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Chemung Subbasin Survey:

A Water Quality and Biological Assessment, June - August 2006

The Susquehanna River Basin Commission (SRBC) conducted a water quality and biological survey of the Chemung Subbasin from June to August 2006. This survey is part of SRBC's Subbasin Survey Program, which is funded in part by the United States Environmental Protection Agency (USEPA). The Subbasin Survey Program consists of two-year assessments in each of the six major subbasins (Figure 1) on a rotating schedule. This report details the Year-1 survey, which consists of point-in-time water chemistry, macroinvertebrate, and habitat data collection and assessments of the major tributaries and areas of interest throughout the Chemung Subbasin. The Year-2 survey will be conducted in the Cohocton River Watershed over a one-year period from spring 2007 to spring 2008. Previous SRBC surveys of the Chemung Subbasin were conducted in 1997 (Traver, 1998) and 1984 (McMorran, 1985).

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Figure 1. *The Susquehanna Subbasin*

Subbasin survey information is used by SRBC staff and others to:

- evaluate the chemical, biological, and habitat conditions of streams in the basin;
- identify major sources of pollution and lengths of stream impacted;
- identify high quality sections of streams that need to be protected;
- maintain a database that can be used to document changes in stream quality over time;
- review projects affecting water quality in the basin; and
- identify areas for more intensive study.

N. Sylvester

Chemung River Walking Bridge in Corning, N.Y.

DESCRIPTION of the Chemung Subbasin

The Chemung Subbasin is an interstate subbasin that drains approximately 2,604 square miles of southwestern New York and northcentral Pennsylvania. Four major river watersheds, the Cohocton River, Canisteo River, Cowanesque River, and Tioga River, combine to form the mainstem of the Chemung River. The primary counties in this subbasin are Chemung, Steuben, Allegany, and Schuyler Counties in New York, and Tioga and Bradford Counties in Pennsylvania (Figure 2). The major population centers include Hornell, Canisteo, Bath, Corning, Horseheads, and Elmira in New York, and Elkland, Mansfield, Blossburg, and Sayre in Pennsylvania. Ecoregions that fall within the Chemung Subbasin are (Figure 2):

- *Northern Appalachian Plateau (Ecoregion 60)*
- *Northern Central Appalachians (Ecoregion 62)*

Ecoregion 60 is a combination of agriculture and forestland. It is a transition ecoregion between the more agricultural and urban ecoregions to the north and west and the more mountainous and forested ecoregions to the south and east. The agricultural lands in Ecoregion 60 are mostly used as pastures and to cultivate hay and grain to feed dairy cattle, and the wooded areas are comprised of mostly oaks and northern hardwoods. Ecoregion 62 is more densely forested, and land use is tied largely to recreation or logging and gas and mineral extraction. The geology of this largely rugged area consists mostly of sandstone, shale, siltstone, conglomerates, and coal. Most of the Chemung Subbasin is within Ecoregion 60 with only a small portion in the southern part of the basin in Ecoregion 62.

Land use in the Chemung Subbasin is depicted in Figure 3. The primary land uses are natural vegetated areas and cultivated land. The largest urban center is the Horseheads/Elmira area. Some abandoned mine lands are found in the headwaters of the Tioga River Watershed that correspond to Ecoregion 62.

Numerous watershed organizations are working in the Chemung Subbasin to educate and involve local citizens and to restore and protect watersheds. Table 1 provides the names and contact information for some of those watershed groups. Many other local entities, such as county conservation districts and land conservation groups, protect and conserve land and water resources in the subbasin. Also, in Pennsylvania, there is a group for active senior citizens interested in protecting and improving watersheds called the Pennsylvania Senior Environment Corps. The website for this organization is http://www.easi.org.

New York State Department of Environmental Conservation will be sampling water chemistry in the Chemung basin during 2007 and 2008 as part of the agency's Rotating Integrated Basin Studies. More details on the program are available at http://www.dec.ny.gov/chemical/30951.html. Lakes/reservoirs and groundwater also will be sampled as part of this program. The information gathered in this sampling program will be used to update NYSDEC's Waterbody Inventory/Priority Waterbodies List (WI/PWL).

SRBC has additional monitoring and protection activities in the Chemung Subbasin. One of the programs is the enhanced monitoring program, which involves monthly sampling of nutrients and sediment on the Cohocton and Chemung Rivers at Campbell, N.Y., and Chemung, N.Y., respectively. Data at these sites have been collected since October 2004 in the Chemung River and October 2005 in the Cohocton River, and are used to calculate nutrient and sediment loads and trends and to calibrate watershed models. The data

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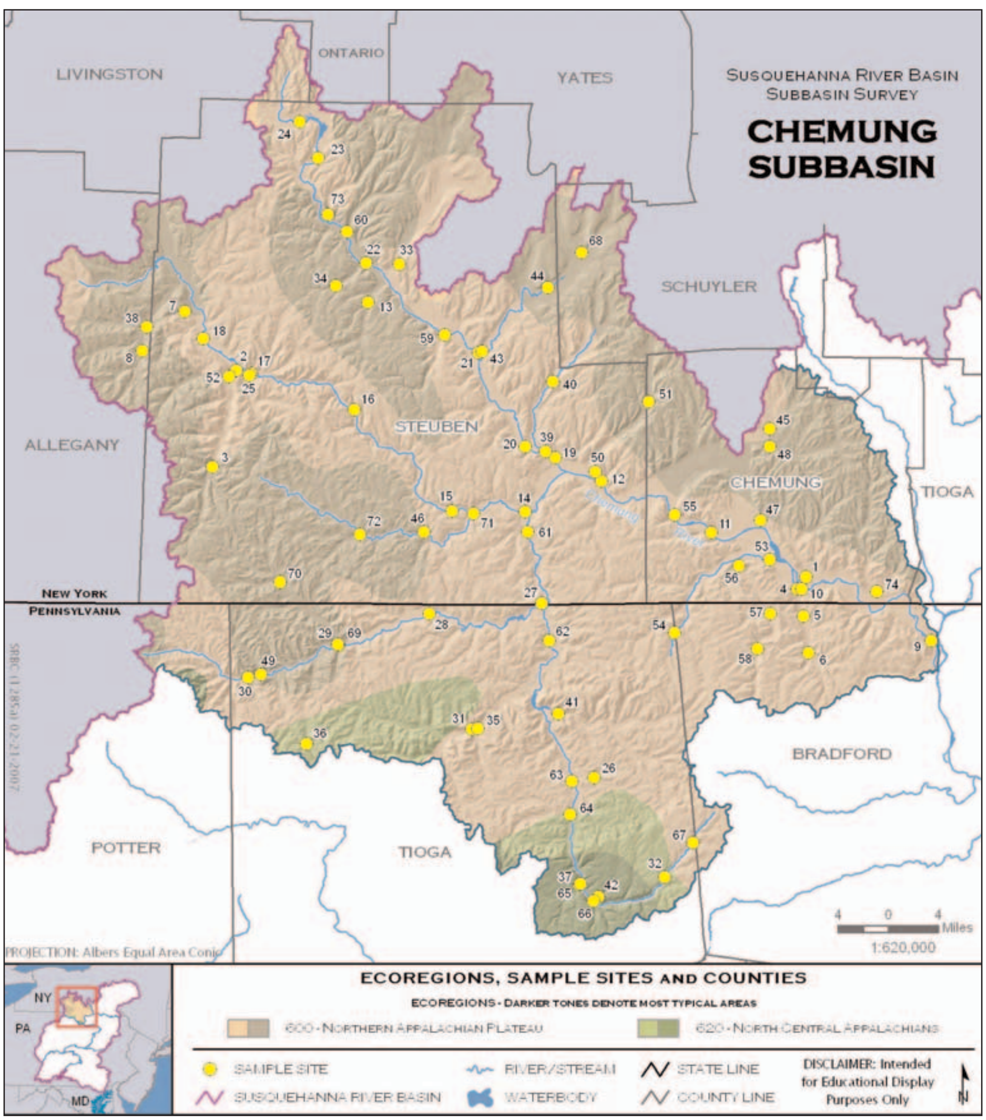
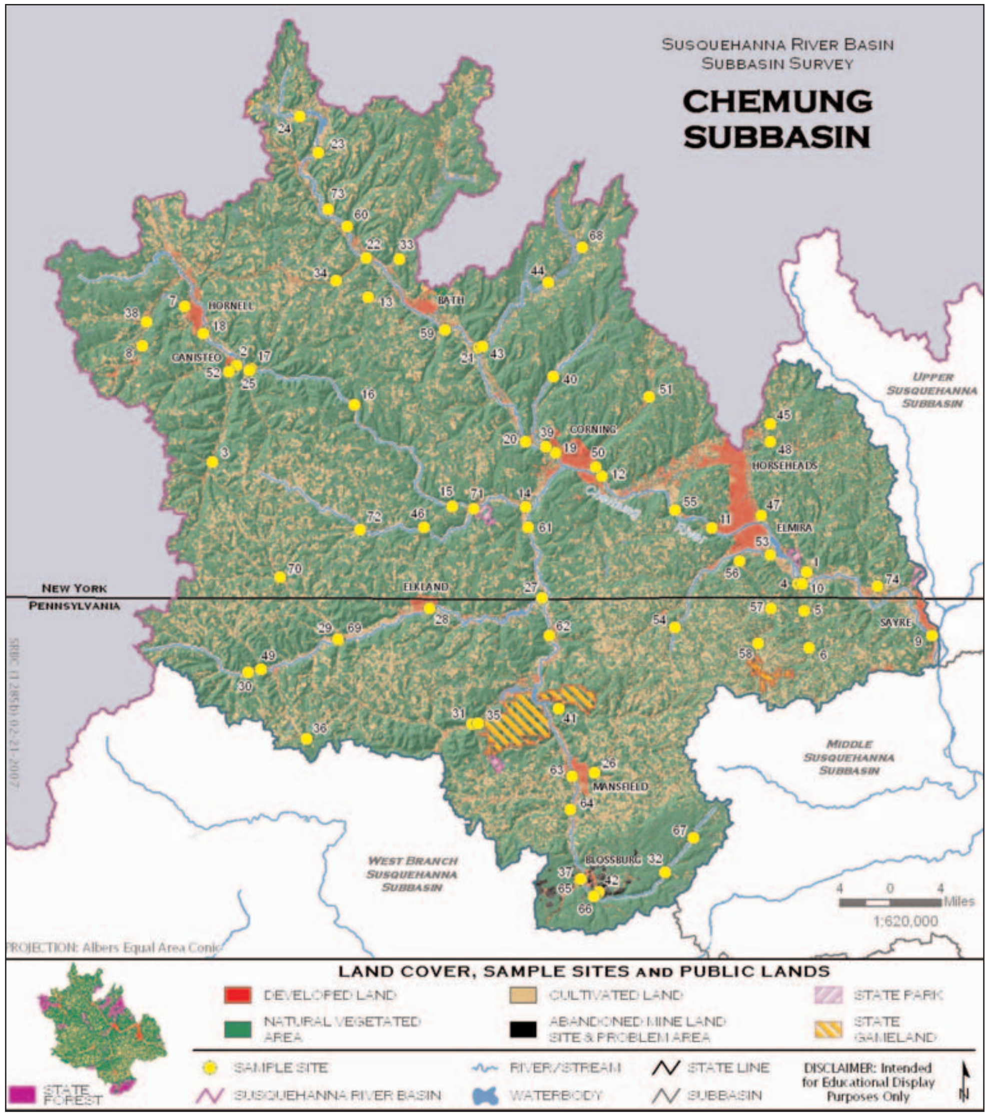


(station names corresponding to sample site numbers on map are located in Appendix)

Figure 2. *Ecoregions, Sample Sites, and Counties in the Chemung Subbasin.*

and more information on the project can be found on SRBC's website at http://www.srbc.net/programs/CBP/nutrientprogram.htm.

SRBC also is working on developing an Early Warning System (EWS) program throughout the Susquehanna River Basin to protect public drinking water supplies. This program allows for early detection of spills or threats to public water supply and alerts water intake facilities. SRBC has implemented the EWS program in Pennsylvania and currently is working with Binghamton and Elmira, N.Y., water suppliers to create this same monitoring and communication network in New York State. SRBC has been gathering additional data on the water quality and travel times of the Chemung River for the EWS program in recent months. The data collected from the Chemung Subbasin Survey Year-1 and Year-2 studies will be used to establish the EWS network. More information on the EWS program is available on SRBC's website at http://www.srbc.net/programs/docs/EWSGeneral(2_07).pdf.



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(station names corresponding to sample site numbers on map are located in Appendix)

Figure 3.
Land Cover, Sample Sites, and Public Lands in the Chemung Subbasin.

Organization Name	County	Contact	Address	Phone	Email or Website
Chemung Basin River Trail Partnership	All	Jennifer Fais, Co-Chair Linda Couchon, Co-Chair	STCRPDB 8 Denison Parkway East, Suite 310, Corning, New York 14830 (Jennifer) Cornell Extension of Chemung County (Linda)	(607) 962-5092 (Jennifer) (607) 734-4453 (Linda)	http://www.chemungrivertrail.com email: jfais@stny.rr.com (Jennifer) email: LWC4@cornell.edu (Linda)
Corey Creek Watershed Association	Tioga	Jim Hufnagle	18475 Route 6 Mansfield, PA 16933	(570) 662-3360	http://www.tiogacountypa.us/tioga/cwp/view.asp?A=928&Q=435165
Cowanesque Valley Watershed Association	Tioga	Karl Kroeck, President	RD 1 Box 990 Knoxville, PA 16928	(814) 326-4308	
Crooked Creek Coalition	Tioga	Harland Hilborn, President	R.R. 2, Box 34 Wellsboro, PA 16901	(570) 724-8042	hrlybear@pa.net
Ellen Run Watershed Projects	Tioga	Chester Bailey	413 Valley Road Mansfield, PA 16933	(570) 662-3152	http://www.tiogacountypa.us/tioga/cwp/view.asp?A=928&Q=435165
Lake Demmon Association	Steuben	Michael Mooney, President	6074 Independence Way, Ontario, NY 14519	(315) 524-8029	
Lamoka Waneta Lakes Association	Schuyler/Steuben	Gordon Shafer, President	P.O. Box 55, Tyrone, NY 14887	(607) 292-6276	http://www.lamokawaneta.com/
Loon Lake Association	Steuben	Helen Sick	2968 Laf-A-Lot Rd, Wayland, NY 14572	(585) 728-5108	helened@frontiernet.net
Loucks Pond Association	Steuben				
Meads Creek Watershed Association	Steuben	Pat Darcangelo	4575 Meads Creek Road, Painted Post, NY 14870	(607) 936-4703	Pdarcangelo@stny.rr.com
Mill Cove Inc	Tioga	Tom Freeman (Blue Ridge Cable) Charlie Fox	43 Acadamy Street, Mansfield, PA 16933 (Tom) RD 3 Box 445 Troy, PA 16947 (Charlie)	(570) 662-2935 (Tom) (570) 297-4642 (Charlie)	website: http://www.tiogacountypa.us/tioga/cwp/view.asp?A=928&Q=435165 email: eef@epix.net (Charlie)
Penn-York Bentley Creek Watershed Association	Chemung, Bradford	Wilber Brown, Chairman	13278 Berwick Turnpike, Gillett, PA 16925	(570) 596-2394	website: http://www.ridgeburytownship.com/cwatershed.html email: rbury@npacc.net
Smith Pond Sportsmen's Association	Steuben	Polly Nelson	8020 Smith Pond Road, Avoca, NY 14809	(607) 566-2870	
Tanglewood Lake Association	Steuben	Mary Woollatt	47 Tanglewood Trail, Campbell, NY 14821	(607) 527-8630	maryderek@aol.com
Tioga County Concerned Citizens Committee	Tioga	Charles Andrews, President	P.O. Box 124 Blossburg, PA 16912		website: http://tcccc-inc.org/ email: tcccc@tcccc-inc.org
Tioga River Watershed Reclamation Projects	Tioga	Victor Otruba, President	19 Richmond Dr. Mansfield, PA 16933	(570) 404-0548	http://www.tiogacountypa.us/tioga/cwp/view.asp?A=928&Q=435165 mtnbooks@epix.net
Town of Southport Drainage Committee	Chemung	Bill Baker, Chair	1139 Pennsylvania Avenue Southport, NY 14871	(607) 734-1548	http://www.townofsouthport.com/
Upper Susquehanna Coalition	All	James Curatolo, Coordinator	4729 State Route 414 Burdett, NY 14818	(607) 546-2528	http://www.u-s-c.org/html
Upper Susquehanna River Keeper	All	Paul Otruba	763 South Main Street Mansfield, PA 16933	(570) 404 0548	http://environeers.net/ mtnbooks@quik.com

Table 1. *Contact Information for Watershed Organizations in the Chemung Subbasin*

METHODS
Used in the 2006 Subbasin Survey

DATA COLLECTION

During the summer of 2006, SRBC staff collected samples from 74 sites throughout the Chemung Subbasin. The appendix contains a list with the sample site number, the station name (designated by approximate stream mile), a description of the sampling location, the latitude and longitude, the drainage size, and reference category. All sites listed in blue were sampled in 2006 and in the previous survey of 1997. The reference category designation was based on ecoregions and drainage areas. Ecoregion 60 was divided into two smaller groups based on the darker and lighter toned areas on Figure 2.

Staff collected macroinvertebrate samples and performed habitat assessments at 70 of the 74 sites. The four additional sites could not be sampled due to deep water or lack of riffle/run habitat. Sites were sampled once during this Year-1 sampling effort to provide a point-in-time picture of stream characteristics throughout the whole subbasin. Samples were collected using a slightly modified version of USEPA's Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers (RBP III) (Barbour and others, 1999).

Water Quality

A portion of the water sample from each collection site was separated for laboratory analysis, and the rest of the sample was used for field analyses. A list of the field and laboratory parameters and their units is found in Table 2. Measurements of flow, water temperature, dissolved oxygen, pH, conductivity, alkalinity, and acidity were taken in the field. Flow was measured using standard U.S. Geological Survey methodology (Buchanan and Somers, 1969). Temperature was measured in degrees Celsius with a field thermometer. A Cole-Parmer Model 5996 meter was used to measure pH. Dissolved oxygen was measured with a YSI 55 meter, and conductivity was measured with a Cole-Parmer Model 1481 meter. Alkalinity was determined by titrating a known volume of sample water to pH 4.5 with 0.02N H_2SO_4. Acidity was determined by titrating a known volume of sample water to pH 8.3 with 0.02N NaOH.

Table 2. *Water Quality Parameters Sampled in the Chemung Subbasin Survey*

Field Parameters	
Flow, instantaneous cfs[a]	Conductivity, µmhos/cm[c]
Temperature, °C	Alkalinity, mg/l
pH	Acidity, mg/l
Dissolved Oxygen, mg/l[b]	
Laboratory Analysis	
Alkalinity, mg/l	Total Magnesium, mg/l
Total Suspended Solids, mg/l	Total Sodium, mg/l
Total Nitrogen, mg/l	Chloride, mg/l
Nitrite - N, mg/l	Sulfate - IC, mg/l
Nitrate - N, mg/l	Total Iron, µg/l[e]
Turbidity, NTU[d]	Total Manganese, µg/l
Total Organic Carbon, mg/l	Total Aluminum, µg/l
Total Hardness, mg/l	Total Phosphorus, mg/l
Total Calcium, mg/l	Total Orthophosphate, mg/l

[a] cfs = cubic feet per second
[b] mg/l = milligram per liter
[c] µmhos/cm = micromhos per centimeter
[d] NTU = nephelometric turbidity units
[e] µg/l = micrograms per liter

One 500-ml bottle and two 250-ml bottles of water were collected for laboratory analyses. One of the 250-ml samples was acidified with nitric acid for metal analyses. The other 250-ml sample was acidified with sulfuric acid for nutrient analyses. Water samples also were placed in two, 40-mL VOA amber vials with Teflon septa membranes and preserved with 1:1 H_2SO_4 prior to analysis for total organic carbon (TOC). Samples were iced and shipped to the Pennsylvania Department of Environmental Protection (PADEP), Bureau of Laboratories in Harrisburg, Pa., for laboratory analysis.

Macroinvertebrates

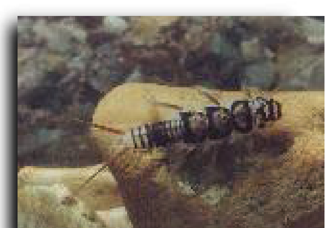
Benthic macroinvertebrates (organisms that live on the stream bottom, including aquatic insects, crayfish, clams, snails, and worms) were collected using a modified version of RBP III (Barbour and others, 1999). Two kick-screen samples were obtained at each station by disturbing the substrate of representative riffle/run areas and collecting 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, where the sample was sorted into a subsample of at least 200 organisms. Organisms in the subsample were identified to genus (when possible), except for midges and aquatic worms, which were identified to family.

Habitat

Habitat conditions were evaluated using a modified version of RBP III (Plafkin and others, 1989; Barbour and others, 1999). Physical stream characteristics relating to substrate, pool and riffle composition, shape of the channel, conditions of the banks, and the riparian zone were rated on a scale of 0-20, with 20 being optimal. Other observations were noted regarding weather, substrate material composition, surrounding land use, and any other relevant features in the watershed.

Midge Larvae (family: Chironomidae)

Caddisfly (family: Hydropsychidae)



Stonefly (family: Perlidae)

DATA ANALYSIS

Water quality was assessed by examining field and laboratory parameters that included nutrients, major ions, and metals (Table 2). 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 of aquatic life (Table 3). Laboratory values were used when field and laboratory data existed for the same parameter. The difference between each value and the level of concern value from Table 3 was calculated for each site, and if the value did not exceed the level of concern value, the site was given a score of zero. If the level of concern value was exceeded, the difference was listed, and an average of all the parameters for each site was calculated. All sites that received a score of zero (no parameters exceeded the limits) were classified as "higher" quality. Sites that had a percentage value between zero and one were classified as "middle" quality, and sites that had a percentage value greater than one were classified as "lower" quality.

Six reference categories were created for macroinvertebrate and habitat data analysis based on ecoregions and drainage size (Omernik, 1987). Ecoregion 62 represented a small number of sites; therefore, those sites were grouped together regardless of drainage size. The sites in Ecoregion 60 were divided by drainage size into small (<100 square miles), medium (100 to 500 square miles), and large drainage areas (>500 square miles). The mainstem Chemung River sites were separated into an independent group, and small drainage areas were divided into brown or tan sites based on the darker and lighter toned areas in Ecoregion 60. Based on the location of the sampling sites, the six reference categories used were: 62, 60s-brown, 60s-tan, 60m, 60L, and River, where "s" stands for small, "m" medium, "L" large, and "brown" and "tan" are the darker and lighter sections on Figure 2, respectively.

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 (mayfly), Plecoptera (stonefly), and Trichoptera (caddisfly) 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.

Benthic macroinvertebrate samples were analyzed using seven metrics mainly derived from RBP III (Plafkin and others, 1989; Barbour and others, 1999): (1) taxonomic richness; (2) modified Hilsenhoff Biotic Index; (3) percent Ephemeroptera; (4) percent contribution of dominant taxon; (5) number of Ephemeroptera/Plecoptera/Trichoptera (EPT) taxa; (6) percent Chironomidae; and (7) Shannon-Wiener Diversity Index. Reference sites were determined for each reference category, primarily based on the results of the macroinvertebrate metrics and secondarily based on habitat and water quality scores, to represent the best combination of conditions. The metric scores 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 ratings for each habitat condition were totaled, and a reference site was chosen based on the highest score of the habitat ratings in each reference category. A percentage of the reference site was calculated, and the percentages were used to assign a habitat condition category to each site (Plafkin and others, 1989; Barbour and others, 1999).

Table 3. *Water Quality Levels of Concern and References*

Parameters	Limits	Reference Code
Temperature	>25 °C	a,f
D.O.	<4 mg/l	a,g
Conductivity	>800 µmhos/cm	d
pH	<5.0	c,f
Acidity	>20 mg/l	m
Alkalinity	<20 mg/l	a,g
TSS	>25 mg/l	h
Nitrogen*	>1.0 mg/l	j
Nitrite-N	>0.06 mg/l	f,i
Nitrate-N	>1.0 mg/l	e,j
Turbidity	>150 NTU	h
Phosphorus	>0.1 mg/l	e,k
TOC	>10 mg/l	b
Hardness	>300 mg/l	e
Calcium	>100 mg/l	m
Magnesium	>35 mg/l	i
Sodium	>20 mg/l	i
Chloride	>250 mg/l	a
Sulfate	>250 mg/l	a
Iron	>1,500 µg/l	a
Manganese	>1,000 µg/l	a
Orthophosphate	>0.05 mg/l	l,f,j,k
Aluminum	>200 µg/l	c

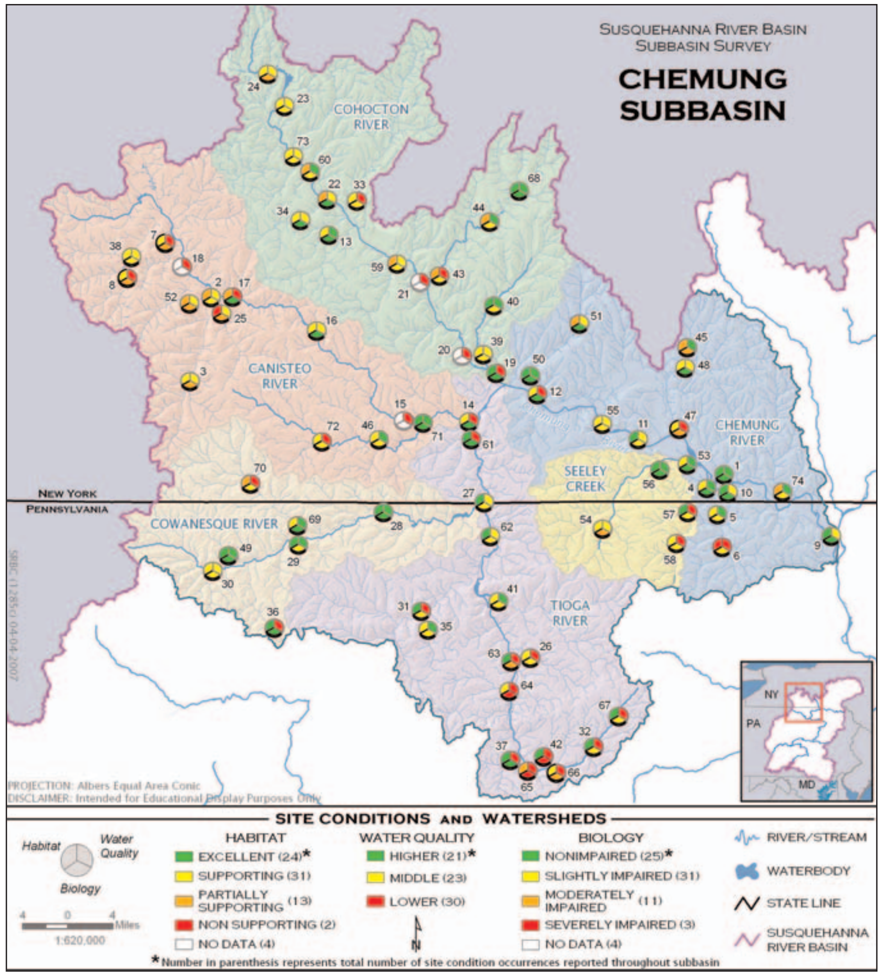
Reference Code	Reference
a	http://www.pacode.com/secure/data/025/chapter93/s93.7.html
b	Hem (1970) - http://water.usgs.gov/pubs/wsp/wsp2254/
c	Gagen and Sharpe (1987) and Baker and Schofield (1982)
d	http://www.uky.edu/WaterResources/Watershed/KRB_AR/wq_standards.htm
e	http://www.uky.edu/WaterResources/Watershed/KRB_AR/krww_parameters.htm
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/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/h6.html#NIT
l	http://www.epa.gov/waterscience/criteria/goldbook.pdf
m	based on archived data at SRBC

** Background levels for natural streams*

RESULTS/DISCUSSION

Water quality, biological (macroinvertebrate) community, and habitat site conditions for each sampling site in 2006 throughout the Chemung Subbasin are depicted in Figure 4. Seven sites, BDWN 0.3, COWN 12.0, NFCR 0.1, POST 0.6, SOUT 2.0, TOBE 1.9, and TUSC 0.4, demonstrated the best overall conditions in each category with nonimpaired macroinvertebrates, "higher" water quality, and excellent habitat. Twenty-one sites (28 percent) did not exceed levels of concern and received "higher" water quality ratings. Twenty-three sites (31 percent) slightly exceeded levels of concern and received a "middle" water quality rating, and 30 sites (41 percent) received a "lower" water quality rating. Nonimpaired biological conditions were found at 25 sites (36 percent), slightly impaired conditions were found at 31 sites (44 percent), moderately impaired conditions were found at 11 sites (16 percent), and severely impaired conditions were found at three sites (4 percent). Habitat conditions were excellent at 24 sites (34 percent), supporting at 31 sites (44 percent), partially supporting at 13 sites (19 percent), and nonsupporting at two sites (3 percent).

The parameters to exceed levels of concern at the most sites were aluminum (29), sodium (19), and total nitrogen (17) (Table 4). The sites with the highest number of parameters exceeding levels of concern were BNTY 5.7 (5), CANA 6.7 (5), CNST 33.0 (5), MORR 0.8 (9), TIOG 29.8 (5), TIOG 35.4 (5), and TIOG 39.6 (6). The highest or lowest value for each parameter is printed in bold on Table 4. The highest values for metals were manganese (11,900 µg/l), iron (11,000 µg/l), and aluminum (9,193 µg/l). The highest values for nitrogen forms were 4.07 mg/l for total nitrogen, 2.0 mg/l for nitrate-n, and 0.04 mg/l for nitrite-n. Total phosphorus and orthophosphate maximum values were 0.69 mg/l and 0.484 mg/l, respectively. The highest sodium value was 92.3 mg/l, and total suspended solids and turbidity were 168 mg/l and 214.5 NTU, respectively. The lowest pH was 3.2, the highest acidity was 130 mg/l, and four sites had an alkalinity of zero (Table 4).



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(station names corresponding to sample site numbers on map are located in Appendix)

Figure 4. *Water Quality, Biological, and Habitat Conditions in the Chemung Subbasin in 2006.*

Some of the streams in the Chemung Subbasin Survey also were sampled as part of the Interstate Streams Monitoring Program, which is an annual monitoring program conducted on streams that cross state lines in the Susquehanna River Basin. SRBC staff collected quarterly or annual water chemistry, macroinvertebrates, flow, and habitat information on Bentley Creek, Seeley Creek, South Creek, Troups Creeks, Chemung River, Cowanesque River, North Fork Cowanesque River, and Tioga River at the Pennsylvania/New York state line. Assessments of these interstate streams from the 2006 Interstate Streams report http://www.srbc.net/pubinfo/techdocs/Publication_244/techreport244.htm are compared to the Subbasin Survey Program assessments throughout this report. An Interstate Streams Website is now available at http://www.srbc.net/interstate%5Fstreams/, and includes the most recent data and assessments.

Section 303(d) of the Clean Water Act requires a Total Maximum Daily Load (TMDL) to be developed for any waterbody designated as impaired, or not meeting the state water quality standards or its designated use. Streams in Pennsylvania are being assessed as part of the PADEP's Instream Comprehensive Evaluation Program, and if found to be impaired, a TMDL is calculated for the watershed. In New York, NYSDEC performs assessments through its Statewide Waters Monitoring Program. Table 5 lists Pennsylvania watersheds that have been identified as impaired, their impairment causes, the dates sampled, and the Chemung Subbasin Survey stations located in impaired sections. Table 6 includes a list of Chemung Subbasin Survey streams on the WI/PWL that were determined to have minor impacts, threatened, or impaired and the causes and sources listed. More information on the Pennsylvania and New York TMDL programs is available on the web at http://www.dep.state.pa.us/water management_apps/tmdl/default.asp and http://www.dec.ny.gov/chemical/ 31290.html, respectively .

COWANESQUE RIVER WATERSHED

This watershed is mostly forested and agricultural land cover with small towns and villages. The overall quality of the entire watershed was good; however, sections and tributaries of the Cowanesque River are listed as impaired on the integrated list (Table 5). Only one of the samples from this survey (COWN 0.1) was sampled in a section that was on the integrated list. Some of these impairments are from point source issues, such as municipal treatment plants and industrial discharges, which may be working towards compliance. Other impairments appear to be from agricultural practices and possible mercury deposition. Also, the Cowanesque River is impounded by the Cowanesque Reservoir near Lawrence, Pa., which impacts the river below the dam.

The most upstream site sampled on Cowanesque River was COWN 29.6 in Westfield, Pa. This site had a slightly impaired biological condition, "middle" water quality, and supporting habitat

Table 4. *Chemung Subbasin Sites with Water Quality Values Exceedng Levels of Concern*

Site	Sample Site	Alkalinity mg/l	Aluminum T µg/l	Hardness T mg/l	Iron T µg/l	Magnesium T mg/l	Manganese T µg/l	Nitrate-N T mg/l	Nitrogen T mg/l	Orthophosphate T mg/l	Phosphorus T mg/l	Sodium T mg/l	Sulfate T mg/l	T Org Carbon mg/l	T Susp Solid mg/l	Turbidity NTU	Acidity (Field) mg/l	pH (Field)	Specific Conductivity (Field) µmhos/cm	Water Temperature (Field) °C	TOTAL
2	BENN001.2																			28.2	1
3	BENN008.3									0.063										29.5	2
6	BNTY005.7		5887		**11000**						0.177				**168**	**214.5**					5
7	CANA001.7		244									32.5									2
8	CANA006.7							1.34	1.54	0.12	0.149	44.6									5
9	CHEM002.5								1.32			31.8									2
10	CHEM018.5								1.65			31.7									2
11	CHEM028.0											27.3									1
12	CHEM039.8		243						1.05			24.4									3
14	CNST001.0		662																	27.9	2
15	CNST007.7		790									20.3								26.6	3
16	CNST022.6											25.7								28.5	2
17	CNST033.0		274							0.084	0.13	30.6								26.2	5
18	CNST038.7		208									34.3								27.7	3
19	COHO000.5											**92.3**								27.6	2
20	COHO004.0		243						1.18												2
21	COHO014.6		246						1.25			80.8									3
22	COHO025.0							1.28	1.42												2
23	COHO037.5							**2**	2.25												2
24	COHO046.3		216						1.15												2
25	COLB000.8																			27	1
26	CORY001.5		242												72						2
27	COWN000.1																			25.1	1
30	COWN029.6								**4.07**	**0.484**	**0.69**			**24.8**							4
31	CRKD008.0		270																		1
32	FELL000.1	0.2	398															4.8			3
33	FMIL001.1		223						1.16												2
34	GOFF003.1							1.83	1.89			33.4									3
36	JEMI007.7		396																		1
37	JOHN000.1	9.4	316																		2
38	KARR000.1											32.9								26.1	2
39	MEAD000.1																			25.3	1
42	MORR000.8	**0**	**9193**		2420	**35.3**	**11900**						**410**				**130**	**3.2**	827		9
43	MUDC001.1		263																		1
47	NEWT000.6			**301**					1.39			67.8							**870**		4
48	NEWT009.7											23.7									1
51	POST008.8								1.39			24.5									2
52	PURD000.3									0.088	0.105									**30.9**	3
54	SEEL011.4							1.02	1.76												2
55	SING000.9							1.54	1.56			31.4									3
57	SOUT005.9		302																	26.1	2
58	SOUT009.1		235																		1
59	STOK000.3											21.9									1
61	TIOG006.2		239																		1
62	TIOG016.3		212																		1
63	TIOG029.8	**0**	1920				1510								46			4.8			5
64	TIOG035.4	**0**	2710				1770										26	4.05			5
65	TIOG039.6	**0**	4320		2510		2660										48	3.5			6
66	TIOG042.3	3.2	400																		2
67	TIOG049.2	14.2	295																		2
70	TRUP005.8		251																		1
72	TUSC012.9		235																	25.2	2
73	TWVE000.5							1.24	1.36												2
	TOTAL	8	29	1	3	1	4	7	17	5	5	19	1	1	3	1	3	5	2	15	

*Most extreme values for each parameter are printed in bold.

** Most extreme values for each parameter are printed in bold.*

Table 5. *Chemung Subbasin Survey Streams Identified as Impaired Streams Requiring a TMDL on PADEP's Integrated List of All Waters*

PA State Water Plan	Watersheds	Major Sources of Impairment	Stations in Impaired Sections
4A	Cowanesque River	Upstream Impoundment/Organic Enrichment/Low D.O.:2002, Source Unknown/Mercury:2002, Agriculture/Nutrients:2002, Municipal Point Source/Nutrients:2002, Industrial Point Source/ Thermal Modifications:2002, Industrial Point Source/ Cause Unknown:2002, Removal of Vegetation/Siltation:2002.	COWN 0.1
4A	Fellows Creek	Abandoned Mine Drainage/Metals, pH:2002	FELL 0.1
4A	Jemison Creek	Golf Courses/Nutrients:2002	
4A	Johnson Creek	Abandoned Mine Drainage/Metals, pH:2002	JOHN 0.1
4A	North Branch Cowanesque River	Agriculture/Siltation, Nutrients:2002	
4A	Tioga River	Source Unknown/Mercury:2002, Upstream Impoundment/ Siltation:2002, Abandoned Mine Drainage/pH, Metals:2002, Atmospheric Deposition/pH:1998, Road Runoff/Siltation:2002, Small Residential Runoff/Siltation:2002.	MORR 0.8, TIOG 16.3, TIOG 29.8, TIOG 35.4, TIOG 39.6, TIOG 42.3
4B	Chemung River	Source Unknown/Mercury:2002	CHEM 2.5

conditions. This site had the highest nitrogen, total phosphorus, total orthophosphate, and total organic carbon in this survey (Table 4). Two tributaries were sampled downstream of that site: North Fork Cowanesque River (NFCR 0.1) and Jemison Creek. NFCR 0.1 had overall good conditions in all categories. Biological condition was nonimpaired, water quality was "higher," and habitat was excellent. This stream was monitored in the Interstate Streams Program upstream from NFCR 0.1 at the Pennsylvania/New York state line. During the July 2004 Interstate Streams Program sampling effort, biological and habitat conditions were nonimpaired and excellent, respectively. The headwaters of Jemison Creek, JEMI 7.7, had nonimpaired biological condition and excellent habitat, but water quality was considered "lower" due to a high aluminum value, potentially from naturally occurring aluminum. Jemison Creek served as a reference site for those sites in Ecoregion 62. This stream is listed as impaired near the mouth due to elevated nutrient levels.

The site on Cowanesque River downstream of Jemison Creek, COWN 20.5, still had slightly impaired biological conditions; however, the water chemistry parameters did not exceed levels of concern, and the habitat in this location was excellent. Troups Creek enters the Cowanesque River downstream of COWN 20.5 with good water quality conditions. The site at the mouth of Troups Creek (TRUP 0.4) served as one of the reference sites for Ecoregion 60, small drainage. TRUP 0.4 had nonimpaired biological condition, "higher" water quality, and supporting habitat, although the upstream site (TRUP 5.8) in New York State was slightly impaired possibly due to habitat conditions, which were partially supporting. At TRUP 5.8, the condition of banks was poor, and the riparian vegetated width was inadequate. The water quality was rated "lower" due to elevated aluminum, which could originate from soil eroding off the banks. There is also a wastewater treatment plant upstream that recently upgraded its treatment system, which could improve

S. Buda

Cowanesque Reservoir Dam near Lawrence, PA.

D. Sitlinger

Troups Creek after high water near the PA/NY state line.

Table 6. *Chemung Subbasin Survey Streams and Lakes on NYSDEC's WI/PWL as Threatened, Minor Impacts, Need Verification, or Impaired Segment*

Stream	Status	Causes	Sources
Almond Lake	Impaired Segment	Silt/Sediment, Aesthetics	Hydro Modification, Streambank Erosion
Bennetts Creek, Lower, and minor tribs	Minor Impacts	Silt/Sediment	Streambank Erosion
Bennetts Creek, Upper, and tribs	Minor Impacts	Silt/Sediment	Streambank Erosion
Canacadea Creek, Lower, and tribs	Minor Impacts	Silt/Sediment, Nutrients, Unknown Toxicity	Municipal, Unknown Source, Urban/Storm Runoff
Canacadea Creek, Upper, and minor tribs	Minor Impacts	Silt/Sediment	Streambank Erosion
Canisteo River, Middle, and minor tribs	Minor Impacts	Silt/Sediment	Streambank Erosion
Canisteo River, Middle, and minor tribs	Minor Impacts	Silt/Sediment	Streambank Erosion
Canisteo River, Middle, and minor tribs	Impaired Segment	Water Level/Flow, Restricted Passage, Unknown Toxicity	Habitat Modification, Unknown Source
Chemung River, Lower, Main Stem	Threatened	Pathogens	Agriculture
Cohocton River, Lower, and minor tribs	Need Verification	Nutrients	Agriculture
Cohocton River, Middle, and minor tribs	Threatened	Nutrients	Agriculture
Cohocton River, Middle, and minor tribs	Threatened	Nutrients	Agriculture
Cohocton River, Upper, and minor tribs	Threatened	Nutrients	Agriculture
Colonel Bills Creek	Minor Impacts	Silt/Sediment	Streambank Erosion
Demmons Pond	Minor Impacts	Algal/Weed Growth	Habitat Modification
Diven/Heller Creek and tribs	Minor Impacts	Unknown Toxicity	Unknown Source
Dry Run and tribs	Minor Impacts	Silt/Sediment	Streambank Erosion
Fivemile Creek, Lower, and tribs	Minor Impacts	Nutrients, Pesticides	Agriculture
Kopper Pond	Impaired Segment	Priority Organics	Industrial, Tox/Contam. Sediment
Lake Salubria	Impaired Segment	Algal/Weed Growth, Nutrients	Habitat Modification, On-Site/Septic Syst
Lamoka Lake and Mill Pond	Impaired Segment	Algal/Weed Growth	Habitat Modification
Loon Lake	Threatened	Problem Species	Habitat Modification
Meads Creek, Lower, and minor tribs	Minor Impacts	Silt/Sediment	Habitat Modification, Streambank Erosion
Meads Creek, Upper, and tribs	Minor Impacts	Silt/Sediment	Habitat Modification, Streambank Erosion
Mud Creek and tribs	Need Verification	Nutrients (phosphorus), Pathogens	Agriculture
Newtown Creek, Lower, and tribs	Minor Impacts	Nutrients, Unknown Toxicity	Urban/Storm Runoff
North Branch Newtown Creek and tribs	Need Verification	Nutrients	Agriculture
Purdy Creek and tribs	Minor Impacts	Silt/Sediment	Streambank Erosion
Seeley Creek and minor tribs	Threatened	Water Level/Flow	Hydro Modification, Streambank Erosion
Smith Pond	Impaired Segment	Algal/Weed Growth, Nutrients	Habitat Modification, On-Site/Septic Syst
Tioga River, Main Stem	Minor Impacts	Silt/Sediment, Water Level/Flow, Acid/Base (pH)	Hydro Modification, Other Source
Tobehanna Creek and tribs	Need Verification	Algal/Weed Growth, Nutrients, Silt/Sediment	Agriculture
Tuscarora Creek, Upper, and tribs	Need Verification	Aesthetics, D.O./Oxygen Demand, Ammonia, Nutrients	Municipal
Twelvemile Creek and tribs	Minor Impacts	Nutrients	Agriculture
Waneta Lake	Impaired Segment	Algal/Weed Growth	Habitat Modification

**Additional suspected and possible causes and sources. See WI/PWL document for details.*

in-stream conditions. Troups Creek also was sampled quarterly as part of the Interstate Streams Monitoring Program at the Pennsylvania/New York state line from July 2004 to June 2005. The macroinvertebrate community sampled in July 2004 was rated slightly impaired, and the habitat was supporting. This Interstate Streams Program site was similar in quality to the upstream Subbasin Survey Program site, TRUP 5.8, and also had elevated aluminum and iron, possibly from eroding stream banks (see photograph on page 8).

COWN 12.0 in Elkland, Pa., had overall good conditions. The biological condition was nonimpaired, the habitat was excellent, and the water quality was "higher." Downstream of Cowanesque Lake at COWN 0.1, however, the conditions degraded slightly. The biological condition was slightly impaired, the water quality was rated "middle," and the habitat conditions remained excellent. The temperature at COWN 0.1 at the time of sampling exceeded water quality levels of concern. COWN 0.1 and a site upstream directly below the dam (COWN 2.2) are sampled in the Interstate Streams Program. SRBC staff rated the biological conditions at COWN 0.1 as nonimpaired and the habitat as supporting in July 2004; however, COWN 2.2 was rated moderately impaired with partially supporting habitat. These sites had elevated iron and aluminum values at the time of sampling. In previous years, COWN 0.1 was rated slightly or moderately impaired, although usually had improved conditions compared to COWN 2.2. This recovery at COWN 0.1 in 2004 compared to previous years' conditions may be due to water quality improvements to the dam discharge, which were implemented around 2000 (Lazorchick, 2007).

S. Buda

Tobehanna Creek near Tyrone, NY.

CANISTEO RIVER WATERSHED

The headwaters of Canisteo River Watershed around Hornell and Canisteo, N.Y., had numerous impaired sites in this survey. Moderately impaired biological conditions were found at five sites in this area. Staff sampled at two stations in Canacadea Creek, one towards the headwaters and one at the mouth; both sites had moderately impaired biological conditions, "lower" water quality, and supporting habitats. Total nitrogen, total nitrate-n, total phosphorus, total orthophosphate, and total sodium exceeded water quality levels of concern at the headwaters site (Table 4), while total sodium and total aluminum exceeded levels at the downstream station.

Another tributary to Canisteo River was Karr Valley Creek, which had slightly impaired biological condition, "middle" water quality, and supporting habitat. Purdy Creek and Colonel Bill's Creek had moderately impaired biological conditions and "middle" water quality due to temperature exceeding standards; total phosphorus and orthophosphate also exceeded levels of concern at Purdy Creek (Table 4). In addition, habitat was impaired at both sites with Purdy Creek conditions rated as partially supporting and Colonel Bill's Creek as nonsupporting. Purdy Creek habitat was impaired due to channel alteration and lack of adequate riparian buffer and Colonel Bill's Creek due to excessive sediment deposition and poor condition of banks. Purdy Creek was channelized with rip rap and a levee on the left bank.

Bennetts Creek had two sample sites, one near the headwaters, BENN 8.3, and one at the mouth, BENN 1.2. BENN 8.3 was moderately impaired, while BENN 1.2 had only slightly impaired biological conditions. Both sites had "middle" water quality; BENN 8.3 exceeded orthophosphate and temperature levels of concern, and BENN 1.2 exceeded temperature levels of concern (Table 4). BENN 1.2 had a lower habitat rating, with partially supporting habitat, whereas BENN 8.3 was rated as supporting.

Although many of the tributaries had impaired biological conditions, the Canisteo River site downstream of Hornell and Canisteo, N.Y., (CNST 33.0) had nonimpaired biological condition. However, at the time of sampling, total aluminum, total phosphorus, orthophosphate, sodium, and temperature exceeded levels of concern. Upstream at CNST 38.7, where only water chemistry samples were collected, total aluminum, sodium, and temperature exceeded levels of concern. The habitat at CNST 33.0 was rated as partially supporting, mostly due to poor condition of banks and lack of adequate vegetated riparian buffer. Downstream at a site in West Cameron, N.Y., (CNST 22.6), biological conditions were still rated as nonimpaired, but water chemistry improved to "middle" and habitat to supporting. At CNST 22.6, sodium and temperature exceeded levels of concern. These sections of Canisteo River are listed on NYSDEC's WI/PWL as an "impaired segment" at CNST 38.7 and as having minor impacts at CNST 33.0 and CNST 22.6. This section of the Canisteo River warrants further study and monitoring.

Tioga-Hammond Reservoir near Tioga, Pa.

Tuscarora Creek enters the Canisteo River near the mouth. Tuscarora Creek had slightly high total aluminum and temperature, slightly impaired biological conditions, and supporting habitat in the headwaters; however, the overall conditions at the mouth (TUSC 0.4) were optimal with nonimpaired biological conditions, "higher" water chemistry, and excellent habitat. This site at the mouth served as a reference site for Ecoregion 60, medium drainage size. A tributary to Tuscarora Creek, North Branch Tuscarora Creek, was sampled in this survey and had slightly impaired biological conditions, "higher" water quality, and supporting habitat. Two additional sites were sampled on the Canisteo River upstream and downstream of Tuscarora Creek. Only water quality information was collected at the upstream site and revealed high total aluminum, sodium, and temperature. Downstream of Tuscarora Creek, total aluminum and temperature were still high at the time of sampling, although biological conditions were nonimpaired, and habitat was supporting.

TIOGA RIVER WATERSHED

The headwaters of the Tioga River Watershed are located in Ecoregion 62 where there are numerous abandoned mine land areas (Figures 2 and 3). Abandoned mine drainage (AMD) from this area pollutes the Tioga River for most of its length. Numerous tributaries have AMD influences, including Fellows Creek, Johnson Creek, and Morris Run, which were sampled in this survey. All the sites had excellent habitat due to the forested nature of this area, except for Corey Creek, which had supporting habitat. The sites on Corey Creek and Fellows Creek had slightly impaired biological condition and "lower" water quality. The water quality at Corey Creek exceeded levels of concern for total aluminum and total suspended solids, while at Fellows Creek parameters of concern were alkalinity, total aluminum, and pH. Problems with sediment embedding the stream substrate were noted during Corey Creek's habitat assessment. This stream has suffered from severe streambank erosion, and efforts are being made through the Corey Creek Watershed Association to implement natural stream channel design (http://www.tiogacountypa.us/tioga/cwp/view.asp?A=928&Q=435165).

Many of the AMD tributaries had acidic conditions and therefore did not support acid-sensitive mayflies. Fellows Creek had no mayflies, since the alkalinity was only 0.2 mg/l. Johnson Creek at the mouth (JOHN 0.1) had higher alkalinity, although it still exceeded levels of concern. However, JOHN 0.1 was rated nonimpaired, largely due to the presence of a few mayfly taxa and many stoneflies. A passive treatment system was constructed in the headwaters of this watershed in Fall 2006, so future improvement may be noted. Morris Run was severely impaired due to AMD. Alkalinity, aluminum, iron, magnesium, manganese, sulfate, acidity, pH, and conductivity exceeded levels of concern. Morris Run had the highest aluminum, magnesium, manganese, sulfate, acidity (field), and lowest pH (field) of all the sites in the Chemung Subbasin Survey. MORR 0.8 only had two taxa in the sample, an acid-tolerant beetle (Dytiscidae: Agabus) and midge larvae.

Three samples from tributaries in the middle of the Tioga River Watershed had slightly impaired biological conditions and supporting or excellent habitat ratings. These sites were Crooked Creek, Hills Creek, and Mill Creek. Crooked Creek and Hills Creek were located upstream of the Hammond Reservoir. Crooked Creek had "lower" water quality due to slightly elevated aluminum, but no water quality values exceeded levels of concern at the sites on Hills Creek and Mill Creek.

The sites on the mainstem Tioga River were all biologically impaired except for the site at the mouth TIOG 6.2, which was nonimpaired. This site was downstream of the Cowanesque River, which may have helped to dilute the AMD. Aluminum still slightly exceeded levels of concern at this site; however, the value was close to the level of concern (239 μg/l) and might not have been representative of usual aluminum levels. No other parameters exceeded levels of concern at TIOG 6.2. At TIOG 16.3, only aluminum slightly exceeded levels of concern (212 μg/l). This site was downstream of the Tioga/Hammond Reservoir, which may have helped precipitate some metals in the water column. All the sites upstream of Tioga/Hammond Reservoir had either moderately or severely impaired biological conditions, except for the headwater site near Chases Mills, Pa., which was slightly impaired. Alklinity and aluminum exceeded levels of concern at all of the sites upstream of the reservoir. Manganese and pH (field) exceeded levels of concern at TIOG 29.8, TIOG 35.4, and TIOG 39.6, along with TSS at TIOG 29.8 and acidity at TIOG 35.4 and TIOG 39.6. The worst site with regard to water quality was TIOG 39.6 in Blossburg, Pa., which also had high iron and the highest manganese and aluminum of the Tioga River sites. Additionally, habitat was degraded at this site due to embeddedness of substrate from AMD precipitate. The biological conditions at TIOG 35.4 and TIOG 39.6 were severely impaired, containing only two taxa in the macroinvertebrate sample. The conditions of the Tioga River also are monitored at Lindley, N.Y., quarterly each year as part of the Interstate Streams Program. Unfortunately, during the past two years, staff were unable to collect a biological sample due to high flows; however, in the past, this site has been rated slightly impaired. Elevated iron and aluminum levels often have been noted at this site.

COHOCTON RIVER WATERSHED

The biological conditions throughout Cohocton River Watershed were mostly nonimpaired and slightly impaired, except for the headwater site, which was moderately impaired. This site (COHO 46.3) was in an area surrounded by wetlands and had slightly high aluminum and nitrogen. The habitat was supporting, but had low scores for sediment deposition, condition of banks, and vegetated riparian width. The macroinvertebrate population improved at the two sites downstream to slightly impaired north of Cohocton, N.Y., (COHO 37.5), and nonimpaired south of Avoca, N.Y., (COHO 25.0). Staff could not sample for macroinvertebrates at the next two sites downstream (COHO 14.6 and COHO 4.0) during this survey; however, the site at the mouth of the Cohocton River (COHO 0.5) also had a nonimpaired biological condition. Water quality problems potentially threaten this river with high total nitrogen nitrate, aluminum, and sodium levels at various sites in the watershed. The highest total nitrate value in the survey was at a site on Cohocton River (COHO 37.5) and very high sodium levels were recorded at COHO 14.6 and COHO 0.5. These high sodium values may not be representative of usual conditions; however, further sampling of sodium as part of the Year-2 survey will be conducted on this river.

L. Steffy

Cohocton River near Avoca, NY.

S. Buda

Five Mile Creek near Kanona, NY.

Three tributaries in the headwaters of Cohocton River Watershed that enter the river from the east are Twelvemile, Tenmile, and Five Mile Creeks. All three tributary sites had slightly impaired biological conditions. Habitat conditions were supporting at Twelvemile and Five Mile Creeks and partially supporting at Tenmile Creek. It appears that Tenmile Creek's slightly impaired biological condition may be due to habitat conditions. Embeddedness, velocity/depth regimes, sediment deposition, channel flow status, and riparian vegetated width all received low scores in the habitat assessment. Water quality conditions at Tenmile Creek were "higher" with no parameters exceeding levels of concern at the time of sampling. The slight biological impairment at Twelvemile and Five Mile Creeks may be due to water quality impairments. Total nitrogen exceeded the level of concern slightly at Five Mile and Twelvemile Creeks. Total nitrate levels at Twelvemile Creek and total aluminum values at Five Mile Creek also exceeded concern levels.

Goff Creek and Campbell Creek enter Cohocton River from the west, and both had nonimpaired biological conditions. The habitat at these two sites was supporting, and the water quality on Campbell Creek was "higher" quality. At Goff Creek, total nitrogen, total nitrate, and total sodium slightly exceeded levels of concern. Stocking Creek also enters Cohocton River on the west bank and had a slightly impaired macroinvertebrate condition, due to a dominance of pollution-tolerant midge larva. Sodium only slightly exceeded levels of concern, but the habitat was partially supporting.

Mud Creek is the largest tributary in the Cohocton River Watershed and includes two large lakes, Waneta and Lamoka Lakes, in the headwaters. Tobehanna Creek is a small tributary to Lamoka Lake that was sampled during this survey. The site near the mouth indicated overall optimal conditions

S. Buda

Mud Creek near Bradford, NY.

with nonimpaired biology, "higher" water quality, and excellent habitat. Downstream of these lakes, a site on Mud Creek (MUDC 10.5) had slightly impaired macroinvertebrates, possibly due to partially supporting habitat. None of the water quality parameters sampled during this survey exceeded levels of concern at the time of sampling. This site had a large number of pollution-tolerant amphipods (Gammaridae: Gammarus) that may have influenced the biological condition rating. This amphipod is often abundant in limestone streams; however, MUDC 10.5 did not have many characteristics of a limestone stream except for higher alkalinity. Possibly there was a spring or groundwater influence at the sample site. The area surrounding MUDC 10.5 included numerous wetland areas. Downstream at MUDC 1.1, biological conditions were still slightly impaired, and habitat was still partially supporting.

Meads Creek Watershed is mostly forested (Figure 3); however, turbid water has been noted during high flows. The macroinvertebrate population was rated slightly impaired at two sites on Meads Creek. The site at the mouth had supporting habitat, and temperature slightly exceeded the level of concern. It is possible that this creek is slightly impaired from times of high flows when runoff contributes pollutants from certain land use practices that can aggravate impairment if not properly managed, such as logging and natural gas drilling. The watershed is also known to be flood-prone. This stream will be sampled more intensively in the Year-2 subbasin survey project.

CHEMUNG RIVER WATERSHED

The Chemung River Watershed had a mixture of tributaries with optimal conditions as well as those that possibly were impacted by pollutants, such as nitrogen and sodium. A few tributaries that crossed the Pennsylvania-New York state line had sites that were rated in different condition categories in each state. The mainstem Chemung River had mostly nonimpaired conditions.

Post Creek was one of the highest quality streams in the Chemung Subbasin Survey. The macroinvertebrate community at both sites sampled on Post Creek indicated nonimpaired biological condition. The site in the headwaters (POST 8.8) had slight nutrient enrichment and localized habitat impacts compared to Post Creek near the mouth (POST 0.6). Overall optimal conditions were noted at POST 0.6. This stream may be a good candidate for protection from further habitat degradation. Another stream in the Chemung River Watershed with overall optimal conditions of nonimpaired biology, excellent habitat, and "higher" water quality was Baldwin Creek. BDWN 0.3 served as one of the reference sites for Ecoregion 60, small drainage areas.

Sing Sing Creek and Newtown Creek had nitrogen and sodium levels that exceeded levels of concern. Sing Sing Creek was slightly impaired and had supporting habitat. The macroinvertebrate sample from Sing Sing Creek was dominated by filter-feeding caddisflies and lacked stoneflies. Newtown Creek at the mouth (NEWT 0.6) also lacked stoneflies and had moderately impaired biological conditions. Hardness, conductivity, nitrogen, and sodium exceeded levels of concern at this site, which may warrant further study. The habitat was rated supporting, with embeddedness as a concern. A tributary to Newtown Creek, North Branch Newtown Creek, also had a moderately impaired biological condition. The macroinvertebrate sample was dominated by midges and other tolerant taxa. This biological impairment possibly may be due to the habitat impairment, which was rated partially supporting with low scores for riparian vegetated width and epifaunal (riffle habitat) substrate. Channel flow was low at the time of sampling, so the impairment may have been due to temporary low

S. Buda

Meads Creek near Meads Creek, NY.

S. Buda

Bentley Creek stream channel restoration project near the PA/NY state line.

flow conditions. Another source of the impairment may be due to a water chemistry pollutant that was not included in the laboratory tests. Newtown Creek upstream of North Branch Newtown Creek was nonimpaired and had a supporting habitat. The sodium concentration (23.7 mg/l) at the time of sampling was slightly higher than the level of concern, but not as high as measured at NEWT 0.6 (67.8 mg/l).

South, Seeley, and Bentley Creeks all cross the Pennsylvania-New York state line from Pennsylvania into New York. During this survey, the sites sampled in Pennsylvania showed slight or moderate impairment, although the sites downstream in New York had nonimpaired biological conditions. Seeley Creek had moderately impaired biological conditions in the headwaters with slightly high nutrient levels. The habitat was rated supporting at both upstream and downstream sites, although low flow conditions were noted as a possible threat to the stream quality. South Creek is a tributary to Seeley Creek and contained two sites in Pennsylvania rated as slightly impaired during this survey. Aluminum exceeded levels of concern at both of these sites, and the uppermost site lacked adequate vegetated riparian zone width. The site at the mouth in New York State (SOUT 2.0) had optimal biological, water quality, and habitat conditions.

Bentley Creek also had nonimpaired biological conditions and "higher" water quality at the mouth in New York State. Conditions at both upstream sites in Pennsylvania were slightly impaired, most likely due to habitat conditions, which were rated nonsupporting at the most upstream site. Dredging, regrading, and other such disturbances were evident in Bentley Creek, resulting in low scores for channel condition, instream cover, velocity/depth, channel flow status, and channel alteration. The water chemistry analysis at the uppermost site indicated high turbidity, total suspended solids, total phosphorus, iron, and aluminum values. The phosphorus and metals were probably from soil particles in this highly turbid sample. Currently, impairment at the upstream sites does not seem to impact the site at the mouth of Bentley Creek, but may in the future.

These streams are all sampled as part of Interstate Streams Program at sites along the Pennsylvania/New York state line. Seeley and South Creeks both had slightly impaired biological conditions and supporting habitat in July 2004. Bentley Creek had nonimpaired biological conditions and supporting habitat in July 2004. Aluminum and iron were sometimes elevated at these sites during quarterly sampling, possibly due to runoff and higher flows.

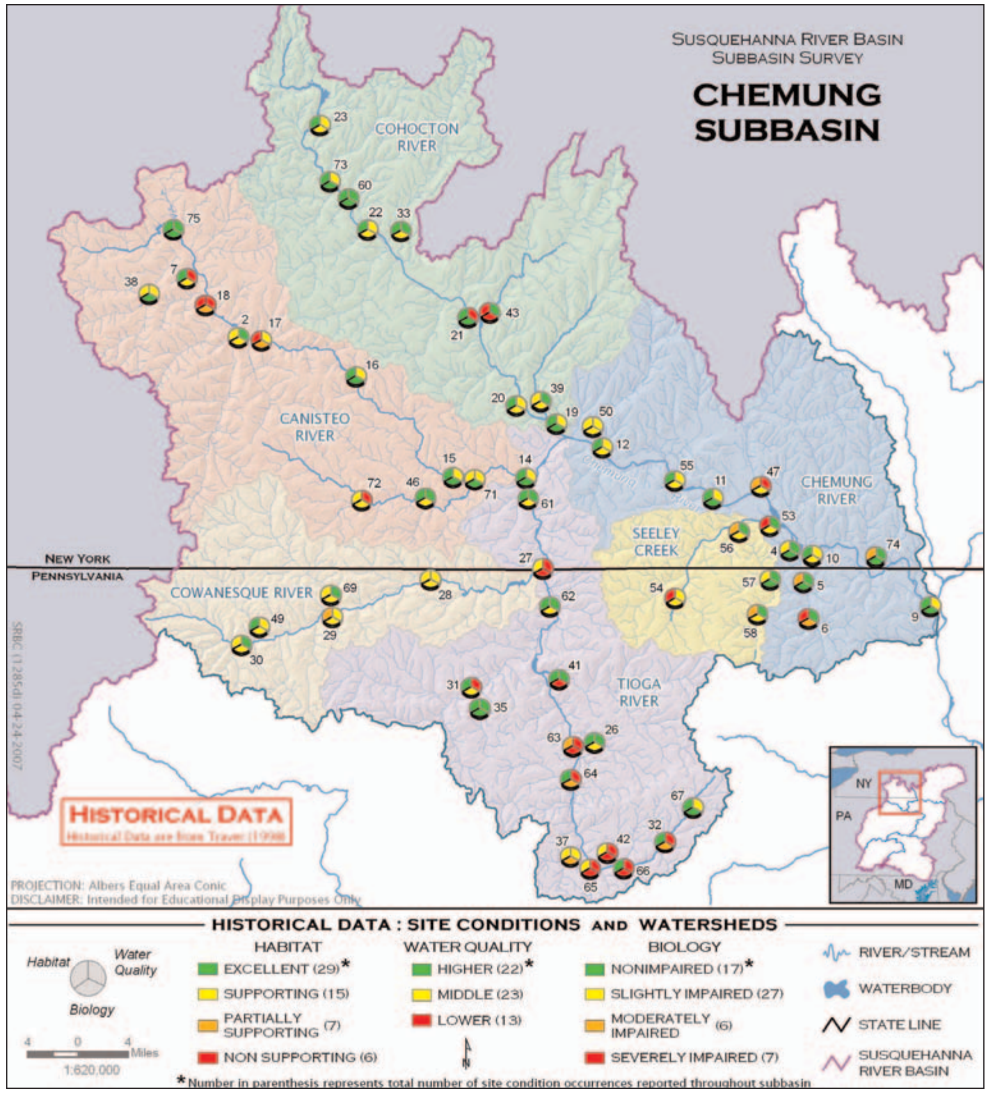
Wynkoop Creek, a tributary near the mouth of the Chemung River, had a slightly impaired macroinvertebrate community, partially supporting habitat, and "higher" water quality. This site near the mouth of Wynkoop Creek had degraded habitat conditions that may have impacted the biological condition slightly. Staff noted excess sediment in addition to a lack of desirable pool and riffle habitat and riparian vegetative zone. The water chemistry results did not indicate any impairment, and the macroinvertebrate community contained numerous sensitive taxa. This stream site may be a candidate for protection from further habitat degradation.

The mainstem Chemung River sites contained mostly nonimpaired biological conditions, except for the site at West Elmira, N.Y., (CHEM 28.0). The habitat was rated excellent at all the sites, except for CHEM 39.8 in South Corning, N.Y. Sodium exceeded levels of concern at all four Chemung River sites, total nitrogen at three sites, and aluminum at one site. The aluminum was elevated at CHEM 39.8, which is the site downstream of where the Tioga and Cohocton Rivers merge near Corning, N.Y. The elevated sodium levels may have been from the Cohocton River. The Chemung River is monitored quarterly for the Interstate Streams Program. Unfortunately, a macroinvertebrate sample was not collected over the past two years due to sampling difficulties; however, in the past the Chemung River at Chemung, N.Y., had slightly impaired or nonimpaired biological conditions. Iron and aluminum were sometimes elevated at this site.

COMPARISON of 1997 and 2006 Data

Overall biological, habitat, and water quality conditions in 1997 and 2006 were indicative of a mostly healthy subbasin. The results for water quality, biological, and habitat conditions in the 1997 Chemung Subbasin Survey (Traver, 1998) are depicted in Figure 5. One site, CNST 55.5, was sampled historically, but not in the current 2006 survey. This site is listed in red print in the Appendix as site number 75. The methods have changed slightly throughout the years, and the methods for the 1997 survey can be found in Traver (1998). Specifically, the number of macroinvertebrates subsampled changed from 100 to 200, the habitat assessment form changed to assigning each parameter 20 points instead of weighting the parameters with different point ranges, and the water quality assessment analysis has changed. In the 1998 report, Traver assessed water quality using Principal Components Analysis and cluster analysis and did not assign rating categories for site conditions. For comparison purposes, the 1997 data were analyzed using current methodology to acquire water quality site condition ratings. In addition, the reference categories have changed due to advances in Geographic Information Systems technology and calculation of drainage size. Another difference between the data sets was flow, which varied from site to site for different years.

A comparison of 1997 and 2006 data showed mostly similar conditions; however, biological conditions appeared to be slightly better in 2006. The overall percentage of each biological condition in 1997 was very similar to the conditions in 2006, although there was a slightly higher percentage of nonimpaired and slightly lower percentage of severely impaired in 2006 (Figures 6 and 7). In 1997, 23 percent of the sites were moderately and severely impaired, and in 2006, 20 percent of the sites were moderately and severely impaired. Conversely, 77 percent were nonimpaired and slightly impaired in 1997 and 80 percent were nonimpaired and slightly impaired in 2006. Twenty-one sites had the same biological condition category in 2006 as they did in 1997. The biological condition had degraded at thirteen sites and improved at 19 sites. Five of the sites that improved had improved by more than one step in condition category, specifically CNST 33.0, COWN 0.1, JOHN 0.1, MILL 1.4, and MUDC 1.1.



J. Zimmerman

(station names corresponding to sample site numbers on map are located in Appendix)

Figure 5. Water Quality, Biological, and Habitat Conditions in 1997 Sample Sites in the Chemung Subbasin.

Habitat conditions improved in some categories, but degraded in others. Fifty-one percent were rated excellent in 1997 while only 34 percent were excellent in 2006. Only three percent were rated nonsupporting in 2006, whereas 11 percent were nonsupporting in 1997. Two sites degraded in habitat condition by more than one condition category from 1997 to 2006. Those two sites were COHO 25.0 and TENM 0.2. On the other hand, habitat conditions improved at five sites from 1997 to 2006. Those sites were COWN 20.5, SEEL 2.8, SEEL 11.4, SOUT 2.0, and TIOG 29.8.

The water chemistry at the time of sampling in 2006 was worse than at the time of sampling in 1997. This may have been due to flow or unusual water chemistry conditions at the time of sampling. Twenty-eight percent were rated “higher” quality and 41 percent “lower” quality in 2006, whereas 38 percent were “higher” and 22 percent “lower” in 1997. Thirty-two of the sites remained in the same water quality condition category from 1997 to 2006, while nineteen degraded and six improved. Seven sites degraded by more than one category step. Those sites were BNTY 5.7, CORY 1.5, FMIL 1.1, MUDC 1.1, SOUT 5.9, SOUT 9.1, and TIOG 6.2. Table 7 shows a comparison of the total number of sites exceeding levels of concern for the sites that were

Year	Alkalinity	Aluminum T	Hardness T	Iron T
1997	8	11	1	3
2006	8	29	1	3
	Magnesium T	**Manganese T**	**Nitrate-N T**	**Nitrogen TOT**
1997	1	6	7	14
2006	1	4	7	17
	Phos T Ortho	**Phosphorus T**	**Sodium T**	**Sulfate T**
1997	6	1	22	1
2006	5	5	19	1
	T Org Carbon	**T Susp Solid**	**Acidity (Field)**	**pH (Field)**
1997	0	3	4	6
2006	1	3	3	5
	Specific Conductivity (Field)		**Water Temperature (Field)**	
1997	2		0	
2006	2		16	

Table 7. *Number of Water Quality Values Exceeding Levels of Concern for the same sites in 1997 and 2006*

sampled in both 1997 and 2006. The top three parameters with the highest number exceeding levels of concern were the same in 1997 and 2006. They were sodium (22), nitrogen (14), and aluminum (11) in 1997 and aluminum (29), sodium (19), and nitrogen (17) in 2006. The number of sites exceeding levels of concern for each parameter was very similar between the two surveys, except for aluminum and temperature, which increased in 2006. The high temperatures may have been due to the fact that the summer of 2006 was the second warmest on record (NOAA, 2006a; NOAA, 2006b). In particular, July was the second hottest on record (NOAA, 2006c), and July or early August was the time when most of the samples were collected for sites that exceeded temperature levels of concern.

The sites that were impaired due to AMD in 1997 still were impaired in 2006, except for Johnson Creek, which improved significantly, and Fellows Creek, which improved only slightly. Morris Run remained the most severely impaired AMD site from both surveys.

Cowanesque River showed improvement from 1997 to 2006 at COWN 0.1 and COWN 12.0. Habitat and water quality conditions at COWN 20.5 improved, but biological conditions did not. Biological and water quality conditions improved and the habitat remained excellent at North Fork Cowanesque River. The Cowanesque River Watershed has been impacted in the past by problems with a tannery, wastewater treatment systems, and agricultural runoff (Traver, 1998). The improvement seen may be due to upgrades in treatment systems and agricultural best management projects. Numerous Stream ReLeaf Projects (http://www.dep.state.pa.us/dep/deputate/watermgt/WC/Subjects/StreamReLeaf/default.htm) are documented in this watershed (eMap PA, 2007). Also, the improvement seen at COWN 0.1, which is located downstream of the Cowanesque Reservoir, may be attributable to the improvements made to the dam around 2000. During the late 1990s, problems with the control mechanisms for the low flow control gates and intake structure gates resulted in low flow releases coming off the bottom of the reservoir, which is water low in dissolved oxygen. Since those repairs have been made, the water released from the dam can be mixed with other layers in the lake to produce better water quality (Lazorchick, 2007).

Impairment of the Canisteo River in the Hornell-Canisteo area was documented

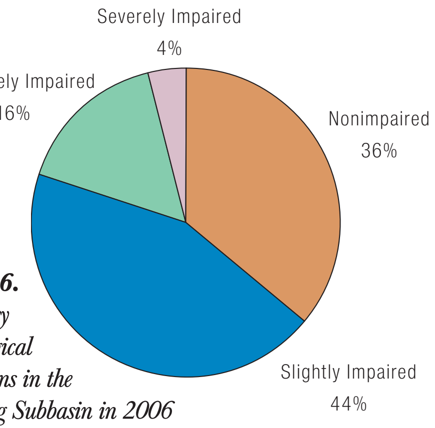


Figure 6. *Summary of Biological Conditions in the Chemung Subbasin in 2006*

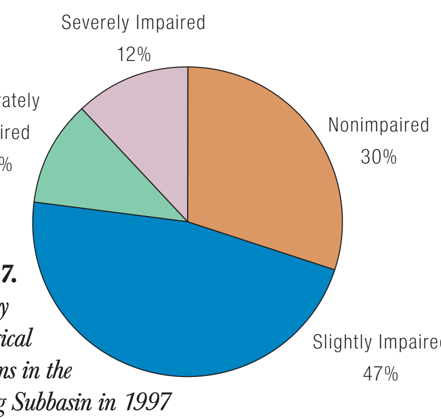


Figure 7. *Summary of Biological Conditions in the Chemung Subbasin in 1997*

in the 1997 sampling at CNST 33.0 and CNST 38.7 and appeared to continue in the 2006 survey. Habitat and water quality degradation was attributed to the urban land use and to poor quality conditions on Canacadea Creek. The 1997 survey also documented improvement in water quality on the Canisteo River downstream at sites CNST 22.6 and CNST 7.7.

CONCLUSIONS

Overall, the streams sampled in the Chemung Subbasin contained fairly good biological, habitat, and water quality conditions in 2006. A majority of the sites were rated either nonimpaired or only slightly impaired; however, there are areas where improvement is needed in this watershed. AMD is a large source of impairment in the Tioga River Watershed. Another area in need of improvement is the headwaters of Canisteo River around Hornell-Canisteo, N.Y. Problems in this area appear to be from habitat degradation and possibly other water quality problems that need further investigation. Impairment in the Tioga River and Canisteo River headwaters has been documented in both 1997 and 2007 reports.

Most of the moderate and severe impacts in the Chemung Subbasin were due to degraded habitat conditions, AMD, or elevated aluminum, sodium, and nutrients. Many of the habitat problems identified in the habitat assessments were due to a lack of adequate vegetated riparian zone width. Vegetation on the banks and in the riparian zone is very important to the life cycles and reproduction of aquatic insects and fish inhabiting the stream. Numerous insects rely on leaf litter as a food source. Other insects that emerge from the stream in the adult life stage to reproduce rely on the surrounding vegetation for activities such as laying eggs. Furthermore, vegetation creates shade that helps to maintain cool stream temperatures and adequate dissolved oxygen levels as well as providing bank stability to minimize erosion.

Another habitat problem identified in the assessments was low flow. The combination of low flow, lack of vegetated riparian areas, and the second hottest summer on record could have been a source of some of the impairment in this watershed. Other factors contributing to impairment in this subbasin were water quality issues, such as AMD, aluminum, sodium, and nutrients. The elevated aluminum and sodium could be related to the erosion of streambanks or other sources; however, aluminum is not toxic to fish unless the pH of the waters is less than 5.2 when aluminum is present in the dissolved form (Gagen and Sharpe, 1987; Baker and Schofield, 1982). Possible sources of sodium could be salt deposits, natural gas wells, and road salt. Nutrients such as nitrogen and phosphorus may be a result of agricultural runoff and in particular, phosphorus from soil erosion.

Some of the highest quality watersheds in this survey were Baldwin Creek, Campbell Creek, Post Creek, Tobehanna Creek, Tuscarora Creek, and sections of the Cowanesque River. Efforts should be made to protect these watersheds from degradation. Some of the most degraded watersheds were Canacadea Creek, Colonel Bill's Creek, Newtown Creek, Purdy Creek, Morris Run, and the Tioga River. Further study is needed as to the source of impairment in some of these watersheds; where

***Table 8.** Information Resource Agencies in the Chemung Subbasin*

Organization Name	County	Contact	Address	Phone	Email or Website
Chemung County Environmental Management Council	Chemung	Diane Fiorentino	425 Pennsylvania Avenue Elmira, NY 14904	607-734-4453	http://www.dec.state.ny.us/website/ej/region8groups.html#chemung
Chemung County Water Quality Committee	Chemung	Mark Watts	851 Chemung Street Horseheads, NY 14845	607-739-2009	http://www.dec.state.ny.us/website/ej/region8groups.html#chemung
Southern Tier Environmental Health and Safety Group	Chemung	Lee Hanle Younge	141 Olcott Road North Big Flats, NY 14814	607-562-3988	http://www.dec.state.ny.us/website/ej/region8groups.html#chemung
Upper Susquehanna Coalition	Chemung	Jim Curatolo	Tioga Soil and Water Conservation District 183 Corporate Drive Owego, New York 13827-3249	607-687-3553	http://www.u-s-c.org/
Steuben County Environmental Management Council	Steuben	Amy Dlugos, Chair	3 East Pulteney Square Bath, NY 14810	607-776-9631 Ext. 2268	http://www.steubencony.org/planning/emc.html
Steuben County Soil and Water Conservation District	Steuben	Jeffrey Parker, District Manager	Steuben SWCD USDA Service Center 415 W. Morris St Bath, NY 14810	607-776-7398	velynda-risley@ny.nacdnet.org
Chemung County Soil and Water Conservation District	Chemung	Mark Watts, District Manager	Chemung SWCD 851 Chemung St Horseheads, NY 14845	607-739-2009	markwatts@stny.rr.com
Tioga County (PA) Conservation District	Tioga	Ralph Brugger, District Manager	50 Plaza Lane Wellsboro, PA 16901	570-724-1801	http://www.geocities.com/tccdpa/
Bradford County Conservation District	Bradford	Michael Lovegreen, District Manager	Stoll Natural Resource Center, RR 5 Box 5030C Towanda, PA 18848	570-265-5539 Ext. 6	http://www.bradfordcountypa.org/OtherAgencies/ConservationDist.asp
Pennsylvania Association of Sustainable Agriculture	PA	Brian Snyder, Executive Director	PASA Headquarters 114 West Main Street P.O. Box 419 Millheim, PA 16854	814-349-9856	http://www.pasafarming.org/

the impairment source and cause are known, restoration efforts are needed.

Additional information and assistance with water related issues can be obtained from numerous resource agencies. A few of the resource agencies in the Chemung Subbasin are listed in Table 8. Agricultural Best Management Practices can be used to limit the impacts associated with farming operations. Information on these practices and other conservation methods can be obtained from County Conservation District Offices (Table 8). Grant opportunities to alleviate AMD impacts and more information on remediation technologies also are available from County Conservation District Offices and the Eastern Pennsylvania Coalition for Abandoned Mine Reclamation (http://www.orangewaternetwork.org/). Urban stormwater problems can be minimized with low impact development and by allowing for groundwater recharge areas. More information on urban pollution remediation can be obtained from the Center for Watershed Protection through its Urban Subwatershed Restoration Manual Series (http://www.cwp.org/) and from the PADEP's Pennsylvania Stormwater Best Management Practices Manual (http://www.dep.state.pa.us/dep/deputate/watermgt/wc/subjects/stormwatermanagement/BMP%20Manual/BMP%20Manual.htm).

SRBC staff is conducting the Chemung Subbasin Survey, Year-2 assessment in the Cohocton River Watershed. The streams sampled in this survey are Twelvemile, Five Mile, Goff, Stocking, Mud, Meads, Tobehanna, and Little Tobehanna Creeks in addition to many unnamed tributaries to lakes and the mainstem Cohocton River. The sampling began in April 2007 and will continue through January 2008. The project includes quarterly water chemistry sampled at 27 sites throughout the watershed, two rain-event episodes sampled at selected sites, and macroinvertebrate and habitat assessments. The survey is focusing on nutrient sources and potential impacts from BTEX (Benzene, Toluene, Ethyl benzene, and Xylenes mix, which are volatile organic compounds found in petroleum-related products such as gasoline) in this watershed. More information on this project is available from SRBC.

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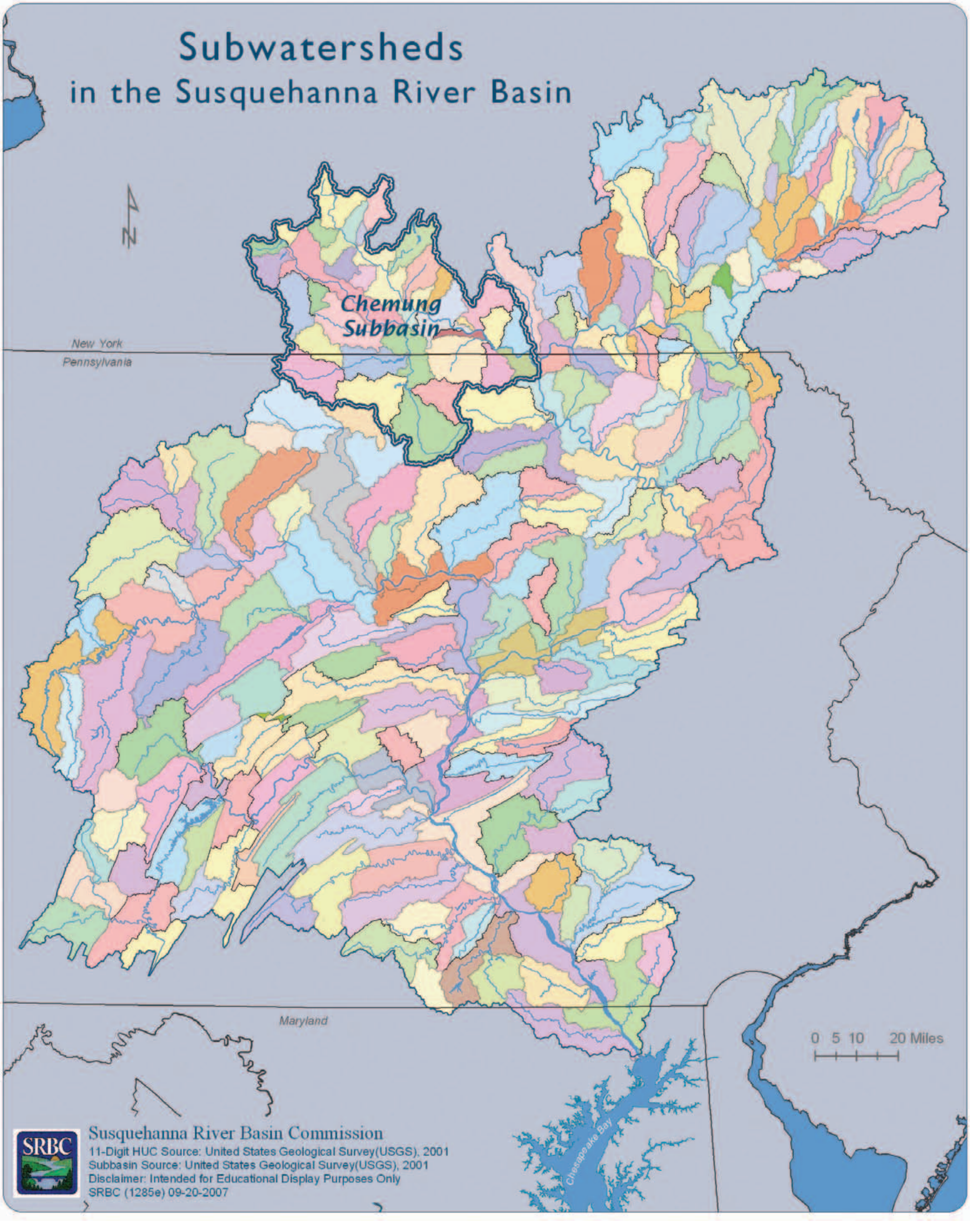
Appendix

Site	Sample Site	Location Description	County	Latitude	Longitude	Drainage Area	Reference Category
1	BDWN000.3	Baldwin Creek at Rt. 60 bridge in Lowman, N.Y.	Chemung	42.0304	-76.7191	39.6	60s-tan
2	BENN001.2	Bennetts Creek at community park in Canisteo, N.Y.	Steuben	42.2670556	-77.6015	95.6	60s-tan
3	BENN008.3	Bennetts Creek at bridge near Rock Creek south of Bennetts, N.Y.	Steuben	42.1562778	-77.6378611	40.6	60s-brown
4	BNTY000.4	Bentley Creek at Wellsburg, N.Y.	Chemung	42.01694	-76.73194	55.3	60s-tan
5	BNTY002.5	Bentley Creek at Mobile Acres Trailer Park, Pa.	Bradford	41.98583	-76.72278	49.3	60s-tan
6	BNTY005.7	Bentley Creek at Bentley Creek, Pa.	Bradford	41.94361	-76.715	32.4	60s-tan
7	CANA001.7	Canacadea Creek at gage at Rt. 21 bridge in Hornell, Steuben Co., N.Y.	Steuben	42.33472	-77.6825	57.5	60s-brown
8	CANA006.7	Canacadea Creek at Rt. 42 bridge south of Almond, N.Y.	Allegheny	42.289	-77.74791667	16.7	60s-brown
9	CHEM002.5	Chemung River at Tozer's Landing in Athens, Pa.	Bradford	41.95722	-76.52583	2577.3	60R
10	CHEM018.5	Chemung River at Ashland Tollbridge Park in Wellsburg, N.Y.	Chemung	42.017556	-76.725889	2450.3	60R
11	CHEM028.0	Chemung River at Rt. 225 bridge in West Elmira, N.Y.	Chemung	42.0816944	-76.86513889	2145.6	60R
12	CHEM039.8	Chemung River at Denison Park in South Corning, N.Y.	Steuben	42.1410833	-77.03475	2040.4	60R
13	CMBL000.1	Campbell Creek downstream of Sinclair Creek near Knight Settlement, N.Y.	Steuben	42.346556	-77.397889	32.6	60s-brown
14	CNST001.0	Canisteo River at bridge near mouth in Erwins, N.Y.	Steuben	42.10583	-77.15333	550.7	60L
15	CNST007.7	Canisteo River at Addison, N.Y.	Steuben	42.10639	-77.26667	390.1	60m
16	CNST022.6	Canisteo River along Rt. 432 at gage at West Cameron, N.Y.	Steuben	42.222583	-77.4182778	339.8	60m
17	CNST033.0	Canisteo River just upstream of Colonel Bills Creek downstream of Canisteo, N.Y.	Steuben	42.26389	-77.57833	309.7	60m
18	CNST038.7	Canisteo River at bridge in South Hornell, N.Y.	Steuben	42.30389	-77.65306	168.1	60m
19	COHO000.5	Cohocton River at park upstream of Painted Post, N.Y.	Steuben	42.1684722	-77.1061667	596.6	60L
20	COHO004.0	Cohocton River at Main Street Bridge in Coopers Plains, N.Y.	Steuben	42.18111	-77.15278	521.5	60L
21	COHO014.6	Cohocton River at West Lamoka Ave Bridge in Savona, N.Y.	Steuben	42.289	-77.2263	377	60m
22	COHO025.0	Cohocton River at Rt. 415 crossing at fishing access downstream of Avoca, N.Y.	Steuben	42.3922778	-77.4011667	192	60m
23	COHO037.5	Cohocton River at Rt. 371 crossing and fishing access north of Cohocton, N.Y.	Steuben	42.512889	-77.47644	42.6	60s-tan
24	COHO046.3	Cohocton River at Parks Road bridge west of Atlanta, N.Y.	Steuben	42.5544	-77.5058	26.7	60s-tan
25	COLB000.8	Colonel Billis Creek at mouth near Canisteo Center, N.Y.	Steuben	42.2618	-77.5814	27.7	60s-tan
26	CORY001.5	Corey Creek at Route 549 bridge in Mansfield, Pa.	Tioga	41.8006389	-77.0466389	15.3	60s-tan
27	COWN000.1	Cowanesque River at Rt. 15 bridge near Lawrenceville, Pa.	Steuben	42.001361	-77.127	300.1	60m
28	COWN012.0	Cowanesque River at Rt. 49 bridge in Elkland, Pa.	Tioga	41.98861	-77.30111	244.7	60m
29	COWN020.5	Cowanesque River along Rt. 249 west of Knoxville, Pa.	Tioga	41.95167	-77.44139	132	60m
30	COWN029.6	Cowanesque River upstream of North Fork at Westfield, Pa.	Tioga	41.91444	-77.58	48.2	60s-tan
31	CRKD008.0	Crooked Creek at railroad bridge at Crooked Creek, Pa.	Tioga	41.85611	-77.23472	83.4	62s
32	FELL000.1	Fellows Creek at first bridge up from mouth near Chases Mills, Pa.	Tioga	41.68556	-76.9375	6.3	62m
33	FMIL001.1	Five Mile Creek upstream of Rt. 53 north of Kanona, N.Y.	Steuben	42.390944	-77.3493611	66.3	60s-tan
34	GOFF003.1	Goff Creek at Rt. 69 crossing north of Towlesville, N.Y.	Steuben	42.3653	-77.4475	20.4	60s-brown
35	HILL000.2	Hills Creek upstream of SR4039 at Crooked Creek, Pa.	Tioga	41.85639	-77.22556	16.2	60s-tan
36	JEMI007.7	Jemison Creek near Azelta, Pa.	Tioga	41.8384	-77.4891	2.1	62s
37	JOHN000.1	Johnson Creek at park in Blossburg, Pa.	Tioga	41.6775	-77.06917	17.4	62s
38	KARR000.1	Karr Valley Creek at mouth near Almond, N.Y.	Allegany	42.31639	-77.74111	27.7	60s-brown
39	MEAD000.1	Meads Creek upstream of Rt. 415 bridge near Coopers Plains, N.Y.	Steuben	42.17528	-77.12139	69.9	60s-tan
40	MEAD011.1	Meads Creek at Rt. 26 bridge downstream of Meads Creek, N.Y.	Schuyler	42.255944	-77.11041667	37.4	60s-tan
41	MILL001.4	Mill Creek at gate on State Game Lands No. 37 near Painter Run, Pa.	Tioga	41.8738611	-77.1016389	75.1	60s-tan
42	MORR000.8	Morris Run along SR 2014 at pipeline crossing near Blossburg, Pa.	Tioga	41.66306	-77.03972	6.8	62s
43	MUDC001.1	Mud Creek at Rt. 415 bridge in Savona, N.Y.	Steuben	42.290556	-77.219944	80.7	60s-tan
44	MUDC010.5	Mud Creek at Rabbit Road downstream of Bradford, N.Y.	Steuben	42.3642778	-77.117944	47.8	60s-brown
45	NBNC000.6	North Branch Newtown Creek upstream of Vargo Road near Slabtown, N.Y.	Chemung	42.2013889	-76.7743611	15.9	60s-tan
46	NBTC000.3	North Branch Tuscarora Creek at Old State Road near South Addison, N.Y.	Steuben	42.08222	-77.30944	31.5	60s-brown
47	NEWT000.6	Newtown Creek at Rt. 352 bridge in Elmira, N.Y.	Chemung	42.09611	-76.78861	78.5	60s-tan
48	NEWT009.7	Newtown Creek along Rt. 233 southeast of Slabtown, N.Y.	Chemung	42.1811	-76.7748	31.3	60s-brown
49	NFCR000.1	North Fork Cowanesque River near mouth at Westfield, Pa.	Tioga	41.91806	-77.56028	21.7	60s-brown
50	POST000.6	Post Creek at railroad bridge near mouth in Corning, N.Y.	Steuben	42.15194	-77.045	34.3	60s-tan
51	POST008.8	Post Creek at Rt. 414 bridge in Post Creek, N.Y.	Chemung	42.2324	-76.9617	17.3	60s-brown
52	PURD000.3	Purdy Creek at bridge near mouth at Canisteo, N.Y.	Steuben	42.2604	-77.6129	22.7	60s-tan
53	SEEL002.8	Seeley Creek near Rt. 427 bridge at Southport, N.Y.	Chemung	42.0503333	-76.7745833	143.5	60m
54	SEEL011.4	Seeley Creek at Bradford/Tioga county line upstream of Mosherville, Pa.	Bradford	41.9675	76.92180556	11.8	60s-tan
55	SING000.9	Sing Sing Creek at Route 352 near Harris Hill Manor, west of Elmira, N.Y.	Chemung	42.10278	-76.92222	35.8	60s-tan
56	SOUT002.0	South Creek at Rt. 26 bridge near Elmira, N.Y.	Chemung	42.04361	-76.8225	43.5	60s-tan
57	SOUT005.9	South Creek at Rt. 14 bridge in Fassett, Pa.	Bradford	41.98889	-76.77417	22.4	60s-tan
58	SOUT009.1	South Creek at Thompson Hill Road in Gillett, Pa.	Bradford	41.94880556	-76.793944	15.6	60s-tan
59	STOK000.3	Stocking Creek at Eagle Valley Road bridge south of Bath, N.Y.	Steuben	42.3096	-77.2789	26.9	60s-tan
60	TENM000.2	Tenmile Creek upstream of Rt. 7 north of Avoca, N.Y.	Steuben	42.42825	-77.4310833	17.9	60s-brown
61	TIOG006.2	Tioga River at Presho, N.Y.	Steuben	42.08278	-77.14917	790.8	60L
62	TIOG016.3	Tioga River at Tioga Junction, Pa.	Tioga	41.95778	-77.11583	442.5	60m
63	TIOG029.8	Tioga River upstream of Rt. 6 and Ellen Run near Mansfield, Pa.	Tioga	41.796167	-77.079944	152.7	60m
64	TIOG035.4	Tioga River upstream of Route 660 bridge north of Covington, Pa.	Tioga	41.757889	-77.0833056	109.4	62m/L
65	TIOG039.6	Tioga River at park in Blossburg, Pa.	Tioga	41.67806	-77.0675	85	62s
66	TIOG042.3	Tioga River near Blossburg, Pa.	Tioga	41.6583	-77.0476	53.3	62s
67	TIOG049.2	Tioga River at T433 bridge near Chases Mills, Pa.	Tioga	41.7251944	-76.89430556	7.6	60s-tan
68	TOBE001.9	Tobehanna Creek at Lamoka Lake Road near Tyrone, N.Y.	Schuyler	42.4043889	-77.0663611	16.5	60s-brown
69	TRUP000.4	Troups Creek at mouth at Knoxville, Pa.	Tioga	41.95330556	-77.4416944	67.8	60s-brown
70	TRUP005.8	Troups Creek along Rt. 36 north of South Troupsburg, N.Y.	Steuben	42.0240833	-77.531667	39.1	60s-brown
71	TUSC000.4	Tuscarora Creek at bridge in Addison, N.Y.	Steuben	42.10389	-77.23306	128.3	60m
72	TUSC012.9	Tuscarora Creek upstream of South Branch at Woodhull, N.Y.	Steuben	42.07944	-77.40833	31	60s-brown
73	TWVE000.5	Twelvemile Creek upstream of Rt. 415 at Wallace, N.Y.	Steuben	42.44778	-77.46025	25.3	60s-brown
74	WYNK000.8	Wynkoop Creek at Rotary Road near Chemung, N.Y.	Chemung	42.0142778	-76.61	34.6	60s-tan
75	CNST 55.5	Canisteo River above Arkport, N.Y.	Steuben	42.39111	-77.70417		

*Stations sampled in 1997 and 2006 appear in blue. Station only sampled in 1997 appears in red.


Subwatersheds
in the Susquehanna River Basin
Chemung
Subbasin
New York
Pennsylvania
Maryland
Chesapeake Bay
0 5 10 20 Miles
SRBC
Susquehanna River Basin Commission
11-Digit HUC Source: United States Geological Survey(USGS), 2001
Subbasin Source: United States Geological Survey(USGS), 2001
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J. Zimmerman

2005 Chemung River Float.

SUSQUEHANNA RIVER BASIN COMMISSION

In 1971, the Susquehanna River Basin Commission was created as an independent agency by a federal-interstate compact among the states of Maryland, New York, and the Commonwealth of Pennsylvania, and the federal government. In creating the Commission, the Congress and state legislatures formally recognized the water resources of the Susquehanna River Basin as a regional asset vested with local, state, and national interests for which all the parties share responsibility. As the single federal-interstate water resources agency with basinwide authority, the Commission's goal is to coordinate the planning, conservation, management, utilization, development and control of the basin's water resources among the public and private sectors.

SUSQUEHANNA RIVER BASIN COMMISSION

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