae		
Mollusca		
Oligochaeta		
Other macroinvertebrates		
		4 5
		<u>Ihdīan</u>
Field faunal condition	Very good	<b>↓</b>

very good

ID: CDRP Station: 02



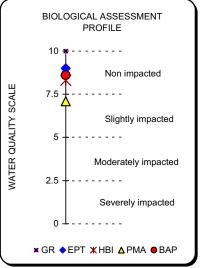
Watershed Assessment Associates Field Report

Notes/observations:

STREAM SITE: LOCATION: DATE: SAMPLE TYPE: SUBSAMPLE:	Cedar Pond Brook Just above Reservoir 14 July 2006 Kick sample 100	CDRP 02 Rd. bridge
ARTHROPODA INSECTA		
EPHEMEROPTERA	Baetidae	Acentrella sp. Baetis sp.
PLECOPTERA	Ephemerellidae Leuctridae Perlidae Perlodidae	Ephemerella sp. Leuctra sp. Perlesta sp. Undetermined Perlodidae
ODONATA COLEOPTERA	Chloroperlidae Gomphidae Psephenidae Elmidae	Undetermined Chloroperlidae Stylogomphus sp. Ectopria nervosa Psephenus herricki
MEGALOPTERA TRICHOPTERA	Corydalidae Philopotamidae	Promoresia sp. Corydalus cornutus Chimarra sp. Dolophilodes sp.
DIPTERA	Hydropsychidae Limnephilidae Odontoceridae Tipulidae	Cheumatopsyche sp. Hydropsyche sp. Undetermined Limnephilidae Psilotreta sp. Hexatoma sp.
DIFTERA	Empididae	Chelifera sp. Hemerodromia sp.
	Chironomidae	Diamesa sp. Brillia sp. Parametriocnemus sp. Microtendipes pedellus gr. Polypedilum aviceps Polypedilum flavum Rheotanytarsus sp.

# BIOLOGICAL ASSESSMENT PROFILE (BAP)GENERA RICHNESS:28BIOTIC INDEX:3.69EPT RICHNESS:13MODEL AFFINITY:62ASSESSMENT:8.6 (Non impacted)

IMPACT SOURCE DETERMINATION (ISD)NATURAL55NUTRIENT ADDITIONS43TOXIC31ORGANIC32COMPLEX39SILTATION32IMPOUNDMENT34



Stream name: Cedar Pond Brook		ned: Hudson
Location: Just above Lowland H	ill Rd. bridge	
Municipality: Stony Point	<b>Rockland Co. NY</b>	200
Date sampled: Friday, July 14, 2	006	12-0
Arrival time at station: 6:45 AM		
Field personnel involved: J. Kelly	v Nolon	STORE S
Physical Characteristics	0	
Width (meters)	8 0.25	
Depth (meters) Current (cm/sec)	0.25 46	1000
Substrate (%)	40	and the second second
Rock (>25.4 cm or bedrock)	10	- States
Rubble (6.35 - 25.4 cm)	60	Same -
Gravel (0.2 - 6.35 cm)	15	
Sand (0.06 - 2.0 cm)	15	1000
Silt (0.004 - 0.06 cm)	5	The Da
Embeddedness (%)	25	
Chemical Measurements		and the second sec
Temperature (C)	19.65	A STORE
Specific conductance (umhos)	175	THE
DO (mg/l)	8.8	WE STATE
DO % saturation	95	
Baro pressure (mm)	756	12210
pH	7.25	100
Salinity (PSS)	0.08	Sec. 4
Biological Attributes	-0	Charles .
Canopy (%)	50	10 a.H.
Aquatic vegetation		2.2
Algae suspended Algae filamentous		1000
Diatoms	Y	
Macrophytes	1	
Occurance of macroinvertebrates	2	
Ephemeroptera	Y	
Plecoptera	Ŷ	iB
Trichoptera	Ŷ	<i>a</i> č
Coleoptera	Y	2
Megaloptera		thum
Odonata		Sunrise
Chironomidae		
Simuliidae		m Mounte
Decapoda		ook wa
Gammaridae		Star Star
Mollusca		Lei
Oligochaeta		$\rangle$
Other macroinvertebrates		B (/
		umb
Field faunal condition	Very good	P8_/
	, cry good	

ID: CDRP Station: 01



Flow

Flow

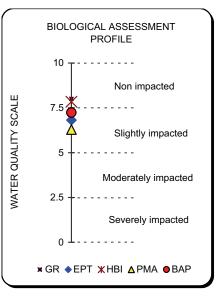
Notes/observations:

STREAM SITE: LOCATION: DATE: SAMPLE TYPE: SUBSAMPLE:	Cedary Pond Brook Just above Lowland H 14 July 2006 Kick sample 100	CDRP 01 lill Rd. bridge
ANNELIDA OLIGOCHAETA		Undetermined Oligochaeta
ARTHROPODA CRUSTACEA		
ISOPODA INSECTA	Asellidae	Caecidotea sp.
EPHEMEROPTERA	Baetidae Ephemerellidae	Baetis sp. Ephemerella sp.
PLECOPTERA	Perlidae	Acroneuria sp. Perlesta sp.
COLEOPTERA	Psephenidae Elmidae	Psephenus herricki Optioservus sp.
TRICHOPTERA	Philopotamidae	Chimarra sp. Dolophilodes sp.
	Hydropsychidae	Cheumatopsyche sp. Hydropsyche sp.
DIPTERA	Limnephilidae Tipulidae Empididae Chironomidae	Undetermined Limnephilidae Antocha sp. Undetermined Empididae Diamesa sp. Cardiocladius obscurus Tvetenia sp. Microtendipes pedellus gr. Polypedilum aviceps Rheotanytarsus sp. Tanytarsus sp.

# BIOLOGICAL ASSESSMENT PROFILE (BAP)GENERA RICHNESS:22BIOTIC INDEX:4.16EPT RICHNESS:9MODEL AFFINITY:57ASSESSMENT:7.2 (Slightly impacted)

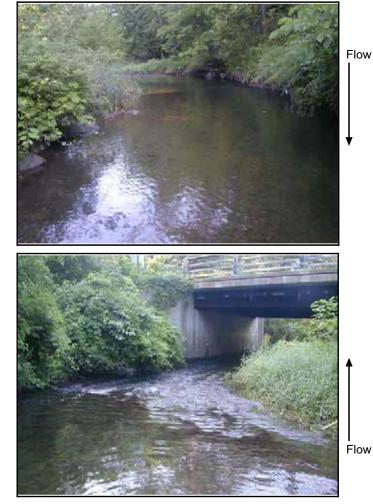
#### IMPACT SOURCE DETERMINATION (ISD) NATURAL 60

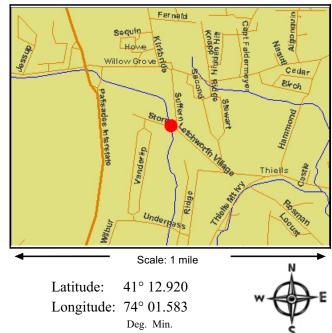
NUTRIENT ADDITIONS	54
TOXIC	32
ORGANIC	42
COMPLEX	40
SILTATION	42
IMPOUNDMENT	46



Stream name: Minisceon		Watershed: I	Hudson
Location: Just above Ste	orrs Rd. bridge		
Municipality: Haverstra	w Rockland	Co. NY	She was
Date sampled: Friday, J	ulv 14, 2006		10
Arrival time at station: 8	U ,		The state
	-		1.
Field personnel involved	•		Contraction of the second
Physical Characteristics			102.10
Width (meters)	6 0.15		Sec. 1
Depth (meters)	0.15 85		
Current (cm/sec) Substrate (%)	05		
Rock (>25.4 cm or be	edrock) 5		
Rubble (6.35 - 25.4 cm			
Gravel (0.2 - 6.35 cm			1.1
Sand (0.06 - 2.0 cm)	20		
Silt (0.004 - 0.06 cm)			-
Embeddedness (%)	40		12
Chemical Measurements			
Temperature (C)	20.48		S. Con
Specific conductance			
DO (mg/l)	8.28		
DO % saturation	91.5		
Baro pressure (mm)	753		
pH	6.6		
Salinity (PSS)	0.06		
Biological Attributes			a second
Canopy (%)	40		
Aquatic vegetation			
Algae suspended			100
Algae filamentous	* 7		
Diatoms	Y		
Macrophytes Occurance of macroinv	antalanataa		
	Y		
Ephemeroptera Plecoptera	Y		NU
Trichoptera	I V		$\square$
Coleoptera	Y		3
Megaloptera	1		\$
Odonata			
Chironomidae			
Simuliidae			
Decapoda	Y		
Gammaridae			
Mollusca			
Oligochaeta			
Other macroinvertebra	ates Diptera	;	
	• •		1
Field faunal condition	Very g	ood	-
Notes/observations:	Pteranarcy, an intole	erant Stonefly	
_ (0.000, 0.0001, 001010)	is noted in the field	-	]
	novea in the netu	p. •••	1







Watershed Assessment Associates Field Report

STREAM SITE:	Minisceongo Creek	MNGO 08
LOCATION:	Just above Storrs Rd.,	bridge
DATE:	14 July 2006	
SAMPLE TYPE:	Kick sample	
SUBSAMPLE:	100	

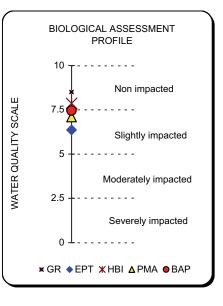
#### NEMERTEA

		Prostoma graecense	1
ARTHROPODA		Undetermined Oligochaeta	1
CRUSTACEA			
DECAPODA	Cambaridae	Undetermined Cambaridae	1
INSECTA	Campanuae	Undetermined Cambandae	I
EPHEMEROPTERA	Baetidae	Baetis sp.	6
EFTIEMENOFTERA	Ephemerellidae	Ephemerella sp.	3
PLECOPTERA	Perlidae	Perlesta sp.	2
COLEOPTERA	Psephenidae	Psephenus herricki	20
COLECTIENA	Flmidae	Optioservus sp.	20
	LIIIIdae	Stenelmis sp.	5
TRICHOPTERA	Philopotamidae	Dolophilodes sp.	2
	Hydropsychidae	Cheumatopsyche sp.	3
	Пушорзуспиае	Hydropsyche sp.	20
	Glossosomatidae	Glossosoma sp.	1
	Rhyacophilidae	Rhyacophila sp.	2
DIPTERA	Tipulidae	Dicranota sp.	4
	Tipulidae	Hexatoma sp.	6
	Chironomidae	Thienemannimyia gr. spp.	1
	ermenendae	Cardiocladius sp.	1
		Orthocladius sp.	4
		Rheocricotopus sp.	1
		Tvetenia sp.	2
		Polypedilum aviceps	7
		Rheotanytarsus sp.	6

BIOLOGICAL ASSESSMENT PROFILE (BAP)			
GENERA RICHNESS:	23		
BIOTIC INDEX:	4.14		
EPT RICHNESS:	8		
MODEL AFFINITY:	62		
ASSESSMENT:	7.46 (Slightly impacted)		

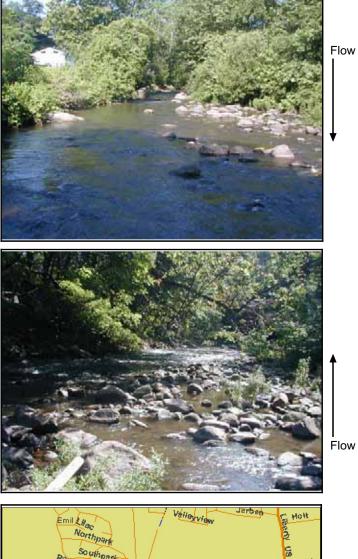
#### IMPACT SOURCE DETERMINATION (ISD) NATURAL 48

NUTRIENT ADDITIONS	53	
TOXIC	38	
ORGANIC	35	
COMPLEX	43	
SILTATION	41	
IMPOUNDMENT	42	



Stream name: Minisceongo Creel	<b>K</b> Wate	ershed: Hudson
Location: Just off Church St.		
Municipality: Haverstraw	<b>Rockland Co. N</b>	Y
Date sampled: Friday, July 14, 20		
Arrival time at station: 9:33 AM	500	
Field personnel involved: J. Kelly	v Nolan	
Physical Characteristics		ALTER
Width (meters)	12	and the second
Depth (meters)	0.2	
Current (cm/sec)	68	
Substrate (%)		1997
Rock (>25.4 cm or bedrock)	35	2 - 10
Rubble (6.35 - 25.4 cm)	30	- Starting
Gravel (0.2 - 6.35 cm)	10	
Sand (0.06 - 2.0 cm)	15	
Silt (0.004 - 0.06 cm)	10	1000
Embeddedness (%)	50	
Chemical Measurements	22.04	
Temperature (C)	22.04	1
Specific conductance (umhos) $DO(max^{(1)})$	285	56
DO (mg/l) DO % saturation	8.25 93.8	
	93.8 760	1.00
Baro pressure (mm)	7.00	101-
pH Salinity (PSS)	0.14	
Biological Attributes	0.14	
Canopy (%)	30	
Aquatic vegetation	30	) <b>&gt;</b>
Algae suspended		Sec.
Algae filamentous	Y	1. 194
Diatoms	Ŷ	
Macrophytes	-	AC INC.
Occurance of macroinvertebrates	5	1
Ephemeroptera	Y	
Plecoptera	_	
Trichoptera	Y	
Coleoptera		
Megaloptera	Y	
Odonata		
Chironomidae	Y	Bubenko
Simuliidae	Y	Lynd
Decapoda		Buffern
Gammaridae	Y	
Mollusca		Cr
Oligochaeta		7 500
Other macroinvertebrates	Isopoda;	Ramapo
Field faunal condition	Good	Sycar
	G000	
Notes/observations:		
		]

ID: MNGO Station: 04



Southpack US HWY Tan Acres Lewis OVP. Beechwood 뚋 Brughest Ha Kaemmerik 5 Madison Ratroad Bubenko Jackson Đy, Lynch Jackson church North uffern Hunt Eatonan Capt Jones Sand Teverone ୢୖୖୖ Barnes uerlook. US HWY 202 High Westside Oak antin Sycamore Rema Oldfield Scale: 1 mile Latitude: 41° 12.436 Longitude: 73° 59.729

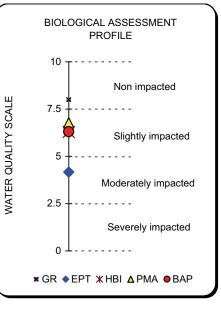
Deg. Min.

Watershed Assessment Associates Field Report

STREAM SITE: LOCATION: DATE: SAMPLE TYPE: SUBSAMPLE:	Minisceongo Creek Just off Church St. 14 July 2006 Kick sample 100	MNGO 04
PLATYHELMINTHES TURBELLARIA		
	Planariidae	Undetermined Turbellaria Undetermined Oligochaeta
ARTHROPODA CRUSTACEA		Undetermined Oligochaeta
ISOPODA	Asellidae	Caecidotea sp.
AMPHIPODA	Crangonyctidae	Crangonyx sp.
	Gammaridae	Gammarus sp.
INSECTA		
COLEOPTERA	Psephenidae	Psephenus herricki
	Elmidae	Stenelmis sp.
MEGALOPTERA	Corydalidae	Corydalus cornutus
TRICHOPTERA	Philopotamidae	Chimarra sp.
	Hydropsychidae	Cheumatopsyche sp.
		Hydropsyche sp.
DIPTERA	Tipulidae	Antocha sp.
	Simuliidae	Simulium sp.
	Empididae	Undetermined Empididae
	Chironomidae	Diamesa sp.
		Cardiocladius sp.
		Cricotopus sp.
		Orthocladius sp.
		Polypedilum aviceps Polypedilum flavum
		Polypedilum illinoense
		Rheotanytarsus sp.
		nnootanytalous sp.

# BIOLOGICAL ASSESSMENT PROFILE (BAP)GENERA RICHNESS:22BIOTIC INDEX:5.47EPT RICHNESS:4MODEL AFFINITY:60ASSESSMENT:6.31 (Slightly impacted)

IMPACT SOURCE DETERMINATION (ISD)		
NATURAL	35	
NUTRIENT ADDITIONS	58	
TOXIC	54	
ORGANIC	45	
COMPLEX	69	
SILTATION	49	
IMPOUNDMENT	47	



# Field Data Summary

Flow

Flow

Stream name: Minisceongo Creek	Watershed: H	Hudson	ID: MNGO	
Location: Just above RR bridge ac	cessed from Joseph St.		Station: 03	
Municipality: Haverstraw R	ockland Co. NY			
Date sampled: Friday, July 14, 200			Company of The	the state
Arrival time at station: <b>11:26 AM</b>	0			
	* •		A B	-
Field personnel involved: J. Kelly N	olan		and the second	
Physical Characteristics				
Width (meters)	10		100 Ares	and the second second
Depth (meters)	0.25		E CALLER STORE	12
Current (cm/sec)	50		THE REAL PROPERTY.	
Substrate (%)	-	Constant Lightler		
Rock (>25.4 cm or bedrock)	5			
Rubble (6.35 - 25.4 cm)	65	<b>网络新闻的</b> 名词	国際のないのない	
Gravel $(0.2 - 6.35 \text{ cm})$	15		States & States	State State
Sand $(0.06 - 2.0 \text{ cm})$	10	Bart Bart		
Silt $(0.004 - 0.06 \text{ cm})$	5 40	The state of the s	The second second	Contraction of the local
Embeddedness (%) Chemical Measurements	40	The second second		
Temperature (C)	23.36			and the second
Specific conductance (umhos)	312			
DO (mg/l)	8.14			and the second s
DO % saturation	95.1		<b>新华(1)</b> 1946	S. Carton
Baro pressure (mm)	761	Contraction of the second s	Strange Bern	
pH	7.47		A LAND A	
Salinity (PSS)	0.15		And the second second	and the second
Biological Attributes				
Canopy (%)	25		Ser Production	- In the second
Aquatic vegetation				1 Statement
Algae suspended			and the set of the	and and
Algae filamentous	Y			-
Diatoms	Y			Not the second
Macrophytes				
Occurance of macroinvertebrates				
Ephemeroptera	Y	Con to the	L S Rait E	5
Plecoptera	V	ve∰anaværsanav Herdin	ran 🖉 🖉 💭 🛛	
Trichoptera	Y Y		Rattroad Beach	
Coleoptera Megaloptera	ľ	Zugibe Strack		
Odonata		Abtors Samsondale	Mackey	
Chironomidae	Y	H ALL	48 ' 💛 🔹 🔪	
Simuliidae	1	2 0	Anthony J Marin	Te P
Decapoda		G B Halgren Vieto		
Gammaridae		Harding o		Pen 🔺
Mollusca		Us Huy 202 Martingo	Shan Shan	anton)
Oligochaeta		A Western US Hwy SW	$A \times A \times A$	Ing wiston L
Other macroinvertebrates		a L orde	Conger NewMai	h Main Allison
			Se Au	M3 44 H
			Store Hillieldie	Alapla Haat
Field faunal condition	Good	<b>↓</b>	Scale: 1 mile	
Notes/observations:				Ņ
		Latitude: 4	·1° 12.217	
		Longitude: 7	'3° 58.769	DD.
		Ī	Deg. Min.	r i
				5

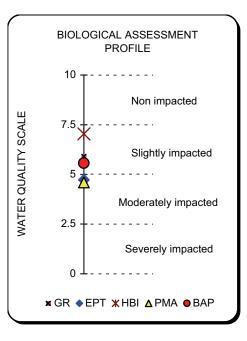
STREAM SITE:	Minisceongo Creek	MNGO 03
LOCATION:	Just above RR bridge a	accessed from Joseph St.
DATE:	14 July 2006	
SAMPLE TYPE:	Kick sample	
SUBSAMPLE:	100	

#### PLATYHELMINTHES TURBELLARIA

IURDELLARIA			
	Planariidae	Undetermined Turbellaria Undetermined Oligochaeta	1 1
ARTHROPODA		-	
CRUSTACEA			
AMPHIPODA	Gammaridae	Gammarus sp.	2
INSECTA			
EPHEMEROPTERA	Baetidae	Baetis sp.	9
COLEOPTERA	Psephenidae	Psephenus herricki	1
	Elmidae	Optioservus sp.	1
		Stenelmis sp.	1
TRICHOPTERA	Philopotamidae	Chimarra sp.	2
	Hydropsychidae	Cheumatopsyche sp.	26
		Hydropsyche sp.	34
	Hydroptilidae	Hydroptila sp.	1
DIPTERA	Tipulidae	Antocha sp.	3
	Empididae	Undetermined Empididae	1
	Chironomidae	Eukiefferiella sp.	1
		Tvetenia sp.	1
		Microtendipes pedellus gr.	1
		Polypedilum flavum	11
		Rheotanytarsus sp.	3

# BIOLOGICAL ASSESSMENT PROFILE (BAP)GENERA RICHNESS:18BIOTIC INDEX:4.87EPT RICHNESS:5MODEL AFFINITY:47ASSESSMENT:5.57 (Slightly impacted)

IMPACT SOURCE DETERMINATION (ISD)NATURAL38NUTRIENT ADDITIONS64TOXIC44ORGANIC60COMPLEX65SILTATION42IMPOUNDMENT64



# Field Data Summary

Stream name: Minisceo	ngo Creek Watershed:	Hudson ID: MNGO
Location: Aprox 100 m	eters below Samsondale Ave. brid	idge Station: 02
Municipality: Haverstra	aw Rockland Co. NY	
Date sampled: Friday, J	July 14, 2006	
Arrival time at station: 1	•	
Field personnel involved		Flow
Physical Characteristics	-	
Width (meters)	<u>2</u> 14	
Depth (meters)	0.25	
Current (cm/sec)	68	
Substrate (%)		
Rock (>25.4 cm or b	edrock) 5	and the second
Rubble (6.35 - 25.4 c		
Gravel (0.2 - 6.35 cn		
Sand (0.06 - 2.0 cm)		
Silt (0.004 - 0.06 cm	·	
Embeddedness (%)	25	
<u>Chemical Measurement</u> Temperature (C)	<u>23.22</u>	
Specific conductance		
DO (mg/l)	8.48	
DO % saturation	9.81	
Baro pressure (mm)	765	
pН	7.52	
Salinity (PSS)	0.16	
<b>Biological</b> Attributes		
Canopy (%)	85	
Aquatic vegetation		Sector and the sector of the s
Algae suspended	X	Flow
Algae filamentous Diatoms	Y Y	The second se
Macrophytes	Ŷ	
Occurance of macroiny	vertebrates	
Ephemeroptera	Y	
Plecoptera	-	
Trichoptera	Y	Ve题指a 都 ···································
Coleoptera		Rugibe Strack
Megaloptera		A Hore Samortale
Odonata		A Brownsell Condate & Machine Ba
Chironomidae	Y	Anthony J Marina
Simuliidae		a halgten victor
Decapoda Gammaridae		Bo Spring Tan Groadway Waben
Mollusca		US An Gumee to Shart Sharth
Oligochaeta	Y	a Huy as santiago as provide the second seco
Other macroinvertebr		S Restate Conger NewMain Main Allson
		and Hittington Charles Have
Field faunal condition	n <b>Good</b>	Scale: 1 mile
Notes/observations:	The site is located approximately	N
	50 meters below a 12" diameter	Latitude: 41° 12.169
	permitted discharge pipe.	Longitude: 73° 58.316
	1	Deg. Min.
		5

STREAM SITE:	Minisceongo Creek	MNGO 02
LOCATION:	Aprox 100 meters belo	w Samsondale Ave., bridge
DATE:	14 July 2006	
SAMPLE TYPE:	Kick sample	
SUBSAMPLE:	100	

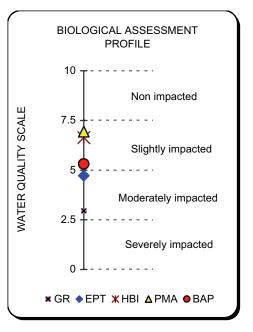
#### NEMERTEA

ARTHROPODA		Prostoma graecense Undetermined Oligochaeta	3 5
INSECTA EPHEMEROPTERA	Baetidae	Destis en	25
		Baetis sp.	25
COLEOPTERA	Psephenidae	Psephenus herricki	1
	Elmidae	Stenelmis sp.	6
TRICHOPTERA	Philopotamidae	Chimarra sp.	1
	Hydropsychidae	Cheumatopsyche sp.	13
		Hydropsyche sp.	34
	Hydroptilidae	Hydroptila sp.	1
DIPTERA	Tipulidae	Antocha sp.	1
	Chironomidae	Diamesa sp.	3
		Polypedilum flavum	7

### BIOLOGICAL ASSESSMENT PROFILE (BAP)

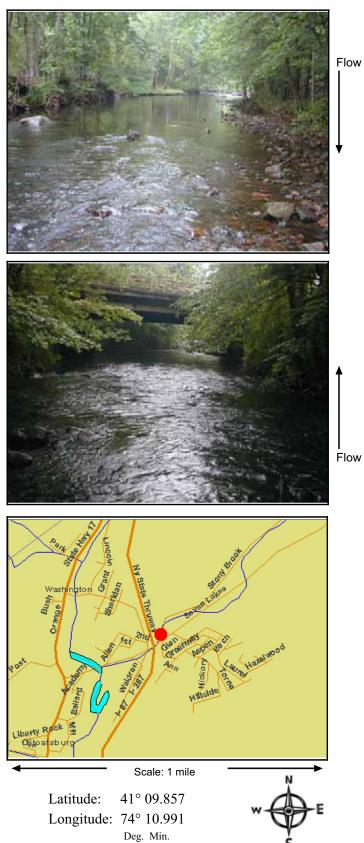
GENERA RICHNESS:	12
BIOTIC INDEX:	5.19
EPT RICHNESS:	5
MODEL AFFINITY:	61
ASSESSMENT:	5.31 (Slightly impacted)

IMPACT SOURCE DETERMINATION (ISD)		
NATURAL	46	
NUTRIENT ADDITIONS	62	
TOXIC	49	
ORGANIC	63	
COMPLEX	65	
SILTATION	46	
IMPOUNDMENT	63	



Stream name: Stoney Bro		d: Ramapo
Location: Just above Seve	en Lakes Rd. bridge	
Municipality: Ramapo	<b>Rockland Co. NY</b>	140000
Date sampled: Saturday,	July 15, 2006	
Arrival time at station: <b>4:0</b>	•	100
Field personnel involved:	J. Kelly Nolan	<b>建造</b> 2年1
Physical Characteristics		
Width (meters)	5.5	A DECEMBER OF
Depth (meters)	0.4	100 E
Current (cm/sec)	1	
Substrate (%)		
Rock (>25.4 cm or bed		ranh.
Rubble (6.35 - 25.4 cm		
Gravel $(0.2 - 6.35 \text{ cm})$	20	
Sand $(0.06 - 2.0 \text{ cm})$	15	10 March 10
Silt $(0.004 - 0.06 \text{ cm})$	5	
Embeddedness (%)	25	
<u>Chemical Measurements</u>	22.66	a survey and
Temperature (C)	23.66	a second
Specific conductance ( $v$	umhos) 65 8.01	5000
DO (mg/l) DO % saturation	8.01 94.4	
	752	
Baro pressure (mm) pH	6.67	
Salinity (PSS)	0.04	
Biological Attributes	0.04	
Canopy (%)	60	
Aquatic vegetation	00	-
Algae suspended		
Algae filamentous		
Diatoms	Y	
Macrophytes		1. 小市
Occurance of macroinver	rtebrates	
Ephemeroptera	Y	$\overline{}$
Plecoptera	Y	$\sim$
Trichoptera	Y	
Coleoptera		~
Megaloptera	Y	Wa
Odonata		tish and
Chironomidae		
Simuliidae		0
Decapoda		×
Gammaridae		Post
Mollusca		
Oligochaeta	<b>T</b> 1	
Other macroinvertebrat	es Leech;	
		Liberty Res Ostoatst
Field faunal condition	Very good	
	v ci y goou	
	Pteranarcy, an intolerant Stonef	ly, L



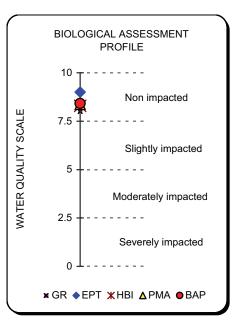


is noted in the field sample.

STREAM SITE: LOCATION: DATE: SAMPLE TYPE: SUBSAMPLE:	Stoney Brook Just above Seven Lak 15 July 2006 Kick sample 100	STOB 01 es Rd., bridge
PLATYHELMINTHES TURBELLARIA	Planariidae	Undetermined Turbellaria Undetermined Oligochaeta
ARTHROPODA INSECTA		
EPHEMEROPTERA	Baetidae	Acentrella sp. Baetis sp.
	Heptageniidae	Epeorus (Iron) sp. Stenonema sp.
PLECOPTERA	Perlidae	Acroneuria sp. Paragnetina sp. Perlesta sp.
ODONATA COLEOPTERA MEGALOPTERA TRICHOPTERA	Peltoperlidae Aeschnidae Psephenidae Corydalidae Philopotamidae	Tallaperla sp. Boyeria sp. Psephenus herricki Nigronia serricornis Chimarra sp. Dolophilodes sp.
DIPTERA	Hydropsychidae Glossosomatidae Chironomidae	Cheumatopsyche sp. Hydropsyche sp. Glossosoma sp. Orthocladius sp. Rheocricotopus sp. Tvetenia vitracies Polypedilum aviceps

# BIOLOGICAL ASSESSMENT PROFILE (BAP)GENERA RICHNESS:22BIOTIC INDEX:3.71EPT RICHNESS:13MODEL AFFINITY:73ASSESSMENT:8.41 (Non impacted)

IMPACT SOURCE DETERMINATION (ISD)NATURAL63NUTRIENT ADDITIONS43TOXIC41ORGANIC32COMPLEX34SILTATION33IMPOUNDMENT32



## Field Data Summary

Stream name: Mahwah River	Watershed: Ramapo	ID: MAWA
Location: Aprox 100 meters above M	ontebello Rd. bridge	Station: 01
-	kland Co. NY	
	IN THE STATE OF TH	
Date sampled: Saturday, July 15, 200	0	
Arrival time at station: 2:36 PM		Flow
Field personnel involved: J. Kelly Nol	lan <b>an an an an</b>	
Physical Characteristics		and the second sec
	5.5	
	).22	
	10	
Substrate (%)		
Rock (>25.4 cm or bedrock) 5	5	and the second
	30	
	30	and the second s
	30	
Silt (0.004 - 0.06 cm) 5		
	25	
Chemical Measurements		The second s
	22.99	
1	126	
	8.41	the second states and the second
	99.1	A REAL PROPERTY AND A REAL
1	752	and the same second for the same second s
1	7.57	
	0.21	
Biological Attributes	70	
Canopy (%) 7 Aquatic vegetation	0	
Algae suspended		
Algae filamentous	N	Flow
Macrophytes		
Occurance of macroinvertebrates		1993年4月1日中国的1994年(1994年) 1993年1月1日中国的1994年(1994年)
Ephemeroptera	Y	
Plecoptera	-	is 510 Mayor
	Y	
Coleoptera	Y ( )	Notice 2
Megaloptera Y	Y Y	US HANDLE ROADIN STORE
Odonata		
Chironomidae	Y Ste	Montebello East
Simuliidae	the start of	ELOY A
1		
Gammaridae		Ord Nativ
Mollusca	Y	5/13 Marr + 287 + 87
Oligochaeta	- <u>)</u>	
Other macroinvertebrates	- ISV	<u>.</u>
	[-Lateyette'	Lackawanna
Field faunal condition	Good	Lackawanna
	300u -	Scale: 1 mile
Notes/observations:		Ň
	Latitud	
	Longitu	ude: 74° 08.118
		Deg. Min.
		5

Watershed Assessment Associates Field Report

41

Appendix III

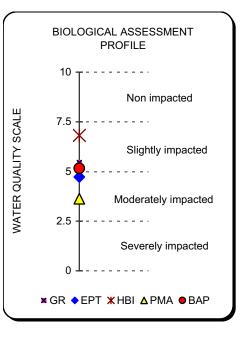
STREAM SITE:	Mahwah River	MAWA 01
LOCATION:	Aprox 100 meters al	bove Montebello Rd., bridge
DATE:	15 July 2006	
SAMPLE TYPE:	Kick sample	
SUBSAMPLE:	100	

#### MOLLUSCA PELECYPODA

ARTHROPODA	Sphaeriidae	Undetermined Sphaeriidae	4
CRUSTACEA AMPHIPODA INSECTA	Gammaridae	Gammarus sp.	23
EPHEMEROPTERA	Baetidae	Baetis sp.	4
	Heptageniidae	Stenonema sp.	4
COLEOPTERA	Psephenidae	Psephenus herricki	5
	Elmidae	Optioservus sp.	16
		Stenelmis sp.	28
MEGALOPTERA	Corydalidae	Corydalus cornutus	1
		Nigronia serricornis	2
TRICHOPTERA	Philopotamidae	Chimarra sp.	1
	Hydropsychidae	Cheumatopsyche sp.	4
		Hydropsyche sp.	1
DIPTERA	Chironomidae	Thienemannimyia gr. spp.	2
		Brillia sp.	1
		Parametriocnemus sp.	1
		Polypedilum flavum	2
		Stictochironomus sp.	1

BIOLOGICAL ASSESSMENT PROFILE (BAP)			
GENERA RICHNESS:	17		
BIOTIC INDEX:	5.05		
EPT RICHNESS:	5		
MODEL AFFINITY:	41		
ASSESSMENT:	5.2 (Slightly impacted)		

IMPACT SOURCE DETE	ERMINATION (ISD)
NATURAL	40
NUTRIENT ADDITIONS	61
TOXIC	38
ORGANIC	24
COMPLEX	41
SILTATION	33
IMPOUNDMENT	41

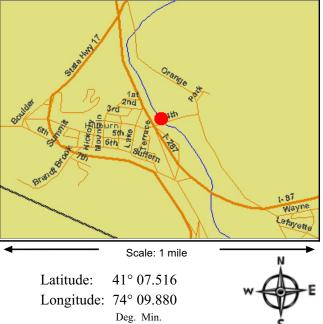


Stream name: Ramapo River	Water	rshed: Ramapo
Location: Just above Fourth St. I	bridge	
Municipality: Ramapo	Rockland Co. NY	
Date sampled: Saturday, July 15,		
	, 2000	
Arrival time at station: <b>3:20 PM</b>		
Field personnel involved: J. Kelly	v Nolan	COMPANY OF T
Physical Characteristics		
Width (meters)	22	
Depth (meters)	0.3	
Current (cm/sec)	80	
Substrate (%)	10	
Rock (>25.4 cm or bedrock)	10	14 2 M
Rubble $(6.35 - 25.4 \text{ cm})$	25	and section
Gravel $(0.2 - 6.35 \text{ cm})$	30	10.000
Sand (0.06 - 2.0 cm) Silt (0.004 - 0.06 cm)	20 15	
Embeddedness (%)	25	
Chemical Measurements	25	
Temperature (C)	23.66	and the second second
Specific conductance (umhos)	282	
DO (mg/l)	8.38	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
DO % saturation	98.3	CONTRACTOR OF
Baro pressure (mm)	754	- inter
pH	7.4	
Salinity (PSS)	0.14	646
<b>Biological</b> Attributes		1000 C
Canopy (%)	20	
Aquatic vegetation		
Algae suspended		
Algae filamentous	Y	
Diatoms	Y	
Macrophytes Occurance of macroinvertebrates		
Ephemeroptera	Y	
Plecoptera	Y	
Trichoptera	Ŷ	
Coleoptera	•	
Megaloptera		
Odonata		
Chironomidae	Y	10
Simuliidae		Double
Decapoda	Y	5rh
Gammaridae		
Mollusca		
Oligochaeta		Bra
Other macroinvertebrates		Second Se
Field faunal condition	Very good	
	, er, goou	•
Notes/observations:		т



Flow

Flow



Appendix III

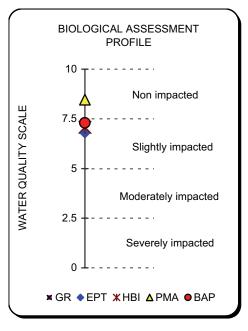
STREAM SITE:	Ramapo River	RAMA 07
LOCATION:	Just above Fourth St.,	bridge
DATE:	15 July 2006	
SAMPLE TYPE:	Kick sample	
SUBSAMPLE:	100	

#### ARTHROPODA CRUSTACEA

CRUSTAGEA			
AMPHIPODA INSECTA	Gammaridae	Gammarus sp.	1
EPHEMEROPTERA	Baetidae	Acentrella sp.	1
		Baetis sp.	25
	Caenidae	Caenis sp.	2
PLECOPTERA	Capniidae	Undetermined Capniidae	1
	Perlidae	Paragnetina sp.	2
COLEOPTERA	Psephenidae	Psephenus herricki	7
	Elmidae	Optioservus sp.	5
		Stenelmis sp.	3
TRICHOPTERA	Philopotamidae	Chimarra sp.	6
	Psychomyiidae	Lype diversa	1
	Hydropsychidae	Cheumatopsyche sp.	13
		Hydropsyche sp.	11
DIPTERA	Tipulidae	Antocha sp.	3
	Chironomidae	Diamesa sp.	2
		Cardiocladius sp.	9
		Eukiefferiella sp.	2
		Orthocladius sp.	2
		Tvetenia sp.	1
		Polypedilum flavum	3

# BIOLOGICAL ASSESSMENT PROFILE (BAP)GENERA RICHNESS:20BIOTIC INDEX:4.84EPT RICHNESS:9MODEL AFFINITY:74ASSESSMENT:7.29 (Slightly impacted)

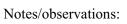
IMPACT SOURCE DETERMINATION (ISD)NATURAL56NUTRIENT ADDITIONS56TOXIC50ORGANIC31COMPLEX45SILTATION39IMPOUNDMENT42



Stream name: Pascack Brook	Watershe	d: Hackensack
Location: Just off Memorial Park	Dr.	
Municipality: Ramapo	Rockland Co. NY	
Date sampled: Saturday, July 15, 2		A DESCRIPTION
Arrival time at station: 12:35 PM	2000	No. of Concession, Name
Field personnel involved: J. Kelly	Nolan	Contraction of the local division of the loc
Physical Characteristics		S HAR BOST
Width (meters)	10.8	
Depth (meters)	0.07	-
Current (cm/sec)	0.37	A REAL PROPERTY AND INCOMENT
Substrate (%)	-	1997年1月1日
Rock (>25.4 cm or bedrock)	5	State and the
Rubble (6.35 - 25.4 cm)	10	and the way
Gravel $(0.2 - 6.35 \text{ cm})$	35	1452
Sand (0.06 - 2.0 cm) Silt (0.004 - 0.06 cm)	40	Star and
Embeddedness (%)	10	STREET TIMES
<u>Chemical Measurements</u>	50	
Temperature (C)	23.6	
Specific conductance (umhos)	23.0 641	
DO (mg/l)	7.17	
DO % saturation	84.6	
Baro pressure (mm)	750	
pH	7.35	
Salinity (PSS)	0.31	The second second second
Biological Attributes		ALC: NO
Canopy (%)	5	
Aquatic vegetation	-	
Algae suspended		
Algae filamentous	Y	The second
Diatoms	Y	
Macrophytes		
Occurance of macroinvertebrates		and and all the
Ephemeroptera	Y	The week
Plecoptera		Morris
Trichoptera	Y	NICE EUM
Coleoptera		And The
Megaloptera		Marman
Odonata		Fanley
Chironomidae	Y	Maple
Simuliidae	N	
Decapoda	N	i Hoyt
Gammaridae	Y	D O X
Mollusca	V	ole
Oligochaeta Other macroinvertebrates	Y Isopoda:	IN WAT
Other macromvertebrates	Isopoda;	Ternore C
		Wolfe 8
		As During 14A

Field faunal condition

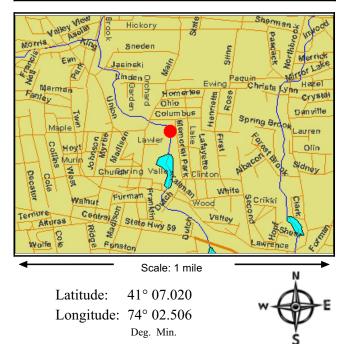
Good



There is abundant litter noted at the station.



ID: PASC Station: 04



Flow

Flow

Pascack Creek

Just off Memorial Park Dr.

STREAM SITE:

LOCATION:

DATE: SAMPLE TYPE: SUBSAMPLE:	15 July 2006 Kick sample 100		
NEMERTEA OLIGOCHAETA ARTHROPODA	Glossiphoniidae	Prostoma graecense Undetermined Oligochaeta Undetermined Hirudinea	1 7 1
CRUSTACEA ISOPODA	Asellidae	Caecidotea sp.	10
AMPHIPODA	Crangonyctidae	Crangonyx sp.	9
INSECTA	orangony orado		Ū
EPHEMEROPTERA	Baetidae	Baetis sp.	22
TRICHOPTERA	Hydropsychidae	Cheumatopsyche sp.	3
		Hydropsyche sp.	6
DIPTERA	Empididae	Undetermined Empididae	1
	Chironomidae	Natarsia sp. A	1
		Thienemannimyia gr. spp.	6
		Cricotopus sp.	9
		Endochironomus sp.	1
		Parametriocnemus sp.	1
		Polypedilum flavum Polypedilum illinoense	2 8
		Polypedilum scalaenum gr.	0 7
		Rheotanytarsus sp.	4
		Tanytarsus sp.	1
		· ·	

PASC 04

#### **BIOLOGICAL ASSESSMENT PROFILE (BAP)**

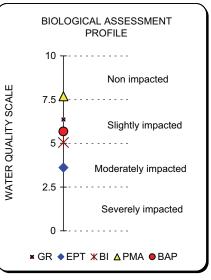
GENERA RICHNESS:	19
BIOTIC INDEX:	6.45
EPT RICHNESS:	3
MODEL AFFINITY:	66
ASSESSMENT:	5.68 (Slightiy impacted)

#### IMPACT SOURCE DETERMINATION (ISD)

NATURAL	46	
NUTRIENT ADDITIONS	53	
TOXIC	58	
ORGANIC	56	
COMPLEX	56	
SILTATION	51	
IMPOUNDMENT	41	

#### NUTRIENT BIOTIC INDEX (NBI)

NBI-P	7.23
NBI-N	5.68



Location: Just below Blue Heron Rd. bridge Municipality: Clarkstown Rockland Co. NY Date sampled: Saturday, July 15, 2006 Arrival time at station: 11:13 AM Field personnel involved: J. Kelly Nolan Physical Characteristics Width (meters) 5 Depth (meters) 0.14 Current (cm/sec) 47 Substrate (%) Rock (>25.4 cm or bedrock) 5 Rubble (6.35 - 25.4 cm) 50 Gravel (0.2 - 6.35 cm) 20 Sand (0.06 - 2.0 cm) 15 Silt (0.004 - 0.06 cm) 10 Embeddedness (%) 50 Chemical Measurements Temperature (C) 21.5 Specific conductance (umhos) 811 DO (mg/l) 7.56 DO % saturation 86.2 Baro pressure (mm) 754 pH 7.07 Salinity (PSS) 0.4 Biological Attributes Canopy (%) 10 Aquatic vegetation Algae suspended Algae suspended Algae suspended Algae filamentous Y Diatoms Y Macrophytes Occurance of macroinvertebrates Ephemeroptera Y Plecoptera Chironomidae Y Simuliidae Decapoda Gammaridae Y Mollusca Other macroinvertebrates Isopoda;	Stream name: Pascack Brook	Watershed: I	Hackensack
Municipality: Clarkstown Rockland Co. NY Date sampled: Saturday, July 15, 2006 Arrival time at station: 11:13 AM Field personnel involved: J. Kelly Nolan <u>Physical Characteristics</u> Width (meters) 5 Depth (meters) 0.14 Current (cm/sec) 47 Substrate (%) Rock (>25.4 cm or bedrock) 5 Rubble (6.35 - 25.4 cm) 50 Gravel (0.2 - 6.35 cm) 20 Sand (0.06 - 2.0 cm) 15 Silt (0.004 - 0.06 cm) 10 Embeddedness (%) 50 <u>Chemical Measurements</u> Temperature (C) 21.5 Specific conductance (umhos) 811 DO (mg/l) 7.56 DO % saturation 86.2 Baro pressure (mm) 754 pH 7.07 Salinity (PSS) 0.4 <u>Biological Attributes</u> Canopy (%) 10 Aquatic vegetation Algae suspended Algae filamentous Y Diatoms Y Macrophytes Occurance of macroinvertebrates Ephemeroptera Y Plecoptera Trichoptera Y Megaloptera Odonata Chironomidae Y Simuliidae Decapoda Gammaridae Y Mollusca Oligochaeta Other macroinvertebrates Isopoda;	Location: Just below Blue Heron R	d. bridge	
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Other macroinvertebrates Isopoda;			5
Other macroinvertebrates Isopoda;	Oligochaeta		stbo
and the second se		Isopoda;	un an an
Field faunal condition <b>Good</b>		-	See Des
Field faunal condition Good		~ .	S
	Field faunal condition	Good	

Notes/observations:

There is discarded litter noted at

the station.

ID: PASC Station: 02



Convent

EssexO ž Castle

Latitude:

Scale: 1 mile

41° 05.698

Deg. Min.

Longitude: 74° 01.951

Flow

carrie

Apollo

Appendix III

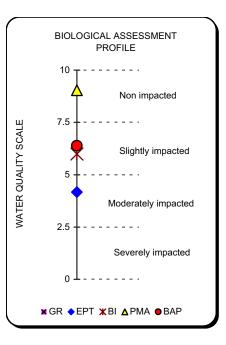
STREAM SITE:	Pascack Brook	PASC 02
LOCATION:	Just below Blue Heron	Rd., bridge
DATE:	15 July 2006	
SAMPLE TYPE:	Kick sample	
SUBSAMPLE:	100	

PLATYHELMINTHES	
TURBELLARIA	

	Planariidae	Undetermined Turbellaria	1
		Undetermined Oligochaeta	2
	Glossiphoniidae	Undetermined Hirudinea	1
ARTHROPODA CRUSTACEA			
ISOPODA	Asellidae	Caecidotea sp.	2
INSECTA	Destides	Destis en	20
EPHEMEROPTERA	Baetidae	Baetis sp.	38
COLEOPTERA	Elmidae	Stenelmis sp.	1
TRICHOPTERA	Hydropsychidae	Cheumatopsyche sp.	10
		Hydropsyche sp.	10
	Hydroptilidae	Hydroptila sp.	1
DIPTERA	Tipulidae	Antocha sp.	2
	Simuliidae	Simulium sp.	1
	Empididae	Undetermined Empididae	2
	Chironomidae	Diamesa sp.	3
		Cardiocladius obscurus	2
		Cricotopus sp.	8
		Orthocladius sp.	6
		Parametriocnemus sp.	1
		Tvetenia sp.	3
		Polypedilum flavum	6

BIOLOGICAL ASSESSMENT PROFILE (BAP)		
GENERA RICHNESS:	19	
BIOTIC INDEX:	5.71	
EPT RICHNESS:	4	
MODEL AFFINITY:	80	
ASSESSMENT:	6.39 (Slightly impacted)	

IMPACT SOURCE DETERMINATION (ISD)		
NATURAL	59	
NUTRIENT ADDITIONS	55	
TOXIC	58	
ORGANIC	46	
COMPLEX	42	
SILTATION	44	
IMPOUNDMENT	41	



Stream name: Muddy Creek	Watershed:	Hackensack
Location: Just below W. Washingt	on Ave. bridge	
_	ockland Co. NY	
Date sampled: Saturday, July 15, 2		
Arrival time at station: 1:35 PM	000	
	T - 1	
Field personnel involved: J. Kelly N	Nolan	Ser Store
Physical Characteristics		
Width (meters)	3.5	The lot of the
Depth (meters)	0.11	
Current (cm/sec)	0.4	
Substrate (%)		2.0
Rock (>25.4 cm or bedrock) Rykhla $(6.25 - 25.4 \text{ cm})$	10	- An
Rubble $(6.35 - 25.4 \text{ cm})$	10	A construction
Gravel (0.2 - 6.35 cm) Sand (0.06 - 2.0 cm)	20 35	
· · · · · · · · · · · · · · · · · · ·	35 35	and the second second
Silt (0.004 - 0.06 cm) Embeddedness (%)	35 75	All of
Chemical Measurements	/5	1 1020
Temperature (C)	22.6	5 22
Specific conductance (umhos)	988	The second s
DO (mg/l)	6.91	
DO % saturation	80.3	
Baro pressure (mm)	756	100
pH	750	
Salinity (PSS)	0.49	AllR. Filter
Biological Attributes	0.72	1 Dec
Canopy (%)	10	11 Second
Aquatic vegetation	10	1 Martin
Algae suspended		A - A DAL
Algae filamentous	Y	The
Diatoms	Ŷ	122-
Macrophytes	-	2.1
Occurance of macroinvertebrates		1921
Ephemeroptera	Y	
Plecoptera	-	- time
Trichoptera	Y	ALouacdie
Coleoptera		F V
Megaloptera		Guttman
Odonata		Maggiolo S
Chironomidae	Y	
Simuliidae		
Decapoda	Y	
Gammaridae	Y	13
Mollusca		E I
Oligochaeta		Woodian
Other macroinvertebrates		Magno
		Sha
Field formal condition	Cood	Azale
Field faunal condition	Good	•

Notes/observations:

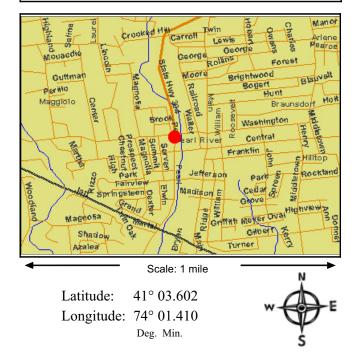


Flow

Flow

ID: MUDD





Appendix III

STREAM SITE:	Muddy Creek	MUDD 02
LOCATION:	Just below W.	Washington Ave., bridge
DATE:	15 July 2006	
SAMPLE TYPE:	Kick sample	
SUBSAMPLE:	100	

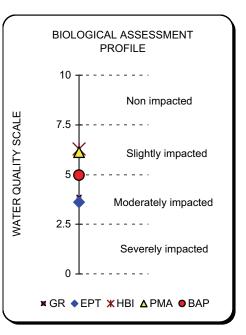
#### ARTHROPODA CRUSTACEA

CRUSTALEA			
ISOPODA	Asellidae	Caecidotea sp.	4
AMPHIPODA	Gammaridae	Gammarus sp.	8
INSECTA			
EPHEMEROPTERA	Baetidae	Baetis sp.	6
COLEOPTERA	Elmidae	Stenelmis sp.	44
TRICHOPTERA	Hydropsychidae	Cheumatopsyche sp.	9
		Hydropsyche sp.	6
DIPTERA	Empididae	Undetermined Empididae	2
	Chironomidae	Thienemannimyia gr. spp.	11
		Cricotopus sp.	2
		Parametriocnemus sp.	2
		Tvetenia sp.	2
		Microtendipes pedellus gr.	1
		Polypedilum flavum	1
		Stictochironomus sp.	2

## BIOLOGICAL ASSESSMENT PROFILE (BAP)

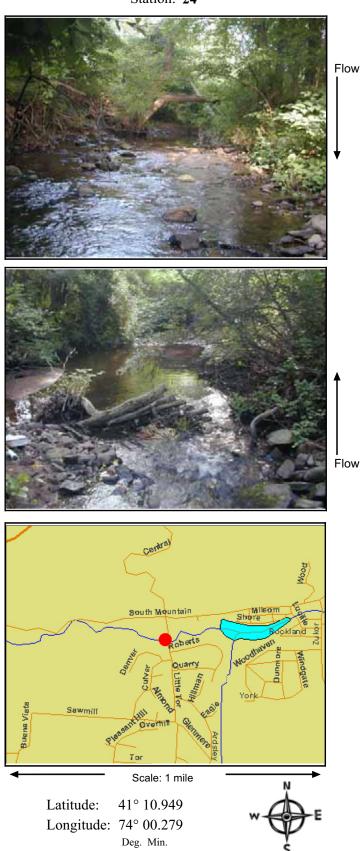
GENERA RICHNESS:	14
BIOTIC INDEX:	5.47
EPT RICHNESS:	3
MODEL AFFINITY:	56
ASSESSMENT:	4.97 (Moderately impacted)

IMPACT SOURCE DETERMINATION (ISD)		
NATURAL	34	
NUTRIENT ADDITIONS	52	
TOXIC	61	
ORGANIC	35	
COMPLEX	45	
SILTATION	40	
IMPOUNDMENT	62	



Stream name: Hackensack Creek	Watershed:	Hackensack
Location: Just above Old Route 30	4 bridge	
	Rockland Co. NY	
Date sampled: Saturday, July 15, 2		
	.000	N. L. Star
Arrival time at station: 7:30 AM		and the second
Field personnel involved: J. Kelly	Nolan	1 Alton
Physical Characteristics		
Width (meters)	4.5	850 B 850
Depth (meters)	0.17	
Current (cm/sec)	0.87	
Substrate (%)	10	1.1
Rock (>25.4 cm or bedrock)	10	In the second
Rubble $(6.35 - 25.4 \text{ cm})$	50 15	
Gravel (0.2 - 6.35 cm) Sand (0.06 - 2.0 cm)	15 20	
Silt (0.004 - 0.06 cm)	5	
Embeddedness (%)	25	
<u>Chemical Measurements</u>	20	Te was
Temperature (C)	18.17	
Specific conductance (umhos)	393	10 A
DO (mg/l)	8.2	
DO % saturation	87.4	
Baro pressure (mm)	758	Ser AF
pH	7.38	
Salinity (PSS)	0.19	
Biological Attributes		12 3/2
Canopy (%)	60	
Aquatic vegetation		
Algae suspended	V	
Algae filamentous Diatoms	Y Y	a realized
Macrophytes	1	A STREET
Occurance of macroinvertebrates		
Ephemeroptera	Y	
Plecoptera	Ŷ	
Trichoptera	Y	
Coleoptera	Y	
Megaloptera		
Odonata		
Chironomidae	Y	$\sim 1$
Simuliidae	• •	$\sim$
Decapoda	Y	
Gammaridae Mollusca		
Oligochaeta		
Other macroinvertebrates		Sa N
other macromverce)rates		Buena Viata
		_ē
Field faunal condition	Very good	
Notos/absomutions		-
Notes/observations:		Latit

## ID: **HACK** Station: **24**



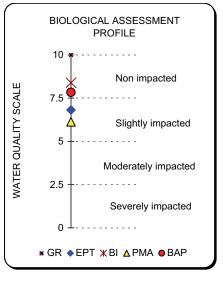
STREAM SITE: LOCATION: DATE: SAMPLE TYPE: SUBSAMPLE:	Hackensack Creek Just above Old Route 15 July 2006 Kick sample 100	HACK 24 304 bridge	
ANNELIDA OLIGOCHAETA		Undetermined Oligochaeta	1
ARTHROPODA CRUSTACEA ISOPODA	Asellidae	Caecidotea sp.	1
INSECTA			-
EPHEMEROPTERA	Baetidae	Baetis sp.	6
PLECOPTERA	Leuctridae	Leuctra sp.	3
	Perlidae	Acroneuria sp.	10
COLEOPTERA	Psephenidae	Ectopria nervosa	1
		Psephenus herricki	3
	Elmidae	Optioservus sp.	6
		Promoresia sp.	6
		Stenelmis sp.	2
TRICHOPTERA	Philopotamidae	Chimarra sp.	1
		Dolophilodes sp.	4
	Hydropsychidae	Cheumatopsyche sp.	2
		Hydropsyche sp.	9
	Rhyacophilidae	Rhyacophila sp.	2
	Glossosomatidae	Glossosoma sp.	1
DIPTERA	Tipulidae	Antocha sp.	5
	Simuliidae	Simulium sp.	1
	Empididae	Undetermined Empididae	1
	Chironomidae	Diamesa sp.	9
		Cardiocladius sp.	1
		Eukiefferiella sp.	1
		Orthocladius sp.	1
		Synorthocladius nr. semivirens	1
		Tvetenia sp.	5
		Polypedilum aviceps	12
		Polypedilum flavum	1
		Polypedilum illinoense	1
		Sublettea coffmani	1
		Rheotanytarsus sp.	2

#### **BIOLOGICAL ASSESSMENT PROFILE (BAP)**

GENERA RICHNESS:	30
BIOTIC INDEX:	3.61
EPT RICHNESS:	9
MODEL AFFINITY:	56
ASSESSMENT:	7.83 (Non impacted)

#### IMPACT SOURCE DETERMINATION (ISD)

NATURAL	61
NUTRIENT ADDITIONS	44
TOXIC	28
ORGANIC	31
COMPLEX	27
SILTATION	30
IMPOUNDMENT	32



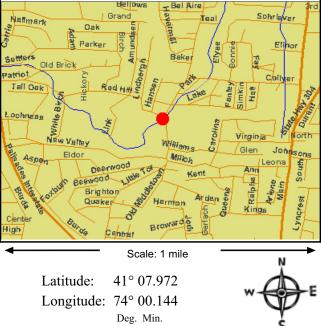
#### 52

Stream name: Hackensack Creek	
Location: Just above Sittle Torr	Rd. bridge
Municipality: Clarkstown	<b>Rockland Co. NY</b>
Date sampled: Friday, July 14, 20	006
Arrival time at station: 12:44 PM	
	v Nolon
Field personnel involved: J. Kelly	y INDIAII
Physical Characteristics	25
Width (meters)	3.5 0.1
Depth (meters) Current (cm/sec)	40
Substrate (%)	40
Rock (>25.4 cm or bedrock)	50
Rubble (6.35 - 25.4 cm)	30
Gravel (0.2 - 6.35 cm)	10
Sand (0.06 - 2.0 cm)	5
Silt (0.004 - 0.06 cm)	5
Embeddedness (%)	25
Chemical Measurements	
Temperature (C)	19.38
Specific conductance (umhos)	471
DO (mg/l)	8.88
DO % saturation	96.7
Baro pressure (mm)	756
pH Solinity (DSS)	6.84 0.23
Salinity (PSS) <u>Biological Attributes</u>	0.23
Canopy (%)	85
Aquatic vegetation	00
Algae suspended	
Algae filamentous	
Diatoms	Y
Macrophytes	Y
Occurance of macroinvertebrates	3
Ephemeroptera	Y
Plecoptera	• 7
Trichoptera	Y
Coleoptera	
Megaloptera Odonata	
Chironomidae	Y
Simuliidae	Ŷ
Decapoda	Ŷ
Gammaridae	-
Mollusca	
Oligochaeta	
Other macroinvertebrates	Diptera
Field formation with	
Field faunal condition	Good
Notes/observations:	

ershed: Hackensack ID: DMRK

Station: 01



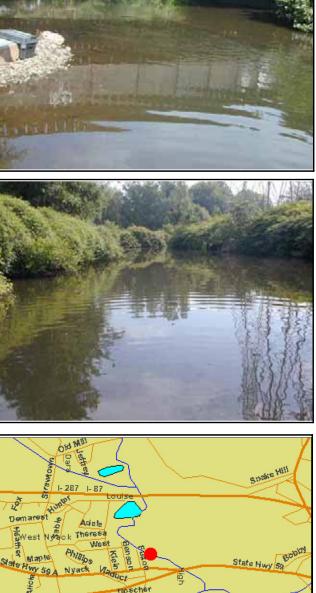


Flow

Flow

STREAM SITE: LOCATION: DATE: SAMPLE TYPE: SUBSAMPLE:	Hackensack River Bra Just above Sittle Torr I 14 July 2006 Kick sample 100			
ANNELIDA OLIGOCHAETA		Lin da ta maina d	Oliveration	0
ARTHROPODA CRUSTACEA ISOPODA	Asellidae	Undetermined Caecidotea sp	-	2
INSECTA EPHEMEROPTERA TRICHOPTERA	Baetidae Philopotamidae Hydropsychidae	Baetis sp. Dolophilodes s Cheumatopsyc	p. he sp.	11 20 14
DIPTERA	Hydroptilidae Tipulidae Simuliidae Tabanidae	Hydropsyche s Hydroptila sp. Antocha sp. Simulium sp. Tabanus sp.	p.	6 1 2 1 1
	Empididae Chironomidae	Undetermined Diamesa sp. Cardiocladius s Cricotopus sp.		7 3 1 1
		Orthocladius s Parametriocne Tvetenia sp. Undetermined	mus sp.	1 7 4 1
		Polypedilum av Polypedilum illi Undetermined Undetermined	riceps noense Chironomini	7 1 1 1
		Micropsectra s	p	6
BIOLOGICAL ASSESSM GENERA RICHNESS:	IENT PROFILE (BAP) 23 4.3			AL ASSESSMENT ROFILE
BIOTIC INDEX: EPT RICHNESS: MODEL AFFINITY:	5 53		10	Non impacted
ASSESSMENT:	6.6 (Slightly impacted)		7.5¥ ≻	Slightly impacted
IMPACT SOURCE DETI NATURAL NUTRIENT ADDITIONS TOXIC ORGANIC	49		MATER QUALITY SCALE	Moderately impacted
COMPLEX SILTATION IMPOUNDMENT	53 37 52		0	Severely impacted
			× GR ♦EPT :	¥HBI ∆PMA ●BAP

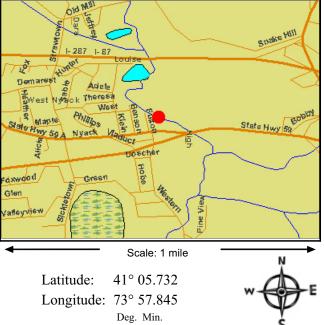
Stream name: Hackensack Creek	Watershed:	Hackensack
Location: Just below RR bridge a	t end of Fulton Ave.	
0	<b>Rockland Co. NY</b>	
Date sampled: Saturday, July 15,		and the second
· · · · ·	2000	States and
Arrival time at station: 9:36 AM		and the second
Field personnel involved: J. Kelly	Nolan	
Physical Characteristics		Section and the section of the secti
Width (meters)	8.5	5
Depth (meters)	0.3	LE
Current (cm/sec)	48	
Substrate (%)	10	
Rock (>25.4 cm or bedrock)	10	
Rubble $(6.35 - 25.4 \text{ cm})$	30	Strain and
Gravel $(0.2 - 6.35 \text{ cm})$	30 15	data 14
Sand (0.06 - 2.0 cm) Silt (0.004 - 0.06 cm)	15	Street.
Embeddedness (%)	13 50	and the second second
Chemical Measurements	50	
Temperature (C)	24.1	The second second
Specific conductance (umhos)	461	A TONY
DO (mg/l)	5.26	the second
DO % saturation	62.4	
Baro pressure (mm)	760	
pH	6.84	
Salinity (PSS)	0.22	
<b>Biological Attributes</b>		Webman 2
Canopy (%)	10	
Aquatic vegetation		
Algae suspended	<b>X</b> 7	<b>K</b> 14
Algae filamentous	Y	6
Diatoms	Y	1
Macrophytes Occurance of macroinvertebrates	Y	- Gene
Ephemeroptera		
Plecoptera		
Trichoptera	Y	town
Coleoptera	-	
Megaloptera		Tit to
Odonata		Demarest p
Chironomidae	Y	West Ny a
Simuliidae		State Haple
Decapoda	Y	Wate Hwy 59 A
Gammaridae	Y	Alio
Mollusca		
Oligochaeta	Y	FORWOOD
Other macroinvertebrates		Glen G
		Valleyview 5
Field faunal condition	Poor	
	- • • •	•
Notes/observations:		Latit



ID: HACK Station: 01A

Flow

Flow



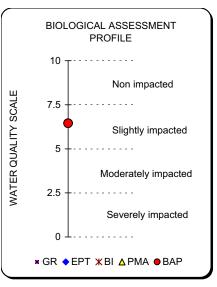
STREAM SITE: LOCATION: DATE: SAMPLE TYPE: SUBSAMPLE:	Hackensack River Just below RR bridge 15 July 2006 Kick sample 100	HACK 01A at end of Fulton Ave.	
PLATYHELMINTHES TURBELLARIA			
	Planariidae	Undetermined Turbellaria	1
		Undetermined Oligochaeta	3
ARTHROPODA CRUSTACEA	Glossiphoniidae	Undetermined Hirudinea	1
AMPHIPODA INSECTA	Gammaridae	Gammarus sp.	34
COLEOPTERA	Elmidae	Ancyronyx variegatus	1
		Dubiraphia sp.	1
		Optioservus sp.	1
NEUDODTEDA	0	Stenelmis sp.	26
NEUROPTERA	Sisyridae	Undetermined Sisyridae	2
TRICHOPTERA DIPTERA	Hydropsychidae Empididae	Cheumatopsyche sp. Undetermined Empididae	19 3
DIFTENA	Chironomidae	Cricotopus sp.	1
	onnononnaac	Glyptotendipes sp.	1
		Microtendipes pedellus gr.	1
		Polypedilum flavum	2
		Polypedilum scalaenum gr.	3

#### **BIOLOGICAL ASSESSMENT PROFILE (BAP)**

GENERA RICHNESS:	16
BIOTIC INDEX:	5.63
EPT RICHNESS:	1
MODEL AFFINITY:	41
ASSESSMENT:	6.45* (Slightly impacted)

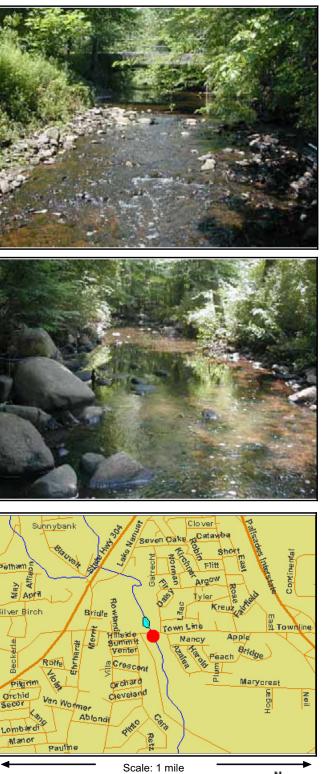
#### IMPACT SOURCE DETERMINATION (ISD)

NATURAL	31
NUTRIENT ADDITIONS	50
TOXIC	55
ORGANIC	42
COMPLEX	53
SILTATION	48
IMPOUNDMENT	54



Stream name: Nauraushaun Brook	Watershed: I	Hackensack
Location: Just below Town Line Ro	d. bridge	
	ockland Co. NY	
Date sampled: Friday, July 14, 2000	D	
Arrival time at station: 1:35 PM		A CONTRACTOR
Field personnel involved: J. Kelly N	lolan	Section 1
Physical Characteristics		- 10 11 - 11
Width (meters)	4.5	
Depth (meters)	0.1	State Share
Current (cm/sec)	50	200 16
Substrate (%)		1 2 2
Rock (>25.4 cm or bedrock)	4	-
Rubble (6.35 - 25.4 cm)	40	1.00
Gravel (0.2 - 6.35 cm)	40	
Sand (0.06 - 2.0 cm)	10	
Silt (0.004 - 0.06 cm)	5	
Embeddedness (%)	40	
Chemical Measurements		
Temperature (C)	25.55	
Specific conductance (umhos)	687	
DO (mg/l)	8.27	1
DO % saturation	101.3	
Baro pressure (mm)	756	
pH	7.77	and the second s
Salinity (PSS)	0.33	100
Biological Attributes		
Canopy (%)	50	
Aquatic vegetation		histing the
Algae suspended	*7	Contraction of the
Algae filamentous	Y	
Diatoms	Y	
Macrophytes Occurance of macroinvertebrates		E
	V	
Ephemeroptera	Y	Suhnyba
Plecoptera Trichontora	V	$\langle \rangle \sim$
Trichoptera Coleoptera	Y	Peinam 5
Megaloptera		
Odonata		April
Chironomidae		Silver Birch
Simuliidae		11-1
Decapoda	Y	च
Gammaridae	1	Rolfe Rolfe
Mollusca		
Oligochaeta		Orchid 10
Other macroinvertebrates	Planarian	Secor Van W
		Lombardi
		Manor
Field faunal condition	Good	
Notos/ahaamatiana		
Notes/observations:		Latit
		Lutiti

ID: NAUR Station: 03



Latitude: 41° 04.714 Longitude: 73° 59.840 Deg. Min. Flow

Flow

STREAM SITE:	Nauraushaun Brook NAUR 03	
LOCATION:	Just below Town Line Rd., bridge	
DATE:	14 July 2006	
SAMPLE TYPE:	Kick sample	
SUBSAMPLE:	100	

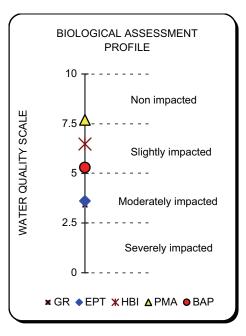
#### ANNELIDA OLIGOCHAETA

		Undetermined Oligochaeta	2
ARTHROPODA			
INSECTA			
EPHEMEROPTERA	Baetidae	Baetis sp.	19
COLEOPTERA	Elmidae	Stenelmis sp.	8
TRICHOPTERA	Hydropsychidae	Cheumatopsyche sp.	25
		Hydropsyche sp.	10
DIPTERA	Tipulidae	Antocha sp.	4
	Empididae	Undetermined Empididae	3
	Chironomidae	Diamesa sp.	7
		Orthocladius sp.	1
		Parametriocnemus sp.	1
		Tvetenia sp.	1
		Cryptochironomus sp.	1
		Polypedilum flavum	18

### BIOLOGICAL ASSESSMENT PROFILE (BAP)

GENERA RICHNESS:	13
BIOTIC INDEX:	5.32
EPT RICHNESS:	3
MODEL AFFINITY:	66
ASSESSMENT:	5.29 (Slightly impacted)

IMPACT SOURCE DETERMINATION (ISD)						
NATURAL	44					
NUTRIENT ADDITIONS	60					
TOXIC	54					
ORGANIC	55					
COMPLEX	61					
SILTATION	47					
IMPOUNDMENT	50					



## **Field Data Summary**

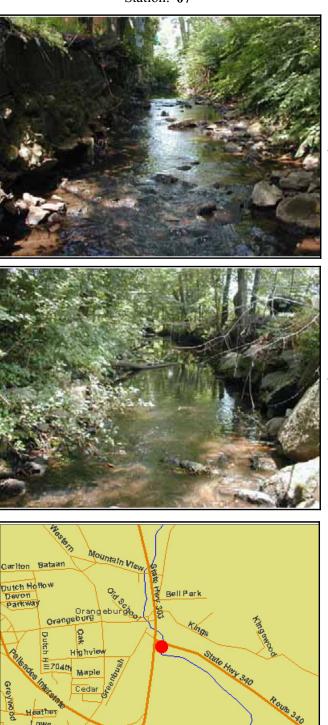
Stream name: Sparkill	V	Vatershed: I	Hudson
Location: Just below Rt. 340 brid	ge		
Municipality: <b>Orangetown</b>	Rockland Co	o. NY	
Date sampled: Friday, July 14, 20			C There
Arrival time at station: 2:40 PM	00		
			ц., "М
Field personnel involved: J. Kelly	Nolan		Sec. 1
Physical Characteristics			2.49
Width (meters)	3.5		
Depth (meters)	0.2		de
Current (cm/sec)	45		0.00
Substrate (%)			1
Rock (>25.4 cm or bedrock)	15		
Rubble (6.35 - 25.4 cm)	40		The B
Gravel $(0.2 - 6.35 \text{ cm})$	20		
Sand $(0.06 - 2.0 \text{ cm})$	10		77
Silt $(0.004 - 0.06 \text{ cm})$	15 50		
Embeddedness (%)	50		
<u>Chemical Measurements</u> Temperature (C)	20.8		19 N.
Specific conductance (umhos)	20.8 676		
DO (mg/l)	070 7.49		Same?
DO % saturation	83.4		elos a
Baro pressure (mm)	762		
pH	6.92		$3 \ll l^{-1}$
Salinity (PSS)	0.33		100
Biological Attributes	0.00		
Canopy (%)	80		144
Aquatic vegetation	00		
Algae suspended			14
Algae filamentous	Y		
Diatoms	Y		
Macrophytes			
Occurance of macroinvertebrates			
Ephemeroptera			
Plecoptera			
Trichoptera	Y		Carlton B
Coleoptera			Dutch Holk
Megaloptera			Devon
Odonata			Parkway
Chironomidae	Y		Art
Simuliidae	Y		$\mathcal{X}$
Decapoda			216.2
Gammaridae			Callestes In
Mollusca			rey
Oligochaeta			S Heat
Other macroinvertebrates			Lov
			$\rightarrow \leftarrow$

Field faunal condition

Notes/observations: There is a grayish cast to the water and heavy brown algae growth on the substrate.

Poor

ID: **SPAR** Station: **07** 



Scale: 1 mile

41° 02.676

Deg. Min.

Longitude: 73° 56.708

Latitude:

Flow

Flow

Appendix III

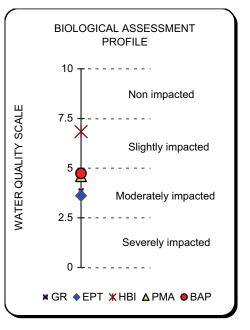
STREAM SITE:	Sparkill	SPAR 07
LOCATION:	Just below Rt., 340 bri	dge
DATE:	14 July 2006	
SAMPLE TYPE:	Kick sample	
SUBSAMPLE:	100	

NEMERTEA

		Prostoma graecense	1
	Planariidae	Undetermined Turbellaria	1
ARTHROPODA INSECTA			
EPHEMEROPTERA	Baetidae	Baetis sp.	3
COLEOPTERA	Elmidae	I	
		Stenelmis sp.	4
TRICHOPTERA	Hydropsychidae	Cheumatopsyche sp.	16
		Hydropsyche sp.	22
DIPTERA	Simuliidae	Simulium sp.	1
	Empididae	Undetermined Empididae	8
	Chironomidae	Thienemannimyia gr. spp.	1
		Diamesa sp.	33
		Orthocladius sp.	3
		Tvetenia sp.	1
		Rheotanytarsus sp.	5
		Tanytarsus sp.	1

BIOLOGICAL ASSESSMENT PROFILE (BAP)					
GENERA RICHNESS:	14				
BIOTIC INDEX:	5.03				
EPT RICHNESS:	3				
MODEL AFFINITY:	47				
ASSESSMENT:	4.73 (Moderately impacted)				

IMPACT SOURCE DE	TERMINATION (ISD)
NATURAL	29
NUTRIENT ADDITION	S 51
TOXIC	43
ORGANIC	48
COMPLEX	53
SILTATION	44
IMPOUNDMENT	52



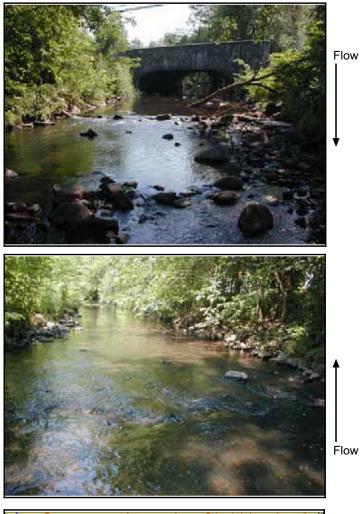
### **Field Data Summary**

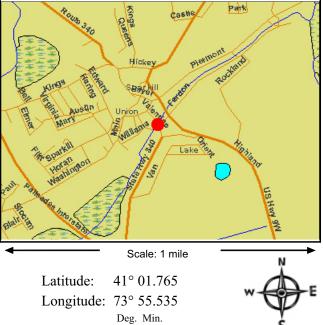
Stream name: Sparkill	Watershed:	Hudson
Location: Just below New St. brid	lge	
Municipality: Orangetown	Rockland Co. NY	
Date sampled: Friday, July 14, 20		
Arrival time at station: 3:14 PM	00	
Field personnel involved: J. Kelly	Nolan	
Physical Characteristics		Section 1
Width (meters)	5.4	Mary Mr.
Depth (meters)	0.2	
Current (cm/sec)	86	and the second second
Substrate (%)	00	
Rock (>25.4 cm or bedrock)	10	
Rubble (6.35 - 25.4 cm)	55	10
Gravel (0.2 - 6.35 cm)	20	
Sand (0.06 - 2.0 cm)	5	1
Silt (0.004 - 0.06 cm)	10	3 14
Embeddedness (%)	50	- Kerner
Chemical Measurements		
Temperature (C)	22.66	Sec. 1
Specific conductance (umhos)	591	
DO (mg/l)	6.47	
DO % saturation	74.3	
Baro pressure (mm)	763	1.2.2
pH	6.83	
Salinity (PSS)	0.29	1000
Biological Attributes	60	
Canopy (%) Aquatic vegetation	00	
Algae suspended		
Algae filamentous	Y	
Diatoms	Y	and the second
Macrophytes	1	and a second
Occurance of macroinvertebrates		69 C C C
Ephemeroptera	Y	
Plecoptera		)
Trichoptera	Y	Fi
Coleoptera		
Megaloptera		作品
Odonata		
Chironomidae	Y	m
Simuliidae	Y	
Decapoda		V
Gammaridae		N. Com
Mollusca		
Oligochaeta Other macroinvertebrates	Iconodo: Dionarian	2 aut Same
Other macromverteorates	Isopoda; Planarian	La
		Blatter
Field faunal condition	Good	

Notes/observations:

There is a grayish cast to the water and abundant brown algae growth on the substrate.

ID: SPAR Station: 06



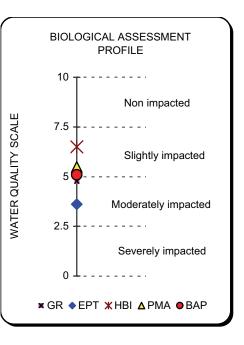


Flow

STREAM SITE: LOCATION: DATE: SAMPLE TYPE: SUBSAMPLE:	Sparkill Just below New St., b 14 July 2006 Kick sample 100	SPAR 06 ridge	
ANNELIDA OLIGOCHAETA			0
ARTHROPODA CRUSTACEA		Undetermined Oligochaeta	2
ISOPODA AMPHIPODA INSECTA	Asellidae Crangonyctidae	Caecidotea sp. Undetermined Crangonyctidae	5 2
EPHEMEROPTERA NEUROPTERA COLEOPTERA	Baetidae Sisyridae Elmidae	Baetis sp. Sisyra sp. Ancyronyx variegatus Stenelmis sp.	1 1 1 27
TRICHOPTERA	Hydropsychidae	Cheumatopsyche sp. Hydropsyche sp.	19 15
DIPTERA	Empididae Chironomidae	Undetermined Empididae Thienemannimyia gr. spp. Diamesa sp. Tvetenia sp. Undetermined Orthocladiinae Polypedilum flavum Rheotanytarsus sp.	8 1 4 1 10 2

# BIOLOGICAL ASSESSMENT PROFILE (BAP)GENERA RICHNESS:16BIOTIC INDEX:5.3EPT RICHNESS:3MODEL AFFINITY:52ASSESSMENT:5.09 (Slightly impacted)

IMPACT SOURCE DETERMINATION (ISD)NATURAL36NUTRIENT ADDITIONS54TOXIC69ORGANIC68COMPLEX63SILTATION61IMPOUNDMENT63



# Water Chemistry and Temperature

Station	Date	Time	Temp. (C)	SC (umhos)	DO (mg/L)	DO % Sat.	pН	Sal. (PSS)
TIOR 01	7/14/2006	5:55 AM	19.31	85	8.42	91.2	7	0.04
CDRP 01	7/14/2006	6:45 AM	19.65	175	8.8	95	7.25	0.08
CDRP 02	7/14/2006	7:30 AM	19.94	123	8.39	91.9	7.14	0.06
CDRP 03	7/14/2006	8:18 AM	22.78	146	8.09	93.6	7.13	0.07
Hackensa	ck Creek							
Station	Date	Time	Temp. (C)	SC (umhos)	DO (mg/L)	DO % Sat.	pН	Sal. (PSS)
DMRK 01	7/14/2006	12:44 PM	19.38	471	8.88	96.7	6.84	0.23
HACK 24	7/15/2006	7:30 AM	18.17	393	8.2	87.4	7.38	0.19
HACK 01A	7/15/2006	9:36 AM	24.1	461	5.26	62.4	6.84	0.22
Mahwah I	River							
Station	Date	Time	Temp. (C)	SC (umhos)	DO (mg/L)	DO % Sat.	pН	Sal. (PSS)
MAWA 01	7/15/2006	2:36 PM	22.99	426	8.41	99.1	7.57	0.21
Minisceon	go Creek							
Station	Date	Time	Temp. (C)	SC (umhos)	DO (mg/L)	DO % Sat.	pН	Sal. (PSS)
MNGO 08	7/14/2006	8:52 AM	20.48	126	8.28	91.5	6.6	0.06
MNGO 04	7/14/2006	9:33 AM	22.04	285	8.25	93.8	7.27	0.14
MNGO 02	7/14/2006	10:43 AM	23.22	326	8.48	9.81	7.52	0.16
MNGO 03	7/14/2006	11:26 AM	23.36	312	8.14	95.1	7.47	0.15
Muddy Cr								
manuay Cl	eek							
Station	eek Date	Time	Temp. (C)	SC (umhos)	DO (mg/L)	DO % Sat.	pН	Sal. (PSS)
		<i>Time</i> 1:35 PM	<i>Temp. (C)</i> 22.6	<b>SC (umhos)</b> 988	<b>DO (mg/L)</b> 6.91	<b>DO % Sat.</b> 80.3	<b>рН</b> 7	<i>Sal. (PSS)</i> 0.49
Station MUDD 02	Date				, j		<b>рН</b> 7	
Station MUDD 02 Nauraush	<b>Date</b> 7/15/2006				, j	80.3	<i>рН</i> 7 <i>рН</i>	0.49
Station MUDD 02	Date 7/15/2006 aun Brook	1:35 PM	22.6	988	6.91	80.3	7	0.49
Station MUDD 02 Nauraush Station	Date     7/15/2006     aun Brook     Date     7/14/2006	1:35 PM <i>Time</i>	22.6 Temp. (C)	988 SC (umhos)	6.91 DO (mg/L)	80.3 DO % Sat.	7 <i>pH</i>	0.49 Sal. (PSS)
Station MUDD 02 Nauraush Station NAUR 03	Date     7/15/2006     aun Brook     Date     7/14/2006	1:35 PM <i>Time</i>	22.6 Temp. (C)	988 SC (umhos)	6.91 DO (mg/L)	80.3 DO % Sat.	7 <i>pH</i>	0.49 <i>Sal. (PSS)</i> 0.33
Station MUDD 02 Nauraush Station NAUR 03 Pascack B	Date     7/15/2006     aun Brook     Date     7/14/2006     crook	1:35 PM <i>Time</i> 1:35 PM	22.6 <i>Temp. (C)</i> 25.55	988 <i>SC (umhos)</i> 687	6.91 <i>DO (mg/L)</i> 8.27	80.3 <b>DO % Sat.</b> 101.3	7 <b><i>pH</i></b> 7.77	0.49 Sal. (PSS)

Appendix IV

### Ramapo River

Station	Date	Time	Temp. (C)	SC (umhos)	DO (mg/L)	DO % Sat.	pН	Sal. (PSS)
RAMA 07	7/15/2006	3:20 PM	23.66	282	8.38	98.3	7.4	0.14
Sparkill								
Station	Date	Time	Temp. (C)	SC (umhos)	DO (mg/L)	DO % Sat.	pН	Sal. (PSS)
SPAR 07	7/14/2006	2:40 PM	20.8	676	7.49	83.4	6.92	0.33
SPAR 06	7/14/2006	3:14 PM	22.66	591	6.47	74.3	6.83	0.29
Stoney Br	ook							
Station	Date	Time	Temp. (C)	SC (umhos)	DO (mg/L)	DO % Sat.	рН	Sal. (PSS)
STOB 01	7/15/2006	4:08 PM	23.66	65	8.01	94.4	6.67	0.04

## Rockland County, NY

## Benthic Macroinvertebrate Taxa Collected

July 14 and 15, 2006

ORDER	FAMILY	GENUS/SPECIES
TUBIFICIDA	Oligochaeta	
AMPHIPODA	Crangonyctidae	
		Crangonyx sp.
	Gammaridae	Gammarus sp.
DECAPODA	Cambaridae	
ISOPODA	Asellidae	Caecidotea sp.
COLEOPTERA	Elmidae	Ancyronyx variegatus
		Dubiraphia sp.
		Optioservus sp.
		Promoresia sp.
		Stenelmis sp.
	Psephenidae	Ectopria nervosa
		Psephenus herricki
DIPTERA	Chironomidae	Brillia sp.
		Cardiocladius obscurus
		Cardiocladius sp.
		Chironomini
		Cricotopus sp.
		Cryptochironomus sp.
		Diamesa sp.
		Endochironomus sp.
		Eukiefferiella sp.
		Glyptotendipes sp.
		Micropsectra sp.
		Microtendipes pedellus gr.
		Microtendipes rydalensis gr.
		Natarsia sp. A
		Orthocladiinae
		Orthocladius sp.
		Parametriocnemus sp.
		Polypedilum aviceps
		Polypedilum flavum
		Polypedilum illinoense
		Polypedilum scalaenum gr.
		Rheocricotopus sp.
		Rheotanytarsus sp.
		Stictochironomus sp.
		Sublettea coffmani
		Synorthocladius nr. semivirens

## Rockland County, NY Benthic Macroinvertebrate Taxa Collected

July 14 and 15, 2006

ORDER	FAMILY	GENUS/SPECIES
DIPTERA	Chironomidae	Tanytarsini
		Tanytarsus sp.
		Thienemanniella xena
		Thienemannimyia gr. spp.
		Tvetenia sp.
		Tvetenia vitracies
	Empididae	
		Chelifera sp.
		Hemerodromia sp.
	Simuliidae	Simulium sp.
	Tabanidae	Tabanus sp.
	Tipulidae	
		Antocha sp.
		Dicranota sp.
		Hexatoma sp.
EPHEMEROPTERA	Baetidae	Acentrella sp.
		Baetis sp.
	Caenidae	Caenis sp.
	Ephemerellidae	Ephemerella sp.
	Heptageniidae	Epeorus (Iron) sp.
	1 0	Stenonema sp.
	Isonychiidae	Isonychia sp.
MEGALOPTERA	Corydalidae	Corydalus cornutus
	-	Nigronia serricornis
NEUROPTERA	Sisyridae	0
	5	Sisyra sp.
ODONATA	Aeschnidae	Boyeria sp.
	Gomphidae	
		Stylogomphus sp.
PLECOPTERA	Capniidae	
	Chloroperlidae	
	Leuctridae	Leuctra sp.
	Peltoperlidae	Tallaperla sp.
	Perlidae	Acroneuria sp.
		Paragnetina sp.
		Perlesta sp.
	Perlodidae	Perlodidae
	Pteronarcidae	Pteronarcys sp.
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## Rockland County, NY Benthic Macroinvertebrate Taxa Collected

July 14 and 15, 2006

ORDER	FAMILY	GENUS/SPECIES	
TRICHOPTERA	Hydropsychidae	Cheumatopsyche sp.	
		Hydropsyche sp.	
	Hydroptilidae	Hydroptila sp.	
	Lepidostomatidae		
	Limnephilidae		
	Odontoceridae	Psilotreta sp.	
	Philopotamidae	Chimarra sp.	
		Dolophilodes sp.	
	Psychomyiidae	Lype diversa	
	Rhyacophilidae	Rhyacophila sp.	
RHYNCHOBDELLIDA	Glossiphoniidae	Hirudinea	
UNIONIDA	Sphaeriidae		
HOPLONEMERTEA	Tetrastemmatidae	Prostoma graecense	
TRICLADIDA	Planariidae	Turbellaria	