Staff used the remaining water to complete field chemistry analysis. Temperature was measured in degrees Celsius with a field thermometer. A Cole-Parmer Model 5996 meter was used to measure pH. Conductivity was measured with a Cole-Parmer 1481 meter, and dissolved oxygen was measured with a YSI 55 meter. Turbidity also was measured in the field with a Hach 2100P portable turbidometer.

Cohocton River south of Bath, N.Y.

Stream discharge was measured, when wading was possible, using a Scientific Instruments pygmy or AA meter, or a FlowTracker according to United States Geological Survey (USGS) methods (Buchanan and Somers, 1969). Three sites were located at USGS gage sites, where the discharge for the time of sampling was obtained from the appropriate USGS web site. During the February sampling round, no discharge measurements were taken due to ice.

In June 2007, staff sampled for benthic macroinvertebrates (organisms that live on the stream bottom, including aquatic insects, crayfish, clams, snails, and worms) at 22 locations in the Cohocton River Watershed, using a modified version of Rapid Bioassessment Protocol (RBP) III (Barbour and others, 1999). Two kick screen samples were taken at each station by disturbing the substrate of representative riffle/run areas and collecting the dislodged material with a one-meter-square 600-micron mesh screen. Each sample was preserved in 95 percent denatured ethyl alcohol and returned to SRBC's lab. A 200-count subsample was picked for each sample, and organisms were identified to genus (when possible), except for midges and aquatic worms, which were identified to family. Duplicate macroinvertebrate samples were completed at 10 percent of the sites for quality assurance purposes.

Physical habitat conditions were assessed using a modified version of RBP III (Plafkin and others, 1989; Barbour and others, 1999). Staff evaluated stream sites based on physical characteristics relating to pool and riffle composition, substrate, conditions of banks, and the extent of riparian zone. Each habitat parameter was assessed on a scale of 0-20, with 20 being optimal; all parameter scores were added together to generate the total habitat score for each site. Other field observations also were recorded regarding weather, land use, substrate composition, and any other relevant watershed features.

Volatile organic/BTEX samples were collected by hand directly from the stream. Water was poured carefully into an amber 40-ml vial so as to minimize aeration and volatilization. The sample was preserved with 1:1 HCl to a pH of between 1 and 2. Two vials were collected at each site and were wrapped together in a 500-ml wide-mouth Nalgene bottle and placed immediately on ice. For quality assurance, a blank sample was completed using organic free de-ionized water once during each sampling round.

Staff could not conduct storm sampling as planned due to insufficient rainfall during the periods of interest. A few samples were taken in April 2008 during a small storm that covered only the lower half of the watershed. For these samples, water was collected using a depth-integrated bridge sampler, placed into a churn splitter, mixed thoroughly and split into three 500-ml bottles, one 125-ml bottle, two vials for TOC, and one glass sediment bottle. The remainder of the water was used for field chemistry, including temperature, dissolved oxygen, conductivity, pH, and turbidity.

DATA ANALYSIS

Water quality was assessed by examining field and laboratory parameters that included nutrients and major ions (Table 1). Staff compared the data collected to water chemistry levels of concern based on current state and federal regulations, background levels of stream chemistry, or references for approximate tolerances for aquatic life (Table 2). The difference between the yearly average value for each parameter was calculated for each site. If the value did exceed the level of concern, the difference was listed; if not, then the site was given a score of zero. For each location, the sum of all the exceeded values was calculated and averaged by the number of parameters. Sites with a water quality score between 0-0.25 were classified as "higher" quality. Sites between 0.26-0.75 were classified as "middle" quality, and sites with a score greater then 0.75 were ranked as "lower" quality. For the water quality calculations, an average for each parameter at each location was used. Any seasonal trends also were noted and will be discussed in the results section. Table 3 lists all the parameters that were analyzed with the volatile organics sampling.

Staff analyzed benthic macroinvertebrate samples using six metrics: (1) taxonomic richness; (2) modified Hilsenhoff Biotic Index; (3) percent Ephemeroptera; (4) number of Ephemeroptera/Plecoptera/Trichoptera (EPT) taxa; (5) percent Chironomidae; and (6) Shannon-Wiener Diversity Index (Table 4). Three reference categories were developed for the macroinvertebrate data analysis: mainstem Cohocton River, tributaries with a drainage area of greater than 20 square miles, and tributaries with a drainage area less than 20 square miles. The metric scores for each site were compared to the reference scores, and a biological condition category was assigned based on RBP III methods (Plafkin and others, 1989; Barbour and others, 1999). The same reference sites were used in the analysis for the habitat scores. The ratings for each habitat

parameter were totaled, and a percentage of the reference site score was calculated for each site. The percentages were used to assign a habitat condition category to each sampling site (Plafkin and others, 1989; Barbour and others, 1999).

Table 1. *Water Quality Parameters Sampled in the Cohocton River Watershed*

Field Parameters	
Flow, instantaneous cfs	Conductivity, µmhos/cm
Temperature, °C	Turbidity, NTU
Dissolved Oxygen, mg/l	Suspended sediment, ppm
pH	
Parameters analyzed on the Spectrophotometer	
Chloride, mg/l	
Sulfate, mg/l	
Laboratory Analysis Parameters – Ambient Monitoring	
Total Sodium, mg/l	Total Orthophosphate, mg/l
Total Suspended Solids, mg/l	Total Organic Carbon, mg/l
Total Dissolved Solids, mg/l	Dissolved Aluminum, µg/l
Total Nitrogen, mg/l	Total Lead, µg/l
Total Ammonia, mg/l	Total Phosphorus, mg/l
Total Nitrate, mg/l	
Laboratory Analysis Parameter – Storm Sampling	
5-Day Biological Oxygen Demand, mg/l	Total Aluminum, µg/l
Alkalinity, mg/l	Total Cadmium, µg/l
Total Nitrite, mg/l	Total Zinc, µg/l
Total Magnesium, mg/l	Total Calcium, µg/l
Total Hardness, mg/l	Total Copper, µg/l
Total Iron, µg/l	Total Chromium, µg/l

Table 2. *Water Quality Standards and Levels of Concern with References*

Parameters	Limits	Reference Code	Parameters	Limits	Reference Code
Temperature	>25 °C	a,f	Phosphorus	>0.1 mg/l	e,j
D.O.	<4 mg/l	a,g	TOC	>10 mg/l	b
	>800		Hardness	>300 mg/l	e
Conductivity	µmhos/cm	d	Calcium	>100 mg/l	m
pH	6.5-8.5	i	Magnesium	>35 mg/l	i
Alkalinity	<20 mg/l	a,g	Sodium	>20 mg/l	i
TSS	>25 mg/l	h	Chloride	>250 mg/l	a,i
Nitrogen*	>1.0 mg/l	j	Sulfate	>250 mg/l	a
Nitrite-N	>0.06 mg/l	f,i	Iron	>300 µg/l	ai
Nitrate-N	>1.0 mg/l	e,j	Aluminum	>100 µg/l	i
Turbidity	>150 NTU	h	Orthophosphate	>0.05 mg/l	l,f,j,k

Reference

a. http://www.pacode.com/secure/data/025/chapter93/s93.7.html
b. Hem (1970) - http://water.usgs.gov/pubs/wsp/wsp2254/
c. Gagen and Sharpe (1987) and Baker and Schofield (1982)
d. http://www.uky.edu/WaterResources/Watershed/KRB_AR/wq_standards.htm
e. http://www.uky.edu/WaterResources/Watershed/KRB_AR/krww_parameters.htm
f. http://www.hach.com/h2ou/h2wtrqual.htm
g. http://sites.state.pa.us/PA_Exec/Fish_Boat/education/catalog/pondstream.pdf
h. http://www.epa.gov/waterscience/criteria/sediment/pdf/appendix3.pdf
i. http://www.dec.ny.gov/regs/4590.html
j. http://water.usgs.gov/pubs/circ/circ1225/images/table.html
k. http://water.usgs.gov/nawqa/circ-1136.html
l. http://www.epa.gov/waterscience/criteria/goldbook.pdf
m. based on archived data at SRBC

Table 3. *Volatile Organic Compound Parameters*

All parameters measured in µg/l
Acetone
Benzene
Bromobenzene
Bromochloromethane
Bromodichloromethane
Bromoform
Bromomethane
2-butanone (mek)
N-butylbenzene
Carbon tetrachloride
Chlorobenzene
Chloroethane
Chloroform
Chloromethane
O-chlorotoluene
P-chlorotoluene
Dibromochloromethane
1,2-dibromo-3-chloropropane (dbcp)
1,2-dibromoethane (edb)
Dibromomethane
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
Dichlorodifluoromethane
1,1-dichloroethane
1,2-dichloroethane
1,1-dichloroethene
Cis-1,2-dichloroethene
Trans-1,2-dichloroethene
Dichloromethane (methylene chloride)
1,2-dichloropropane
1,3-dichloropropane
2,2-dichloropropane
1,1-dichloropropene
Cis-1,3-dichloropropene
Trans-1,3-dichloropropene
1,1-dimethylethylbenzene (tert-butylbenzene)
Ethylbenzene
Hexachloro-1,3-butadiene
2-hexanone
4-isopropyltoluene
2-methoxy-2-methylpropane (mtbe)
1-methylethylbenzene (isopropylbenzene)
4-methyl-2-pentanone (mibk)
1-methylpropylbenzene (sec-butylbenzene)
Napthalene
N-propylbenzene
Styrene
1,1,1,2-tetrachloroethane
1,1,2,2-tetrachloroethane
Tetrachloroethene
Toluene
1,2,3-trichlorobenzene
1,2,4-trichlorobenzene
1,1,1-trichloroethane
1,1,2-trichloroethane
Trichloroethene
Trichlorofluoromethane
1,2,3-trichloropropane
1,2,4-trimethylbenzene
1,3,5-trimethylbenzene
Chloroethene
M/p-xylene
T-butyl alcohol
O-xylene

Loading rates for total nitrogen and total phosphorus were calculated using concentrations in mg/l, and the stream discharge measured in the field (or obtained from USGS gages when applicable) when that sample was collected. When a measured stream discharge was not available due to high flows or ice, staff estimated the flow based on known flow ratios from USGS gages and previous flow measurements at the sites. Drainage areas were calculated by ESRI ArcGIS 9.2 software based on the North American Albers Equal Area Conical projection. A 1:24,000 scale watershed GIS dataset was used as a base layer. Additional watershed boundary lines were added manually where needed (i.e., at new monitoring sites) to the base layer. The data were converted to lbs/acre/year so nutrient loading rates could be compared between sites regardless of watershed size. These loading rates are only a rough estimate, as there are only four discrete data points taken throughout the year.

RESULTS

Water quality, biological community, and physical habitat site conditions for each sampling site in the Cohocton River Watershed are depicted in Figure 3. Seven sites, COHO 35.2, COHO 25.0, TWVE 0.5, TOBE 1.4, LTOB 0.7, UTLL 0.2, and MUDC 6.5, demonstrated the best overall conditions in each category with nonimpaired macroinvertebrates, "higher" water quality, and excellent physical habitat. Eight sites (32 percent) did not exceed water quality standards or levels of concern for any parameter, and 11 other sites (44 percent) also were ranked as having "higher" water quality. Three sites (12 percent) slightly exceeded water quality standards or levels of concern and were given a "middle" water quality rating. The remaining three sites (12 percent) received a "lower" water quality ranking based on

Table 4. *Explanation of Biological Metrics*

Taxonomic Richness: Total number of taxa in the sample. Number decreases with increasing stress.

Hilsenhoff Biotic Index: A measure of organic pollution tolerance. Index value increases with increasing stress.

Percent Ephemeroptera: Percentage of number of Ephemeroptera (mayflies) in the sample divided by the total number of macroinvertebrates in the sample. Percentage decreases with increasing stress.

Percent Contribution of Dominant Taxa: Percentage of the taxon with the largest number of individuals out of the total number of macroinvertebrates in the sample. Percentage increases with increasing stress.

EPT Index: Total number of Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies) taxa present in a sample. Number decreases with increasing stress.

Percent Chironomidae: Percentage of number of Chironomidae individuals out of total number of macroinvertebrates in the sample. Percentage increases with increasing stress.

Shannon-Wiener Diversity Index: A measure of the taxonomic diversity of the community. Index value decreases with increasing stress.

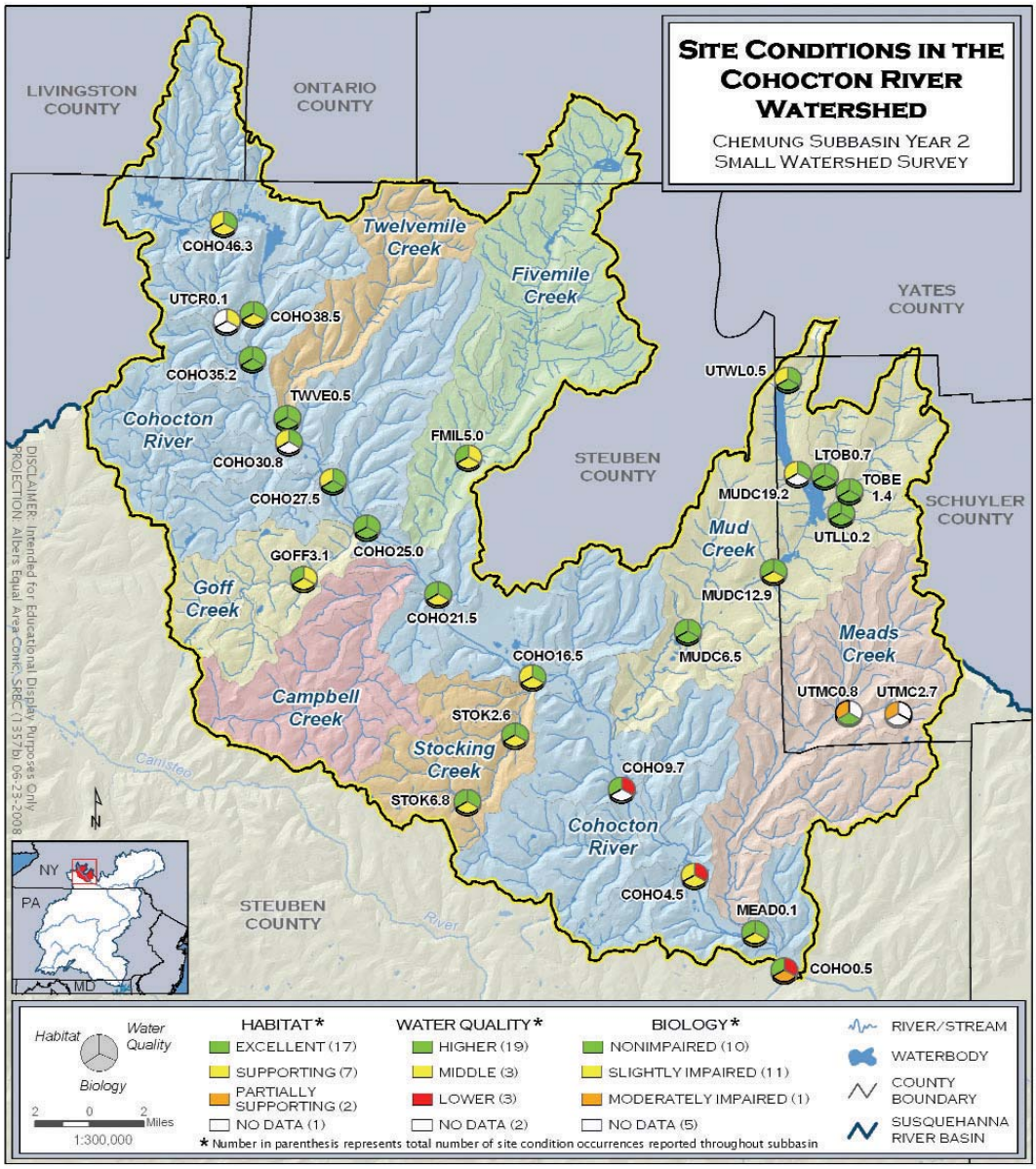

Figure 3. *Site Conditions in the Cohocton River Watershed*