THE 2002 SUSQUEHANNA RIVER BASIN WATER QUALITY ASSESSMENT 305(b) REPORT

Publication 220 *April 2002*

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This report was prepared to meet the requirements of Section 305(b) of the Clean Water Act. The format used is specified by the U.S. Environmental Protection Agency in its "Guidelines for Preparation of the 1996 State Water Quality Assessments (305(b) Reports)."

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This report is prepared in cooperation with U.S. Environmental Protection Agency under Contract No. 1-093391-02.

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**Statutory Citations: Federal - Pub. L. 91-575, 84 Stat. 1509 (December 1970); Maryland - Natural Resources Sec. 8-301 (Michie 1974); New York - ECL Sec. 21-1301 (McKinney 1973); and Pennsylvania - 32 P.S. 820.1 (Supp. 1976).*

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THE 2002 SUSQUEHANNA RIVER BASIN WATER QUALITY ASSESSMENT 305(b) REPORT

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INTRODUCTION

This 2002 305(b) report provides a summary of the Susquehanna River Basin Commission's (SRBC's) assessment of the water quality, physical habitat, and biological status of its basin's rivers and streams. These assessments are based on monitoring activities from sediment and nutrient sampling, subbasin surveys, interstate stream projects, a stream restoration project in Cumberland County, Pennsylvania, and a low-flow study downstream of the Whitney Point reservoir. Also included are summary data from SRBC's ground-water withdrawal reviews. This report, which was prepared to meet the requirements of Section 305(b) of the Clean Water Act, is formatted according to the U.S. Environmental Protection Agency (USEPA) in its "Guidelines for Preparation of the Comprehensive State Water Quality Assessments (305(b) Reports) and Electronic Updates (September 1997)."

In accordance with the guidelines, this report involves the use of water quality, biological, and physical habitat evaluations to determine the degree of use support. The assessments made in this 305(b) report provide updates to the previous assessments: "The 1996 Susquehanna River Basin Water Quality Assessment 305(b) Report," "The 1998 Susquehanna River Basin Water Quality Assessment 305(b) Report," and the 1999, 2000, and 2001 305(b) Electronic Updates.

PART 1: EXECUTIVE SUMMARY

The Susquehanna River drains 27,510 square miles in parts of New York, Pennsylvania, and Maryland and has one of the largest river basins on the East Coast of the United States. It originates at Otsego Lake in New York State and flows 444 miles to the Chesapeake Bay at Havre de Grace, Maryland, where it contributes over half of the freshwater inflow to the Chesapeake Bay. Of the basin's 31,193 total stream miles (USEPA, 1993), 1,183 are assessed in this report. Ninety-one percent of the assessed streams (1,081 stream miles) fully support designated uses.

The major causes of stream impairment for this 305(b) report are nutrient enrichment, siltation, and habitat alteration from agricultural activities, removal of riparian vegetation and physical alteration of the stream channel. Other causes of stream impairment include acid mine drainage (AMD), domestic waste, and municipal wastewater.

SRBC's monitoring program developed out of its responsibilities and jurisdiction in interstate and Susquehanna River basinwide issues. To support the goals of the Chesapeake Bay Program, SRBC monitors nitrogen, phosphorus, sediment, and total suspended solids in the main stem Susquehanna River and its major tributaries, the West Branch Susquehanna River, the Juniata River, and the Conestoga River. SRBC established an interstate water quality network in 1986 to assess compliance with water quality standards for streams that cross state lines. Regional water quality, physical habitat, and biological conditions throughout the basin are addressed through subbasin surveys. Additionally, SRBC undertakes small scale studies as projects warrant. These monitoring networks not only help SRBC meet program objectives, but also provide information to assess streams for the 305(b) report.

Observed trends in nutrients and sediments along the Susquehanna River at three main stem locations and three stations at the mouth of major tributaries provide evidence of improvement or no change in stream water quality. From 1985 to 2000, phosphorus and nitrogen trends have improved at all six stations while improving conditions in suspended sediments occurred at three of the six stations (Takita and Edwards, 2001).

PART II: BACKGROUND

The Susquehanna River drains the largest basin on the Atlantic coast of the United States and is the nation's sixteenth largest river. It originates at Otsego Lake, New York, and flows 444 miles to the Chesapeake Bay at Havre de Grace, Maryland. The 27,510-square-mile Susquehanna River Basin drains portions of New York, Pennsylvania, and Maryland and provides over half of the freshwater inflow to the Chesapeake Bay. Although relatively undeveloped, some of the basin's water resources have experienced degradation and overuse.

Total Waters

The information presented in Table 1 and Figure 1 provides a general perspective of the Susquehanna River Basin's water and land resources.

Summary of Classified Uses

The streams in the Susquehanna River Basin are classified separately (Table 2) for the three basin states, since each state has its own classification system. Stream classifications are based on a combination of aquatic life, water supply, and recreational uses.

PART III: SURFACE WATER QUALITY ASSESSMENT

Chapter One: Surface Water Monitoring Program

SRBC operates under the general authority of the Susquehanna River Basin Compact, the broad objectives of the SRBC's Comprehensive Plan, and the guidelines of the SRBC's overall strategic plan. The strategic plan, originally adopted in 1995, was designed to guide SRBC activities through the year 2000. The SRBC's Division of Water Quality and Monitoring Programs (now known as the Watershed Assessment and Protection Division) then developed its own plan to complement the overall strategy and focus on specific goals, objectives, and actions to help the SRBC more effectively manage water quality in the Susquehanna River Basin. The Watershed Assessment and Protection Division updates and evaluates its plan every two years.

SRBC obtains stream assessment information through a variety of water quality programs. SRBC's monitoring program developed out of its responsibilities and jurisdiction in interstate and regional issues. To support the goals of the Chesapeake Bay Program, SRBC monitors nitrogen, phosphorus, and suspended sediment in the main stem Susquehanna River and its major tributaries. SRBC also established an interstate water quality network to assess compliance with state water quality standards for streams that cross state lines. Regional water quality and biological conditions in the basin are addressed through six subbasin surveys. These monitoring networks not only help SRBC meet each program objective, but also provide information to assess streams for the 305(b) report. The stream assessments provided in this 2002 305(b) report were obtained from the FY2000 Interstate Streams Water Quality Network survey and Upper Susquehanna Subbasin Survey, and were supplemented by information from various additional projects.

Fixed station nutrient monitoring network

USEPA's September 1983 Management Study, Chesapeake Bay: A Framework for Action (1983) states that the Susquehanna River Basin is dominated by nonpoint sources, which account for 90 percent of the nitrogen and 76 percent of the phosphorus loads within the Susquehanna River Basin. In response, SRBC initiated a water quality monitoring program in October 1984 to provide nutrient loading and trend information

Table 1. Susquehanna River Basin Geographic Statistics

Basin Population[1]	4.2 million
Basin Surface Area[2]	27,510 sq. mi.
- New York	6,327 sq. mi.
- Pennsylvania	20,908 sq. mi.
- Maryland	275 sq. mi.
Water Subbasins[3]	
- Chemung	2,604 sq. mi.
- Upper Susquehanna	4,944 sq. mi.
- Middle Susquehanna	3,755 sq. mi.
- West Branch Susquehanna	6,992 sq. mi.
- Juniata	3,406 sq. mi.
- Lower Susquehanna	5,809 sq. mi.
Total miles of rivers and streams[4]	31,193.0 mi.
- Miles of perennial rivers/streams	26,064.0 mi.
- Miles of intermittent streams	5,500.7 mi.
- Miles of ditches and canals	45.3 mi.
- Border miles of shared rivers/streams	0.0 mi.
Numbers of lakes/reservoirs/ponds[4]	2,293
Acres of lakes/reservoirs/ponds[4]	79,687 acres
Square miles of estuaries/harbors/bays[4]	0 sq. mi.
Miles of ocean coast[4]	0 mi.
Miles of Great Lake shores[4]	0 mi.
Acres of freshwater wetlands[4]	Unknown
Acres of tidal wetlands[4]	0 acres
Land Use[5]	
- Forested	(63.1%) or 17,362 sq. mi.
- Urban	(9.3%) or 2,560 sq. mi.
- Pasture	(6.7%) or 1,845 sq. mi.
- Cropland	(19.4%) or 5,338 sq. mi.
- Water	(1.5%) or 405 sq. mi.

Sources of information:

[1]U.S. Bureau of the Census, 2000

[2,3]Susquehanna River Basin Study Coordination Committee, 1970

[4]U.S. Environmental Protection Agency, 1993

[5]Ott and others, 1991

Figure 1. The Susquehanna River Basin Subbasins

Table 2. Summary of Stream Classifications in the Susquehanna River Basin and Degree of Use Attainment

State	Classification*	Total Miles Assessed	Miles Attained	Miles Partly Attained	Miles Not Attained
New York	A	9.00	9.00		
	A(T)				
	A(TS)				
	AA				
	B	279.05	276.55	2.50	
	B(T)	7.82	7.82		
	C	457.87	448.17	9.20	0.50
	C(T)	49.80	38.90	10.90	
	C(TS)	7.00	7.00		
	D				
Pennsylvania	WWF	153.44	131.60	18.84	3.00
	HQ-WWF				
	TSF	13.30	10.30		3.00
	HQ-TSF				
	CWF	157.78	112.28	19.38	26.12
	HQ-CWF	13.50	11.50	2.00	
	EV				
	Classes with MF				
Maryland	I-P	20.10	15.00	5.00	
	III-P	5.53	4.28	1.25	
	IV-P	8.85	8.60	0.25	
Total		**1,183.04**	**1,081.00**	**69.42**	**32.62**

*See Appendix A for definitions

for the main stem Susquehanna River and its major tributaries. SRBC documents nutrient concentrations, loadings, and trends on an annual basis at six monitoring sites.

The collection of nutrient data above the fall line at stations on the main stem and large tributaries was deemed necessary to enable accurate allocation of loadings to the main river reaches and major subbasins. Each site represents large areas (over 400 square miles) having significant differences and levels of complexity, in terms of geological setting and land uses. In most cases, the sites were existing stations sampled by different agencies for one purpose or another over a period of years and where flow measurements were available or facilities for such measurements could be readily installed. These sites are:

1. Susquehanna River at Towanda, Pa.
2. Susquehanna River at Danville, Pa.
3. West Branch Susquehanna River at Lewisburg, Pa.
4. Juniata River at Newport, Pa.
5. Susquehanna River at Marietta, Pa.; and
6. Conestoga River at Conestoga, Pa.

The scope of the current monitoring program includes the following objectives:

1. To measure concentrations and estimate nutrient and suspended sediment loads over a wide range of stream flows at the current network of stations.
2. To establish a sound database to effectively plan and implement immediate and long-range nutrient reduction efforts. The environmental measurements and analyses provide loading data for the main stem and the selected major tributaries in sufficient detail to:
   a. Allow Chesapeake Bay Watershed model refinement and verification;

b. Track and better define nutrient loading dynamics;
c. Relate measured load fluctuations to changes in water discharge due to precipitation events of varying intensities, durations, and seasons; and
d. Evaluate nutrient loading trends.

The collection of water quality samples representative of river conditions is essential for a successful nutrient monitoring program. Samples are collected at each site to measure nutrient and suspended sediment concentrations during periods of low and high flow. Low flow samples are collected monthly. High flow samples are collected for five storm flow events each year. Daily collection of storm samples occurs at the major river sites from the start of the storm to the time when the flow recedes close to its pre-storm discharge rate.

Long-term monitoring at the six major river stations in the Susquehanna River Basin shows significant changes in total nitrogen, total phosphorus, and suspended sediment. The trend analysis from Nutrients and Suspended Sediment Transported in the Susquehanna River Basin, 2000, and Trends, January 1985 through December 2000 (Takita and Edwards, 2001) describes improving conditions in total nitrogen and total phosphorus throughout the Susquehanna River Basin, while improving conditions in suspended sediment occurred at three of the six stations.

Subbasin surveys

SRBC staff has been conducting water quality and biological surveys on selected streams within each of the major subbasins since the early 1980s. The first round of subbasin surveys began in 1982, a second round began in 1993, and a third round began in 1998. Chemical and biological investigations are conducted to assess the condition of streams in the basin, identify impaired stream reaches and sources of impairment, provide a screening tool for many streams for possible further investigations, compare the most current assessments with historical data, and provide data for the 305(b) reports.

The subbasin surveys are designed to rotate among six major subbasins, sampling a subbasin approximately once every 10 years. Sampling is conducted from mid-summer to early fall, when streamflows are maintained primarily by baseflow. The sampling objective is to collect a single sample at each site over a relatively short time period to provide a "snapshot" of stream characteristics. Station locations on the main subbasin river are located so that the effects of major tributaries on the river can be evaluated, and water quality variations along the river due to point and nonpoint source changes can be documented. On tributary streams, stations are usually located near the mouth, at some mid-watershed point, and at a point near the headwaters. Several sites are used because of the potential differences in geologic setting and sources of pollution within the watershed. During a subbasin survey, 70 to 110 stations are sampled.

Field and laboratory water quality analyses are performed on water quality samples collected at each site. Water quality parameters measured in the field include water temperature, conductivity, pH, dissolved oxygen, alkalinity, and acidity. The results are compared to the water quality standards to assess stream health and potential causes where stream quality is impaired. Water quality samples are collected with a depth-integrating sampler and sent to the Pa. DEP Laboratory in Harrisburg, Pa., for analysis.

Habitat conditions are evaluated using a modified version of RBP III (Plafkin et. al., 1989). Eleven habitat features of substrate, instream cover, channel morphology, and riparian and bank structure are field evaluated at each site and used to calculate a site-specific habitat assessment score. Habitat assessment scores are used to assess habitat conditions of study sites relative to those of reference sites.

Benthic macroinvertebrate community integrity is assessed using procedures described by Plafkin and others (1989). Using this method, staff calculates a series of biological indexes for a stream and compares them to a nonimpaired

reference station in the same region to determine the degree of impairment. Metrics vary based on the needs of the survey, but always include taxa richness, EPT (Ephemeroptera/Plecoptera/ Trichoptera) Index, Hilsenhoff Biotic Index, and Shannon Diversity Index. The 100-organism subsample data are used to generate scores for each of the metrics. Each metric score is then converted to a biological condition score, based on the percent similarity of the metric score, relative to the metric score of the reference site. The sum of the biological condition scores constitutes the total biological score for the sample site, and total biological scores are used to assign each site to a biological condition category.

Beginning in 1999, the subbasin survey included a second year of a more focused sampling effort targeted to specific watersheds within the subbasin. Selection of targeted watersheds is based on assessments made during Year 1 of the subbasin survey and input from stakeholders in the respective subbasin. Data gathered from a targeted watershed sampling effort, in cooperation with input from stakeholders, provide fundamental information needed to plan for restoration and protection activities. This report includes information collected during Years 1 and 2 from the Upper Susquehanna Subbasin survey (Stoe, 1999, Diehl and Sitlinger, 2001).

All water quality, physical habitat, and biological data collected from the subbasin surveys are stored in the SRBC's computer system. SRBC plans to begin entering new assessment data into the "New STORET." Reports are published following each survey and are available from SRBC. A one-page report announcement is published and widely distributed.

Interstate stream water quality network

SRBC began the interstate stream water quality monitoring network (ISWQN) in April 1986 to monitor the water quality and biological conditions of streams that cross state borders in the Susquehanna River Basin. The ISWQN was established because monitoring programs conducted by New York, Pennsylvania, and Maryland do not produce comparable data and do not assess all the interstate streams.

The original 36 stations were sampled annually, and some of those streams judged to have a high potential for degradation were sampled once each month. Benthic macro-invertebrates were monitored annually at all stations. In October 1989, the ISWQN was modified to eliminate some of the streams and to increase the sampling frequency at the remaining stations. The streams removed from the network were small, first-order streams with good water quality and little potential for degradation. Thirty-one streams remained in the network. Fifteen of the streams were sampled once every other month, with the exclusion of January and February. The other 16 streams were sampled annually during July and August. In July 1996, the ISWQN was reduced from 31 streams to 29, with modifications to the sampling frequency. Fifteen stations were sampled quarterly, while the remaining 14 stations were sampled annually in July and August.

In November 1997, the program was modified to sample on a quarterly basis and to improve the quality of the data being collected. Laboratory analyses were added for the dissolved fractions of most water quality parameters. Also, analyses of total and dissolved solids were included to provide information on how storm runoff and sediment loads affect water chemistry.

The interstate streams are divided into three groups, according to the degree of water quality impairment, historical water quality impacts, and potential for degradation. These groupings are determined based on historical water quality and land use.

Streams with impaired water quality or judged to have a high potential for degradation due to large drainage areas or historical pollution are assigned to Group 1. Group 1 streams are sampled quarterly for benthic macroinvertebrates and annually for benthic macroinvertebrates and habitat information.

Streams judged to have a moderate potential for impacts are assigned to Group 2. Water quality samples, benthic macroinvertebrate

samples, and physical habitat information are obtained from Group 2 streams annually; preferably during base flow conditions in the summer months.

Streams judged to have a low potential for impacts are assigned to Group 3. Benthic macroinvertebrate samples and physical habitat information are assessed yearly, in the spring. Water quality samples are not collected on these streams, but stream field chemistry parameters are measured at the time of biological sampling.

The monitoring program includes periodic collection of water and biological samples from, as well as physical habitat assessments of, interstate streams. Water quality data are used to: (1) assess compliance with water quality standards; (2) characterize stream quality and seasonal variations; (3) build a database for assessment of water quality trends; (4) identify streams for reporting to USEPA under Section 305(b) of the Clean Water Act; (5) provide information to signatory states for 303(d) listing and possible Total Maximum Daily Load (TMDL) development; and (6) identify areas for restoration and protection. Biological conditions are assessed using benthic macroinvertebrate populations, which provide an indication of the biological health of a stream and serve as indicators of water quality. Habitat assessments provide information concerning potential stream impairment from erosion and sedimentation, as well as an indication of the stream's ability to support a healthy biological community.

Temperature, dissolved oxygen, conductivity, pH, alkalinity, and acidity are measured at all sites in the field. Water samples are collected using a depth-integrating sampler at each of the Groups 1 and 2 sites to measure nutrient, metal, and ion concentrations. Staff obtains composite samples by collecting eight depth-integrated samples across the stream channel and combining them in a churn splitter. The samples are then sent to the Pennsylvania Department of Environmental Protection (Pa. DEP), Bureau of Laboratories in Harrisburg, Pa., for analysis.

Benthic macroinvertebrates are collected annually from Groups 1 and 2 stations during July and August and from Group 3 stations in May. Macroinvertebrates are sampled to provide an indication of the ecological condition of the stream. Macroinvertebrates are defined as aquatic insects and other invertebrates too large to pass through a No. 30 sieve. Benthic macroinvertebrate samples are analyzed using field and laboratory methods described in Rapid Bioassessment Protocol for Use in Streams and Rivers by Plafkin and others (1989). Sampling is performed using a 1-meter-square kick screen with size No. 30 mesh. The kick screen is stretched across the current to collect organisms dislodged from riffle/run areas by physical agitation of the stream substrate. Two kick screen samples are collected from a representative riffle/run at each station. The two samples are composited and preserved in isopropyl alcohol for later laboratory analysis, where the sample is sorted into a 100-organism subsample. Organisms in the subsample are identified to genus, where possible. For each of the sampling stations, the 100-organism subsample data set is used to calculate numerical values for several metrics.

Physical habitat conditions at each station are assessed using a slightly modified version of the habitat assessment procedure outlined by Plafkin and others (1989). Eleven habitat parameters are field evaluated at each site and used to calculate a site-specific habitat assessment score, which is compared to the habitat assessment score of a reference site.

Stream discharge is measured at all Groups 1 and 2 stations unless high streamflows make access impossible. Several stations are located near United States Geological Survey (USGS) stream gages. Recorded stages from USGS gaging stations and rating curves are used to determine instantaneous discharges in cubic feet per second (cfs). Instantaneous discharges for stations not located near USGS gaging stations are measured at the time of sampling, using standard USGS procedures.

Analysis methods of biological and physical habitat conditions are similar to those used in the subbasin surveys. Trends analysis also is performed using Seasonal Kendal Tests and

Locally Weighted Scatterplot Smoothing (LOWESS), as described in Trends in Nitrogen, Phosphorus, and Suspended Sediment in the Susquehanna River Basin, 1974-93 (Edwards, 1995).

This report includes information collected during 1998, 1999, and 2000 Interstate Streams sampling (Rowles and Sitlinger, 1999; Rowles and Sitlinger, 2000; Hoffman and Sitlinger, 2001). All water quality and biological data are stored in SRBC's computer system. Reports are published on an annual basis and are available from SRBC.

Monitoring/data management needs

Currently, SRBC is working on a protocol to assess the larger rivers in the Susquehanna River Basin, including the main stem of the Susquehanna River, West Branch Susquehanna, Chemung, and Juniata Rivers. A pilot project will be conducted in the Susquehanna River main stem along the New York-Pennsylvania border during Summer 2002 and evaluated for use in the other parts of the Basin in subsequent years.

Although the capacity of SRBC's geographic information systems (GIS) section has grown dramatically in the past several years, there is still a need to link the data contained in our assessment database to specific stream reaches. GIS is a powerful tool that could be used to link the water quality database with geographic data, such as land use, point source discharge sites, and ecoregional information to determine possible sources of contamination.

Chapter Two: Assessment Methodology and Summary Data

Assessment methodology

SRBC's water quality assessment program is designed to determine if the waters of the Susquehanna River Basin meet the water quality standards of the state through which the stream flows. The program also coordinates standards between states to avoid conflicts on interstate streams. The standards are based on protected uses and water quality criteria to prevent stream degradation, as determined by each of the SRBC's member states (New York, Pennsylvania, and Maryland).

All surface waters in the basin have multiple use designations for aquatic life, water supply and recreation. Water quality criteria for a specific water body are set to protect the most sensitive use, which is generally aquatic life.

Maryland classifies all of its waters for basic water uses that include swimming, supporting a balanced population of fish and other aquatic life, supporting wildlife, and providing for water supply (agricultural, industrial). In Pennsylvania, all surface waters must meet protected uses for aquatic life (warm water fishes), water supply (potable, industrial, livestock, and wildlife), and recreation (boating, fishing, water contact sports, and aesthetics). The State of New York has a minimum use requirement that stipulates water quality shall be suitable for primary (swimming) and secondary (fishing) contact recreation. These waters must be suitable for fish survival, but not necessarily for fish propagation. Each state's water classification and best use definitions are presented in Appendix A.

SRBC focuses primarily on determining the degree to which the waters of the Susquehanna River Basin support aquatic life because aquatic life use support can be easily and economically assessed using biological sampling techniques and because aquatic life is one of the most sensitive of the national use support categories. SRBC does not sample for bacteria (to determine if the contact recreation use is being met) or collect fish tissue (for fish consumption impairments); thus, these assessments are not included in the 305(b) report. A limited number of parameters, such as chloride, iron, manganese, nitrite + nitrate, sulfate, and total dissolved solids, are examined for the ISWQN program with regard to drinking water. However, as samples are collected only quarterly and not in targeted water supply areas, SRBC considers the aquatic life use support as the best indicator of the health of the basin's waters.

SRBC's water quality assessment program involves the collection of physical habitat, chemical water quality, and biological (macroinvertebrate) data primarily obtained

through the interstate streams water quality monitoring network and the subbasin surveys, described in Chapter One. Data collected from other investigations, such as low flow studies and stream restoration projects, conducted by SRBC are also included in assessing use support. These data are analyzed relative to the designated use and associated criteria of the water body being assessed. Other information such as land use, location of point sources, and habitat characteristics are incorporated into the assessment as a guide to the possible causes and sources of impairment of a water body. An overall use-support classification for a water body is based on an integrated assessment of the available data and, when available, the professional judgment of scientists who planned and conducted the field investigations. Assessments based on the collection and analysis of field data are considered to be monitored assessments. Evaluated assessments are based on other information, such as maps, general knowledge of the area, descriptive reports, and historical water quality data (greater than five years) from which a use-support decision is made.

The degree of use support of designated uses is described as full support, partial support, and not supporting. Assessments are based on biological, stream habitat, and/or chemical data collected from SRBC monitoring programs. The biological and stream habitat conditions of a stream segment are assessed using procedures described in Plafkin and others (1989). Using this method, staff calculates a series of biological indexes for each stream and compares them to indexes for a nonimpaired reference station in the same region to determine the degree of impairment. The metrics used in SRBC projects are: Taxonomic Richness, Shannon Diversity Index, Hilsenhoff Biotic Index, EPT Index, Ratio of Scrapers/Filterers, Ratio of EPT/Chironomidae, Community Loss Index, Percent Dominant Taxa, Percent Trophic Similarity, and Percent Taxonomic Similarity.

The 100-organism subsample data were used to generate scores for each of the metrics. Each metric score was then converted to a biological score, based on the percent similarity of the metric score, relative to the metric score for the reference site. The sum of the biological condition scores constituted the total biological score for the sample site, and total biological scores were used to assign each site to a biological condition category. A score of 54 percent or greater constitutes full support, 18 percent to 53 percent indicates partial support, and 17 percent or less characterizes non-supporting conditions.

Habitat conditions also were assessed using Rapid Bioassessment Protocols (Plafkin and others., 1989), in a similar manner to the biological assessment. Habitat scores were rated excellent (comparable to the reference), supporting, partially supporting, and nonsupporting.

For water chemistry, the assessment is based on toxicants and conventional pollutants. Acute and chronic water quality standards are used for toxics, and stream designated-use-specific standards are used for the conventional pollutants. When both biological and chemical data are available and the use attainment differs, the degree of use support is weighted to the data most likely to indicate attainment of use. For example, if a one-time grab sample indicates full support, based on biological data, and partial support, based on chemical data, the weight of the evidence would be based on the biological data, giving full support because aquatic organisms are long-term indicators of water quality. Specific criteria for attainment of use determination are described below.

Biological

Fully Supporting = 54% or greater of the reference condition
Partially Supporting = 18% to 53% of the reference condition
Not Supporting = 17% or less of the reference condition

Habitat

Fully Supporting = Excellent (comparable to reference site) habitat
Partially Supporting = Supporting to partially supporting habitat

Not Supporting = Nonsupporting habitat

Chemistry

Toxics:

Fully Supporting = For at least 10 samples within a 3-year period, zero to one violation of the acute standard for any one parameter per 10 samples, or for the most recent grab sample, no violation of acute and no more than one parameter exceeding chronic standard.
Partially Supporting = For at least 10 samples within a 3-year period, two violations of the acute standard for any one parameter per 10 samples, or for the most recent grab sample, one parameter exceeding acute standard and no more than two other parameters exceeding chronic standard, or three parameters exceeding the chronic standard.
Not Supporting = For at least 10 samples within a 3-year period, three violations of the acute standard for any one parameter per 10 samples, or for the most recent grab sample, two parameters exceeding acute standard, or more than three other parameters exceeding the chronic standard.

Conventional Pollutants:

Fully Supporting = For at least 10 samples within a 3-year period, the standard is exceeded in less than 11 percent of the samples for any one parameter, or for the most recent grab sample, no more than one parameter exceeds the respective standard.
Partially Supporting = For at least 10 samples within a 3-year period, the standard is exceeded in 11 percent to 25 percent of the samples for any one parameter, or for the most recent grab sample, no more than two parameters exceed the respective standards.
Not Supporting = For at least 10 samples within a 3-year period, the standard is exceeded in more than 25 percent of the samples for any one parameter or for the most recent grab sample, three or more parameters exceed the respective standards.

Data gathered to assess the status of the basin's streams are stored in SRBC's water quality assessment database. The database is similar to the USEPA Water Body System (WBS) with respect to producing assessment summaries. However, the design and some attributes differ between the two databases.

Sources and causes are determined for each impaired reach. A major source/cause is defined as a source/cause that is the only one responsible for nonsupport of any designated use or predominates over other source/cause. A minor source/cause is one of multiple sources/causes responsible for nonsupport or partial support or is judged to contribute relatively little to nonattainment.

Water quality summary

There are approximately 31,193 miles of named streams in the Susquehanna River Basin (USEPA, 1993), of which 1,183.04 stream miles, or four percent, are assessed in this report. Reach-specific data by subbasin are provided in each of the following subbasin summary sections.

Approximately 91 percent of the assessed stream miles meet designated uses (Table 3). This represents 1,081 miles of assessed streams.

Partial support of designated uses is reported for approximately six percent (69.42 miles) of the assessed stream miles. Partial support is reported when a designated use is marginally restricted, largely where some degradation of the biological community is observed.

Nonsupport of designated uses is reported for approximately three percent (36.62 miles) of the assessed stream miles. When attainment of a designated use is limited or not possible (based on a severely degraded biological community), a stream is reported as not supporting designated uses.

Of the streams surveyed, the primary causes of steam impairment are nutrient enrichment, siltation, and habitat destruction (Table 4). The primary sources of impairment are agricultural runoff, AMD, and habitat modification (Table 5).

Table 3. Susquehanna River Basin Overall Use Support Summary for Rivers and Streams

Degree of Use Support	Assessment Category		Total Miles Assessed
	Miles Evaluated	Miles Monitored	
Fully Supporting		1,081.00	1,081.00
Partially Supporting		69.42	69.42
Not Supporting		32.62	32.62
Total Assessed		1,183.04	1,183.04

Table 4. Susquehanna River Basin Total Stream Miles Not Supporting and Partially Supporting Uses by Various Causes of Impairment

Cause of Impairment	Total Length of Waters Affected (in miles)			
	Not Supporting		Partial Support	
	Major	Minor	Major	Minor
Unknown				1.90
Toxicity				
Pesticides				
Organics				
Metals		26.62		1.00
Ammonia				
Chlorine				3.33
Other Inorganics				
Nutrients			31.73	0.65
pH		26.12		
Siltation			27.84	0.65
Dissolved Oxygen		3.00		
Total Dissolved Solids		3.00		3.33
Thermal Modification				
Flow Alteration				
Habitat Alteration	3.00	0.50	21.20	3.10
Pathogen Indicators				
Radiation				
Oil and Grease				
Odor				
Suspended Sediments				
Noxious Aquatic Plants				
Filling and Draining				
Sulfate				

Table 5. Susquehanna River Basin Total Stream Miles Not Supporting and Partially Supporting Uses by Various Sources of Impairment

Source of Impairment	Total Length of Waters Affected (in miles)			
	Not Supporting		Partially Supporting	
	Major	Minor	Major	Minor
Unknown				1.90
Domestic Waste	3.00			
Industrial Waste				
Municipal Waste			4.00	3.33
Other Point Source				
Agricultural Runoff			26.14	0.25
Urban Runoff				
Other Nonpoint Source			2.00	
Acid Precipitation				
Acid Mine Drainage		26.62		
Mining (non-coal)				
Landfills				
Hydro/Habitat Modification	3.00	0.50	30.80	2.90

Chapter Three: Rivers and Streams Water Quality Assessment

Chemung Subbasin

The Chemung Subbasin is located in the northwestern portion of the Susquehanna River Basin and drains a watershed of 2,604 square miles (Figure 2). The New York portion of the subbasin totals 1,880 square miles, with the remaining area in Pennsylvania. The Chemung River is formed by the confluence of the Tioga River, flowing northward from Pennsylvania, and the Cohocton River, flowing southeast in New York. The Chemung River joins the Susquehanna River at Sayre, Pa. Major tributaries include the Chemung, Tioga, Cohocton, Cowanesque, and Canisteo Rivers.

The terrain is typical of glaciated watersheds, and is comprised of rolling to flat-topped uplands with steep-sided alluvial valleys in which the main rivers flow. Forests occupy the steeper hillsides bordering stream valleys, while the flatter hilltops and stream valleys are used for agriculture. Major mineral resources are sand and gravel deposits, located in the alluvial valleys, and coal, which is mined in the headwaters of the Tioga River. Major population centers, which are located in the New York potion of the subbasin, are the cities of Elmira, Corning, and Hornell.

Designated use support

Sixty-four percent of the assessed stream miles meet designated uses (Table 6). This represents 109.71 miles of assessed streams. Partial support of designated uses is reported for 19 percent (32.6 miles) of the assessed miles. Nonsupport of designated uses is reported for 17 percent (29.62 miles) of the assessed miles.

Causes and sources of nonsupport of designated uses

The primary causes of stream impairment in the Chemung Subbasin are high metals concentrations and low pH problems associated with AMD in the Tioga River Watershed, as well as habitat alteration throughout the subbasin.

During 1998, 1999, and 2000, SRBC continued its assessment of interstate streams in the Chemung Subbasin. The water quality in most of these streams meets designated use classes and water quality standards. The parameter that most frequently exceeded water quality standards was total iron, but these elevated

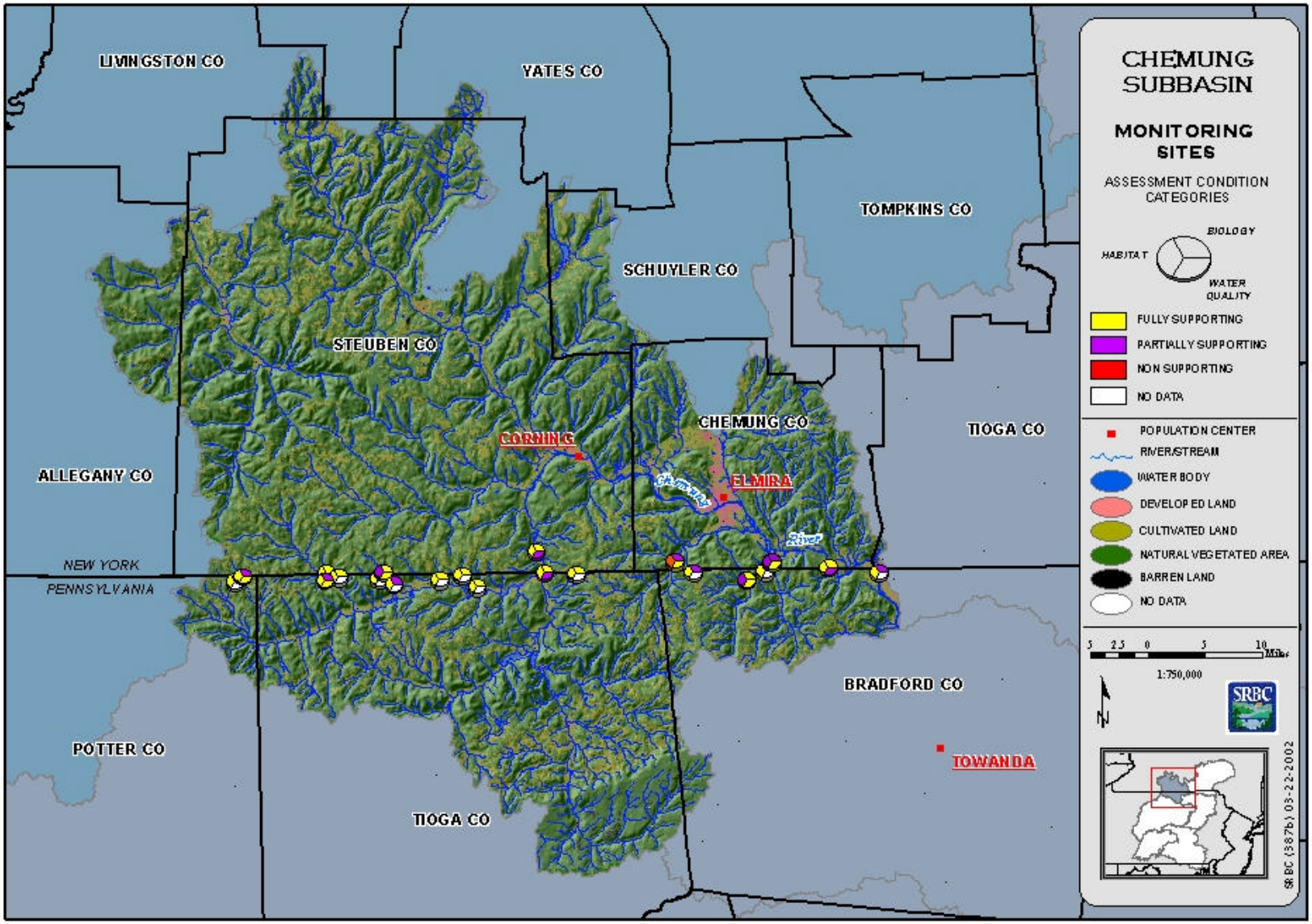

Figure 2. Chemung Subbasin Monitoring Site Locations

Table 6. Chemung Subbasin Overall Use Support Summary for Rivers and Streams

Degree of Use Support	Assessment Category		Total Miles Assessed
	Miles Evaluated	Miles Monitored	
Fully Supporting		109.71	109.71
Partially Supporting		32.60	32.60
Non Supporting		29.62	29.62
Total Assessed		171.93	171.93

iron concentrations appear to be natural (Rowles and Sitlinger, 1999; Rowles and Sitlinger, 2000; Hoffman and Sitlinger, 2001).

SRBC monitored the Chemung River at Chemung, N.Y., the Cowanesque River at Lawrenceville, Pa., and the Tioga River at Lindley, N.Y., as well as 18 interstate tributaries. In the most recent assessment of the Chemung River, a nonimpaired macroinvertebrate population existed at the sampling site for the first time in many years.

Two sites are sampled on the Cowanesque River downstream of Cowanesque Reservoir: one directly downstream of the impoundment (COWN 2.2) and one at the mouth of the Cowanesque River (COWN 1.0). At COWN 2.2, moderately impaired biological conditions existed during 1999, while the biological community at this site has been impaired for the past eight years of sampling. A number of conditions are adding to the impairment of this site, including increased phytoplankton production in the reservoir causing a shift in the macroinvertebrate community, bottom discharges decreasing the oxygen levels and increasing sedimentation (which has since been remedied), and poor habitat conditions at the sampling site. Conditions improve at the downstream site (COWN 1.0), resulting in a slightly impaired biological community with good habitat.

The Tioga River had a nonimpaired biological community during July 1999, and habitat conditions were considered excellent (Hoffman and Sitlinger, 2001). However, total iron, sulfate, and manganese were elevated during this sampling period. Poor water quality at this site may have been due to AMD in the headwaters of the Tioga River. The Tioga-Hammond Reservoir, located upstream of the sampling site, alleviated some of the effects of AMD by buffering the outflow of Tioga Lake with alkaline waters stored in Hammond Lake. However, the effects of the AMD may still be observed downstream. Poor water quality from the Cowanesque River also may affect the Tioga River downstream of their confluence.

Seeley Creek and Bentley Creek show impairment due to habitat degradation. The habitat at these sites is heavily altered by rechannelization, sedimentation, and poor riparian conditions.

The causes and sources of partially supporting and nonsupporting uses are shown in Tables 7 and 8, respectively.

Upper Susquehanna Subbasin

The Upper Susquehanna Subbasin is located in the northeastern portion of the Susquehanna River Basin and drains a watershed of 4,944 square miles, of which 4,520 square miles are in New York (Figure 3). The source of the Susquehanna River is Otsego Lake at Cooperstown, N.Y. From Cooperstown, the river flows southward across Pennsylvania and back into New York at Great Bend, Pa. The Susquehanna River then flows westward to Sayre, Pa., where the Chemung River enters.

Most of the subbasin is steeply sloped with hills and ridges and is dominated by forestland. Agriculture occupies the areas with a gentle slope. The population of the Upper Susquehanna Subbasin is largely rural with major population centers at Binghamton, Johnson City, Endicott, Cortland, and Oneonta, N.Y.

Table 7. Chemung Subbasin Total Stream Miles Not Supporting and Partially Supporting Uses by Various Causes of Impairment

Cause of Impairment	Total Length of Waters Affected (in miles)			
	Not Supporting		Partial Support	
	Major	Minor	Major	Minor
Unknown				
Organics				
Metals		26.62		1.00
Ammonia				
Chlorine				
Other Inorganics				
Nutrients			7.70	
pH		26.12		
Siltation			7.30	
Dissolved Oxygen				
Total Dissolved Solids				
Flow Alteration				
Habitat Alteration	3.00	0.50	17.00	1.00
Sulfate				

Table 8. Chemung Subbasin Total Stream Miles Not Supporting and Partially Supporting Uses by Various Sources of Impairment

Source of Impairment	Total Length of Waters Affected (in miles)			
	Not Supporting		Partial Support	
	Major	Minor	Major	Minor
Unknown				
Domestic Waste				
Industrial Waste				
Municipal Waste			4.00	
Other Point Source				
Agricultural Runoff			3.70	
Urban Runoff				
Other Nonpoint Source				
Acid Mine Drainage	26.12			
Mining (non-coal)				
Hydro/Habitat Modification	3.50		24.90	

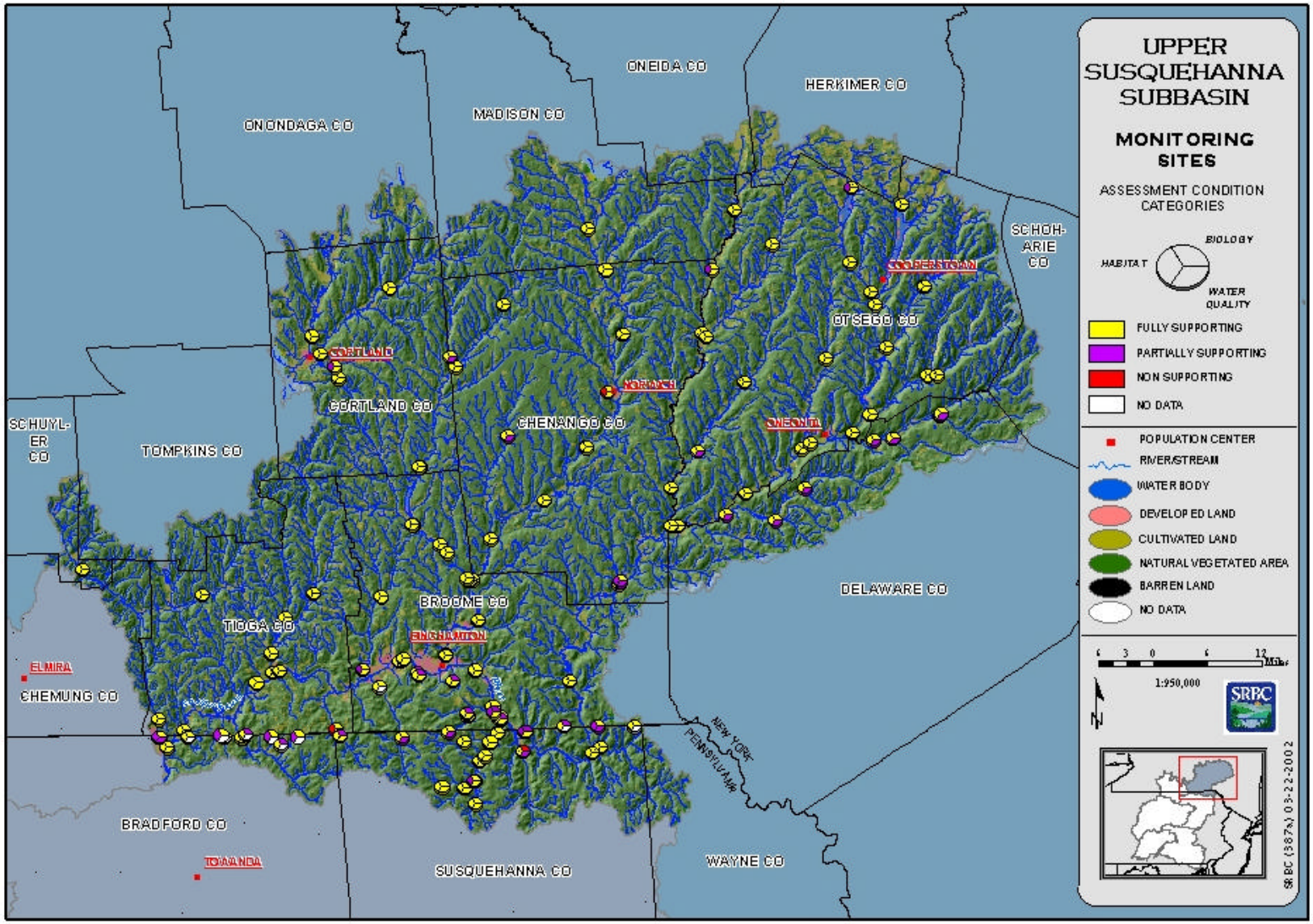

Figure 3. Upper Susquehanna Subbasin Monitoring Site Locations

Designated use support

About 98.8 percent of the assessed stream miles meet designated uses (Table 9). This represents 873.74 miles of assessed streams. Partial support of designated uses is reported for 1.2 percent (10.8 miles) of the assessed miles. Of the streams assessed, no streams received a nonsupport designation.

Causes and sources of nonsupport of designated uses

The major causes of impairment in the Upper Susquehanna Subbasin are siltation and poor habitat from habitat degradation.

In 1998, SRBC surveyed the Upper Susquehanna Subbasin and performed follow-up targeted sampling in the Snake Creek, Little Snake Creek, and Fuller Hollow Watersheds during 1999. During the 1998 survey, SRBC sampled 83 sites during base-flow conditions for macroinvertebrates, physical habitat, and water quality. Overall, the watersheds of the Upper Susquehanna Subbasin contain healthy biological communities and excellent habitat conditions. Areas of concern associated with this survey were located in the Tioughnioga section as well as Nanticoke and Salt Lick Creeks (Stoe, 1999). During the 1999 follow-up survey, Fuller Hollow Creek near Binghamton, N.Y., showed significant impairment, largely due to poor riparian conditions (Diehl and Sitlinger, 2001).

SRBC continued its interstate streams sampling effort in 1998, 1999, and 2000 in the Upper Susquehanna Subbasin. SRBC monitored the Susquehanna River at Windsor and Kirkwood, N.Y., and at Sayre, Pa. During the most recent sampling effort in 1999-2000, the biological communities at all three river sites were designated nonimpaired with good habitat conditions (Hoffman and Sitlinger, 2001).

Seventeen tributaries also were sampled along the New York-Pennsylvania border including Apalachin, Cascade, Cayuta, Little Snake, Snake, and Wappasening Creeks. Slightly impaired conditions in some of these streams were attributed to very low flow conditions during the sampling period. The causes and sources of partial and nonsupport are shown in Tables 10 and 11, respectively.

Middle Susquehanna Subbasin

The Middle Susquehanna Subbasin covers an area of 3,755 square miles in northeastern Pennsylvania from Sayre to Sunbury, Pa. (Figure 4). The Susquehanna River at Sunbury, however, represents a total drainage area of 11,303 square miles. The river flows southeast through high, flat-topped plateaus separated by steep-sided valleys. Midway, the Susquehanna River joins the Lackawanna River before turning and flowing southwest towards Sunbury. The terrain in the southern portion of the subbasin consists of northeast-southwest trending ridges and valleys.

The major population center in the subbasin is located in the area known as Wyoming Valley—from Carbondale in the north along the Lackawanna River to Nanticoke in the south along the Susquehanna River. This highly urbanized coal-mining region contains the cities of Scranton and Wilkes-Barre.

Table 9. Upper Susquehanna Subbasin Overall Use Support Summary for Rivers and Streams

Degree of Use Support	Assessment Category		Total Miles Assessed
	Miles Evaluated	Miles Monitored	
Fully Supporting		873.74	873.74
Partially Supporting		10.80	10.80
Non Supporting			
Total Assessed		884.54	884.54

Table 10. Upper Susquehanna Subbasin Total Stream Miles Not Supporting and Partially Supporting Uses by Various Causes of Impairment

Cause of Impairment	Total Length of Waters Affected (in miles)			
	Not Supporting		Partial Support	
	Major	Minor	Major	Minor
Unknown				1.90
Organics				
Metals				
Ammonia				
Chlorine				
Other Inorganics				
Nutrients			2.00	
pH				
Siltation			2.50	
Dissolved Oxygen				
Total Dissolved Solids				
Flow Alteration				
Habitat Alteration			4.40	1.90
Sulfate				

Table 11. Upper Susquehanna Subbasin Total Stream Miles Not Supporting and Partially Supporting Uses by Various Sources of Impairment

Source of Impairment	Total Length of Waters Affected (in miles)			
	Not Supporting		Partial Support	
	Major	Minor	Major	Minor
Unknown				1.90
Domestic Waste				
Industrial Waste				
Municipal Waste				
Other Point Source				
Agricultural Runoff				
Urban Runoff				
Other Nonpoint Source			2.00	
Acid Mine Drainage				
Mining (non-coal)				
Hydro/Habitat Modification			6.90	1.90

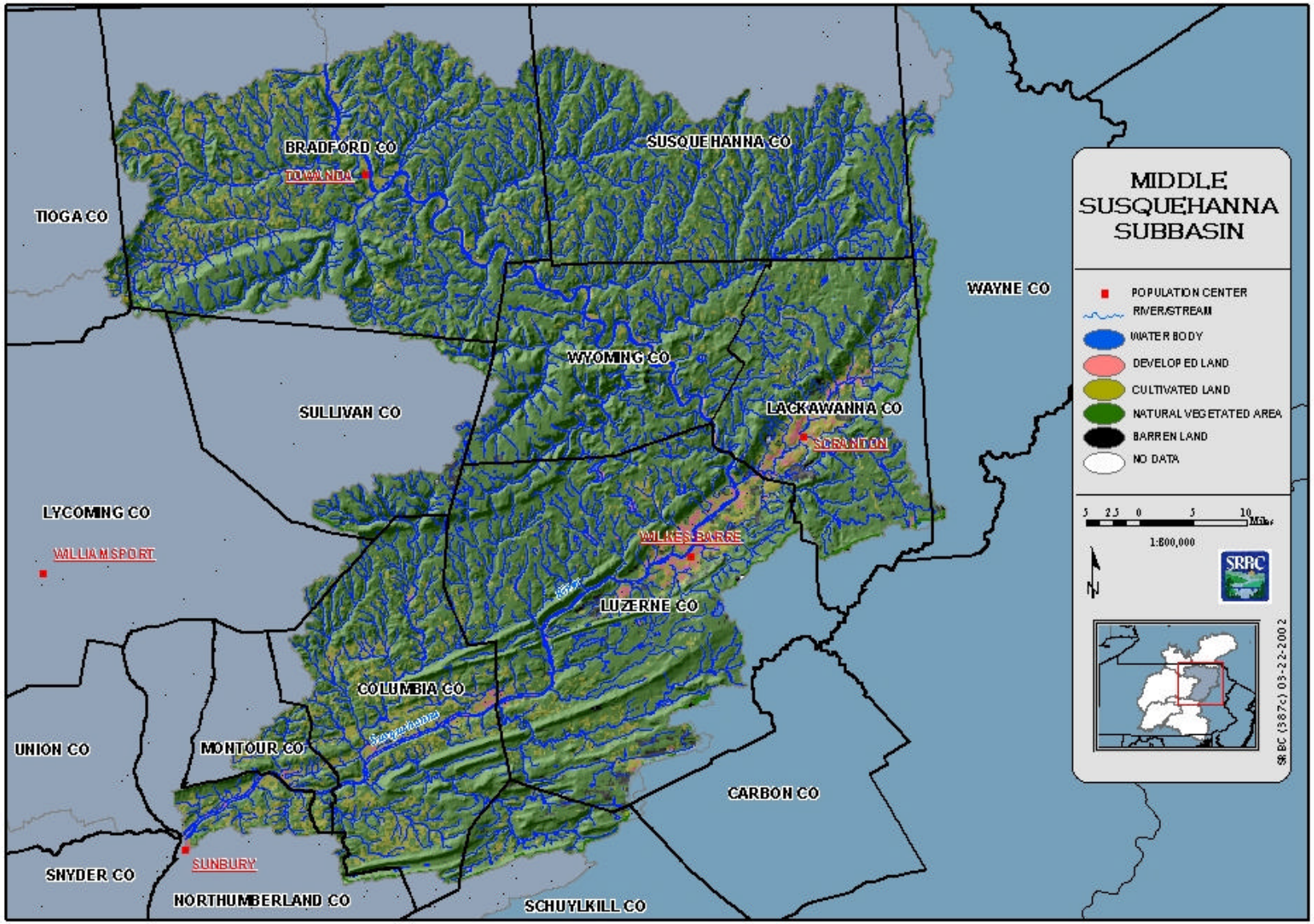

Figure 4. Middle Susquehanna Subbasin

Designated use support

Streams in the Middle Susquehanna River Subbasin were not assessed for designated use support during this reporting period. The Middle Susquehanna River Subbasin was assessed during summer 2001; a report will be issued by July 2002.

West Branch Susquehanna Subbasin

The West Branch Susquehanna River drains 6,992 square miles of the western and central part of the Susquehanna River Basin (Figure 5). Originating in the low rolling hills of the Allegheny Mountains in Pennsylvania, the West Branch flows northeast passing the steep hillsides of the Allegheny High Plateaus Section. At Renovo, the West Branch Susquehanna River turns southeast and cuts through the Allegheny Front, entering a region of broad valleys separated by long, high ridges. Following the northern flank of Bald Eagle Mountain northeastward, the West Branch turns south to its confluence with the Susquehanna River near Sunbury.

The subbasin is covered predominantly by forests, especially in the northern and western ends of the subbasin where land is less suitable for agriculture. Extensive coal mining is the major land use activity in the western parts of the subbasin. Agricultural and urban lands primarily are located in the eastern and southern parts of the subbasin. Larger communities include State College, Lock Haven, Williamsport, Clearfield, and Lewisburg.

Designated use support

Streams in the West Branch Susquehanna River Subbasin were not assessed for designated use support during this reporting period. The next West Branch Susquehanna Subbasin survey is scheduled for summer 2002.

Juniata Subbasin

The Juniata River drains an area of 3,406 square miles in south central Pennsylvania and is the second largest tributary to the Susquehanna River (Figure 6). The Juniata River is formed by the confluence of the Little Juniata River and the Frankstown Branch Juniata River. The Juniata Subbasin is entirely within the Ridge and Valley Physiographic Province, which is characterized by a series of tightly folded parallel mountains and long, narrow valleys. Major streams run through the center of the valleys, picking up flow from small tributaries from the flanks of mountains.

Farming, the predominant economic activity is scattered throughout the valleys, while the steep mountain ridges are forested. The subbasin population is largely rural, with the Altoona-Hollidaysburg area being the only sizable urban center. Other small towns include Tyrone, Huntingdon, Lewistown, and Newport.

Designated use support

Streams in the Juniata Subbasin were not assessed for designated use support during this reporting period.

Lower Susquehanna Subbasin

The Lower Susquehanna Subbasin is located in southcentral Pennsylvania, and covers an area of 5,809 square miles, of which 275 square miles are in Maryland (Figure 7). The northern part of the subbasin contains ridges trending southwest to northeast and valleys of moderate width. The Susquehanna River bisects this series of ridges and widens as it flows south to southeast through the rolling hills and broad valleys of the central part of the subbasin. Metamorphosed sediments that have been intensely folded and faulted characterize the southern part of the subbasin. This material caused the river to carve a deep gorge into the bedrock in a narrowing river valley. The Susquehanna River flows into the Chesapeake Bay at Havre de Grace, Md., providing over 50 percent of the freshwater inflow to the Bay.

Of the six subbasins in the Susquehanna River Basin, the Lower Susquehanna Subbasin is the most developed. The steep river slope and narrow valley of the lower Susquehanna gorge provide areas for hydropower development. This part of the subbasin is a major production area for electricity (McMorran, 1986). Some of the most productive agricultural lands and the largest population centers of the Susquehanna River

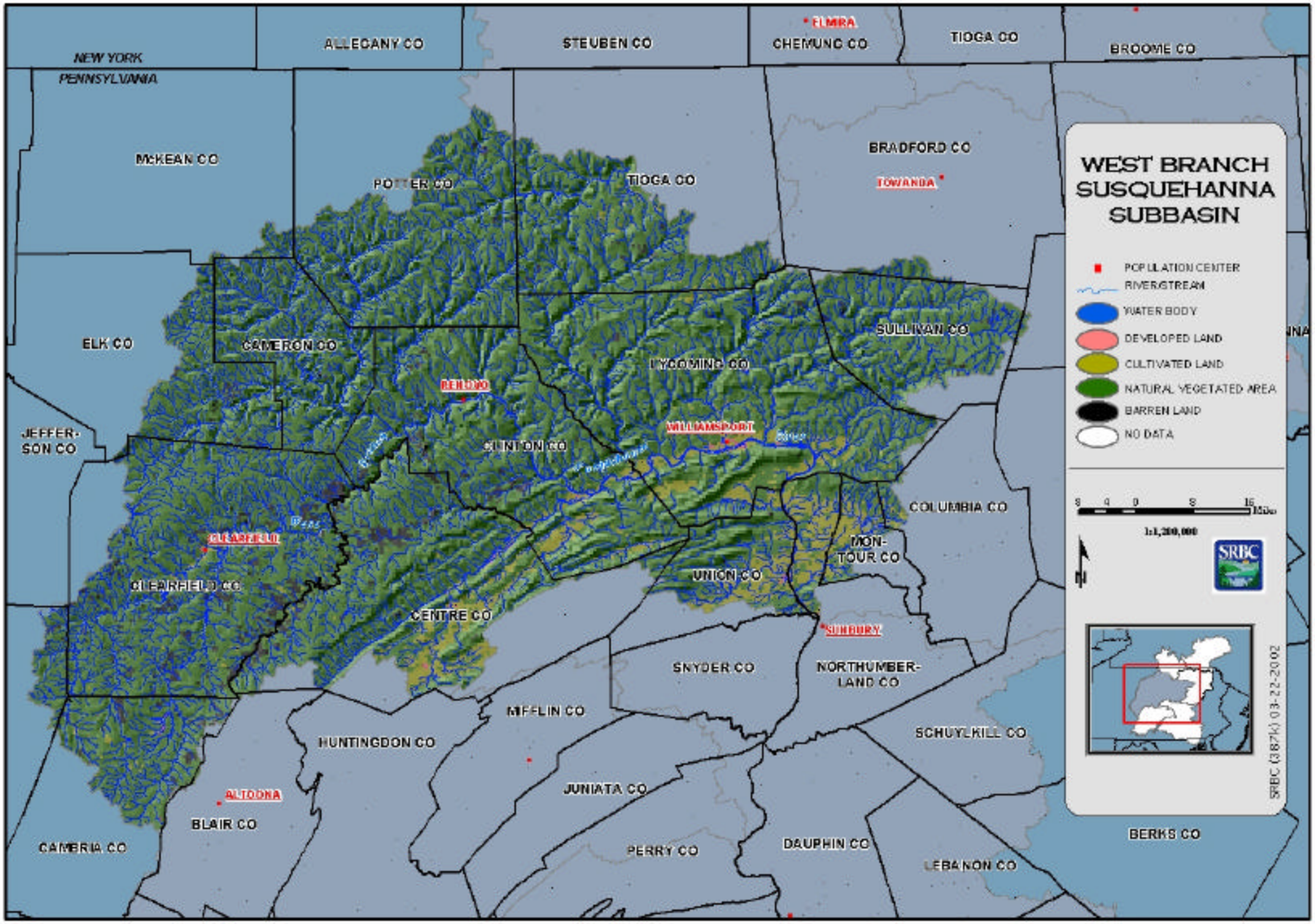

Figure 5. West Branch Susquehanna Subbasin

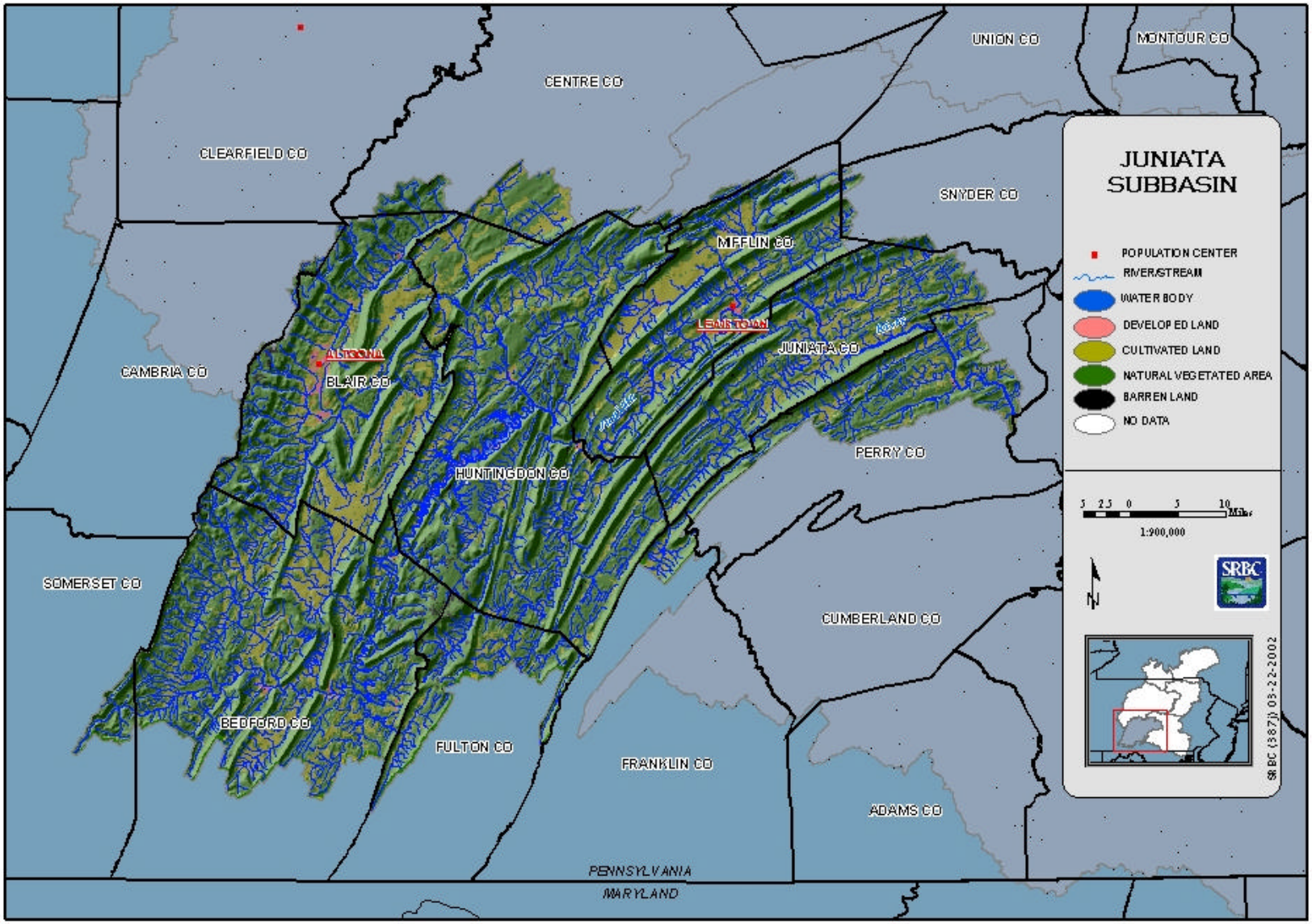

Figure 6. Juniata River Subbasin

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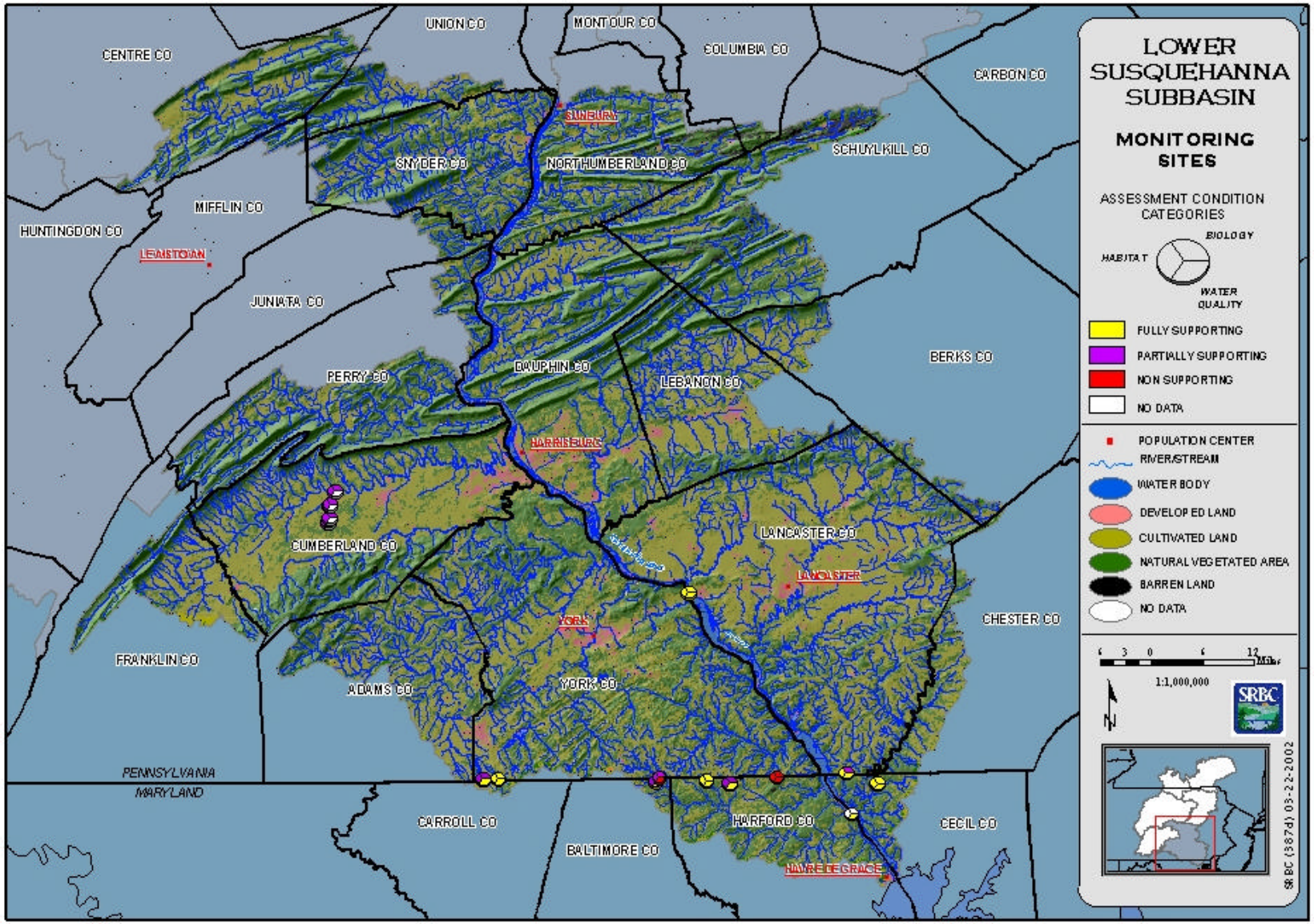

Figure 7. Lower Susquehanna Subbasin Monitoring Site Locations

Basin are located in the Lower Susquehanna Subbasin. Intense agricultural development occurs in many of the fertile limestone-type soils throughout the subbasin. A significant population is employed in government-related activities around Harrisburg, Pennsylvania's capital. Other major population and industrial centers are Lancaster, York, Lebanon, and Carlisle.

Designated use support

About 77 percent of the assessed stream miles meet designated uses (Table 12). This represents 97.55 miles of assessed streams. Partial support of designated uses is reported for 20.6 percent (26.02 miles) of the assessed miles. Nonsupport of designated uses is reported for two percent (3 miles) of the assessed miles.

The causes and sources of partial and nonsupport are shown in Tables 13 and 14, respectively.

Causes and sources of nonsupport of designated uses

Impairments in the Lower Susquehanna Subbasin are due largely to nutrient enrichment and siltation from agricultural runoff. The Lower Subbasin has some of the most highly productive agricultural lands in the Susquehanna River Basin. Agricultural runoff and livestock in streams commonly cause increased nutrient levels and sedimentation in this area.

SRBC continued its interstate streams sampling program in 1998, 1999, and 2000 (Rowles and Sitlinger, 1999; Rowles and Sitlinger, 2000; Hoffman and Sitlinger, 2001). During this time frame, SRBC assessed the Susquehanna River main stem at Marietta, Pa., and Conowingo, Md. The biological community at Marietta was designated nonimpaired; macroinvertebrates were not sampled at Conowingo due to deep water and no riffle habitat. Both sites had good water quality.

Nine additional sites were sampled in the Lower Susquehanna Subbasin along the Pennsylvania-Maryland border, including Conowingo, Deer, Ebaughs, Octoraro, and Scott Creeks. Most of these streams have agricultural influences, while a municipal discharge affects Ebaughs Creek, and Scott Creek is impaired by sewage and petroleum.

During 1999, SRBC performed a stream assessment of Mt. Rock Spring Creek in Cumberland County, Pa., for a stream restoration project. Mt. Rock Spring Creek is a limestone spring creek located in a heavily agricultural area near Carlisle, Pa. SRBC, Conodoguinet Creek Watershed Association, Cumberland County Conservation District, and Pa. DEP cooperated in a project to restore a section of the stream using fluvial geomorphology techniques. In its assessment of Mt. Rock Spring Creek, SRBC found impaired conditions throughout the reach, largely due to nutrient enrichment and siltation from agricultural runoff.

Chapter Four: Lake Water Quality Assessment

According to USEPA's (1993) Total Waters Database and Reporting Program, the Susquehanna River Basin has a total of 2,293 lakes, reservoirs, and ponds totaling 79,687 acres.

During past 305(b) reporting cycles, SRBC conducted a 2-year project, funded by USEPA and Pa. DEP through the Section 314(a) Clean Lakes Program. The purpose of the project was to: (1) update the Pa. DEP's database for lakes and water quality of lakes; (2) enhance the water quality assessment reporting activities under Section 305(b); and (3) help evaluate and prioritize projects funded under the Section 314 Clean Lakes Program. SRBC's inventory of lakes in the Pennsylvania part of the Susquehanna River Basin identified 135 lakes with public access, of which 70 were considered significant (Ballaron and others., 1996). The trophic state of 10 lakes in the Susquehanna River Basin was reported in the 1996 305(b) report (Edwards, 1996).

Chapter Five: Estuary and Coastal Assessment

Not applicable.

Table 12. Lower Susquehanna Subbasin Overall Use Support Summary for Rivers and Streams

Degree of Use Support	Assessment Category		Total Miles Assessed
	Miles Evaluated	Miles Monitored	
Fully Supporting		97.55	97.55
Partially Supporting		26.02	26.02
Non Supporting		3.00	3.00
Total Assessed		126.57	126.57

Table 13. Lower Susquehanna Subbasin Total Stream Miles Not Supporting and Partially Supporting Uses by Various Causes of Impairment

Cause of Impairment	Total Length of Waters Affected (in miles)			
	Not Supporting		Partial Support	
	Major	Minor	Major	Minor
Unknown				
Organics				
Metals				
Ammonia				
Chlorine				3.33
Other Inorganics				
Nutrients			4.00	14.69
pH				
Siltation				14.69
Dissolved Oxygen		3.00		
Total Dissolved Solids		3.00		3.33
Flow Alteration				
Habitat Alteration				
Sulfate				

Table 14. Lower Susquehanna Subbasin Total Stream Miles Not Supporting and Partially Supporting Uses by Various Sources of Impairment

Source of Impairment	Total Length of Waters Affected (in miles)			
	Not Supporting		Partial Support	
	Major	Minor	Major	Minor
Unknown				
Domestic Waste	3.00			
Industrial Waste				
Municipal Waste			3.33	
Other Point Source				
Agricultural Runoff			18.69	
Urban Runoff				
Other Nonpoint Source				
Acid Mine Drainage				
Mining (non-coal)				
Hydro/Habitat Modification				

Chapter Six: Wetlands Assessment

SRBC has not conducted any assessment work on wetlands in the basin.

Chapter Seven: Public Health/Aquatic Life Concerns

Toxics in the nation's waters and their impact on human and aquatic health have been of increasing concern to federal and state agencies. These pollutants enter the water environment from point sources such as industrial facilities and sewage treatment plants and nonpoint sources such as agricultural and urban runoff, atmospheric deposition, rock and soil weathering, and erosion.

SRBC's role in addressing toxic pollution is to support state and federal programs. The SRBC assists other agencies in data collection for the overall goals of the Chesapeake Bay Program and Pa. DEP.

Presently, SRBC is serving as a contractor for Maryland and Pennsylvania to develop Source Water Assessment and Protection (SWAP) reports for surface water sources in the Lower Susquehanna River Basin. The program does not require new data collection. Instead, the process involves: (1) collecting and assembling pre-existing data; (2) delineating the source water assessment areas; (3) meeting with the water suppliers; (4) holding public meetings to collect information and find out concerns; (5) inventorying contaminants within the watershed; (6) ranking contaminants based on susceptibility matrices; (7) reporting results; (8) holding public meeting to present results; and (9) submitting final report to the states. SRBC will complete the SWAP work for Maryland and Pennsylvania by June 2003.

PART IV: GROUND-WATER ASSESSMENT

Overview

SRBC obtains ground-water quality information through its ground-water withdrawal approval permits, investigations, cooperative studies, and surveys pertaining to existing ground-water quality or probable future ground-water quality in the basin. The ground-water quality information in this report was compiled from SRBC's ground-water project review files.

Susquehanna River Basin Commission Ground-water Program

SRBC's ground-water program deals with water quantity as set forth in SRBC's "Regulations and Procedures for Review of Projects," Section 803.43, regulating ground-water withdrawals. Anyone proposing to withdraw ground water from a single well or a well field in excess of an average of 100,000 gallons per day (gpd) for any consecutive 30-day period must obtain SRBC approval of the withdrawal. As part of the regulation, samples of ground water for water quality analysis must be collected and the results reported to the SRBC every three years.

Ground-water monitoring is necessary to ensure ground-water withdrawals and sources of ground-water contamination do not endanger the quantity and quality of the ground-water resource. Ground-water quality contamination from on-lot septic systems and agricultural pollution are of concern to SRBC and are identified in the Groundwater Management Plan (SRBC, 1993).

Many domestic wells are located in subdivisions that utilize on-lot septic systems. In the absence of controls on well location and lot size, problems related to well interference and ground-water contamination from on-lot systems frequently occur.

Agricultural nonpoint source contamination of ground water, principally from nitrate and pesticides, has received considerable attention in recent years. However, limited attention is given to the fact that many of the receiving streams of point sources are influent during parts of the year, and thus are sources of ground-water recharge and potential contamination. The geologic areas of concern are those underlain by carbonate rocks and those having thick deposits of glacial outwash.

Although the use and purpose of the ground-water withdrawal vary for each project, ground-water quality results were compared against the maximum contaminant level (MCL) referenced in the Code of Federal Regulation (40 CFR Ch. I Sec. 1412, 7-1-97) and "USEPA's Quality Criteria for Water, 1986 (Gold Book)" (Table 15). A fully supporting designation requires that less than 10 percent of the values for any given parameter exceed MCL and Water Quality Criteria (WQC) for each sample. Partial support is indicated by 10 to 50 percent of results exceed MCL and WQC. Nonsupport is determined by greater than 50 percent of results exceeding MCL and WQC. Figures 8 through 13 show approved ground-water withdrawal locations and their associated assessments.

Table 15. Maximum Contaminant Level (MCL) and Water Quality Criteria (WQC) Exceedances for Various Parameters from Permitted Ground-water Withdrawals in the Susquehanna River Basin

Parameter	Units	Max	Avg.	Min	Count	MCL	WQC	Number Exceed MCL	Number Exceed WQC
Alk	mg/l	2,580	142	*ND	730		300		34
Al	ug/l	19,300	271	ND	350				
Ba	mg/l	200	0.74	0.0002	714	2		4	
Ca	mg/l	281	55.4	0.01	666				
Cd	ug/l	20	3.8	0.0026	611	50		0	
Cl	mg/l	1,500	46.9	ND	747		250		29
Cr	ug/l	300	18.8	ND	597	100	50	1	2
T HARD	mg/l	750	179.7	5	709				
Fe	ug/l	25,600	404.2	ND	683		300		98
Pb	ug/l	200	18.6	ND	568		50		8
Mg	mg/l	7590	25.7	ND	297				
Mn	ug/l	7,600	165.3	ND	681		50		172
NO3	mg/l	31.8	3.07	ND	768	10		31	
pH	s.u.	9.3	7.25	3.49	768		5		5
OP	mg/l	3.5	0.167	0.0011	300				
TDS	mg/l	3,400	292	1	681				
Na	mg/l	560	24.4	0.002	735				
SPEC COND	UMHOS	5,400	524	15.6	531				
SO4	mg/l	660	36.3	0.02	756		250		16
TOC	mg/l	130	4.6	0.176	288				
Zn	ug/l	829	54	ND	673		5,000		0

* Not Detected

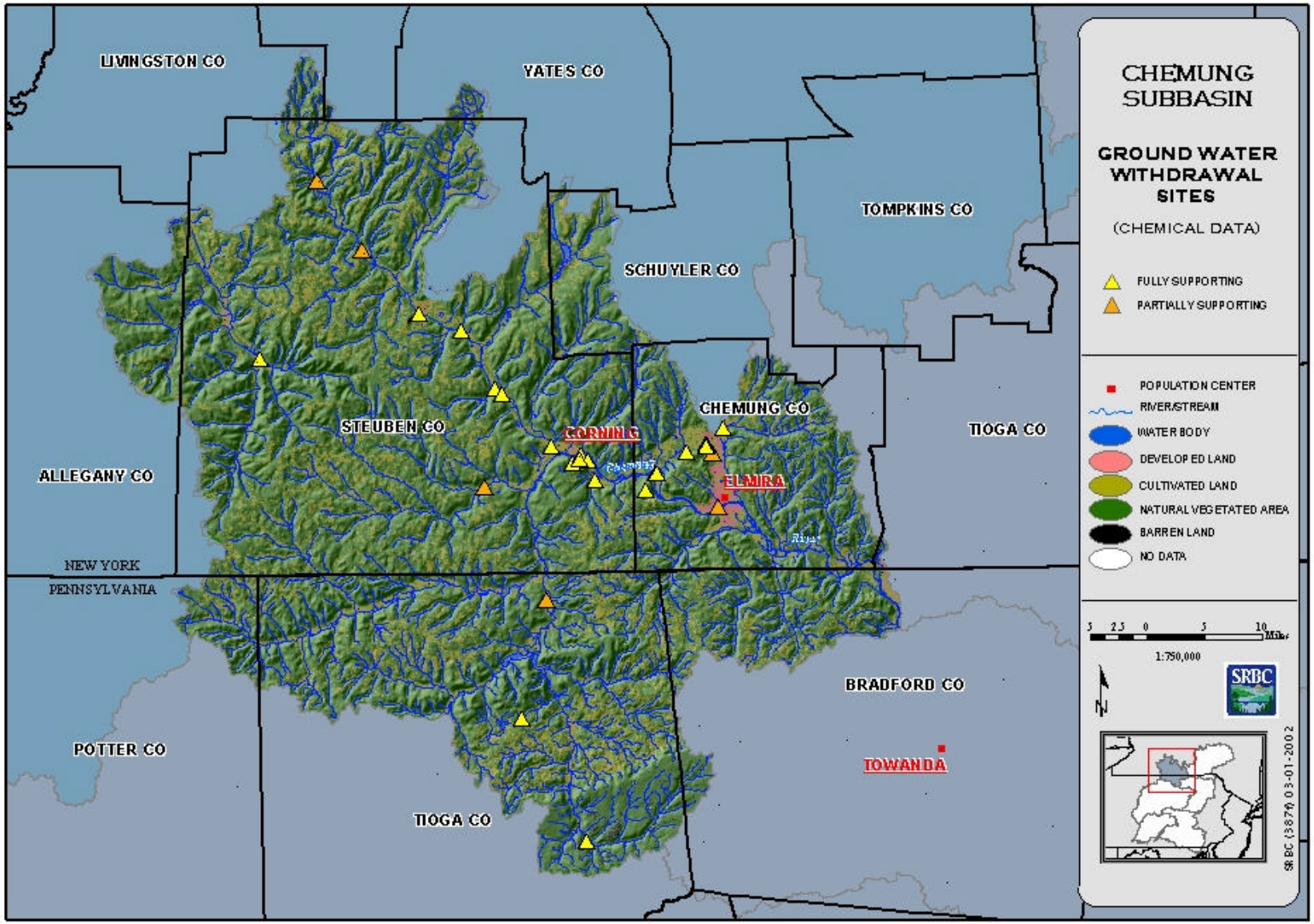

Figure 8. Chemung Subbasin Ground-water Withdrawal Site Locations

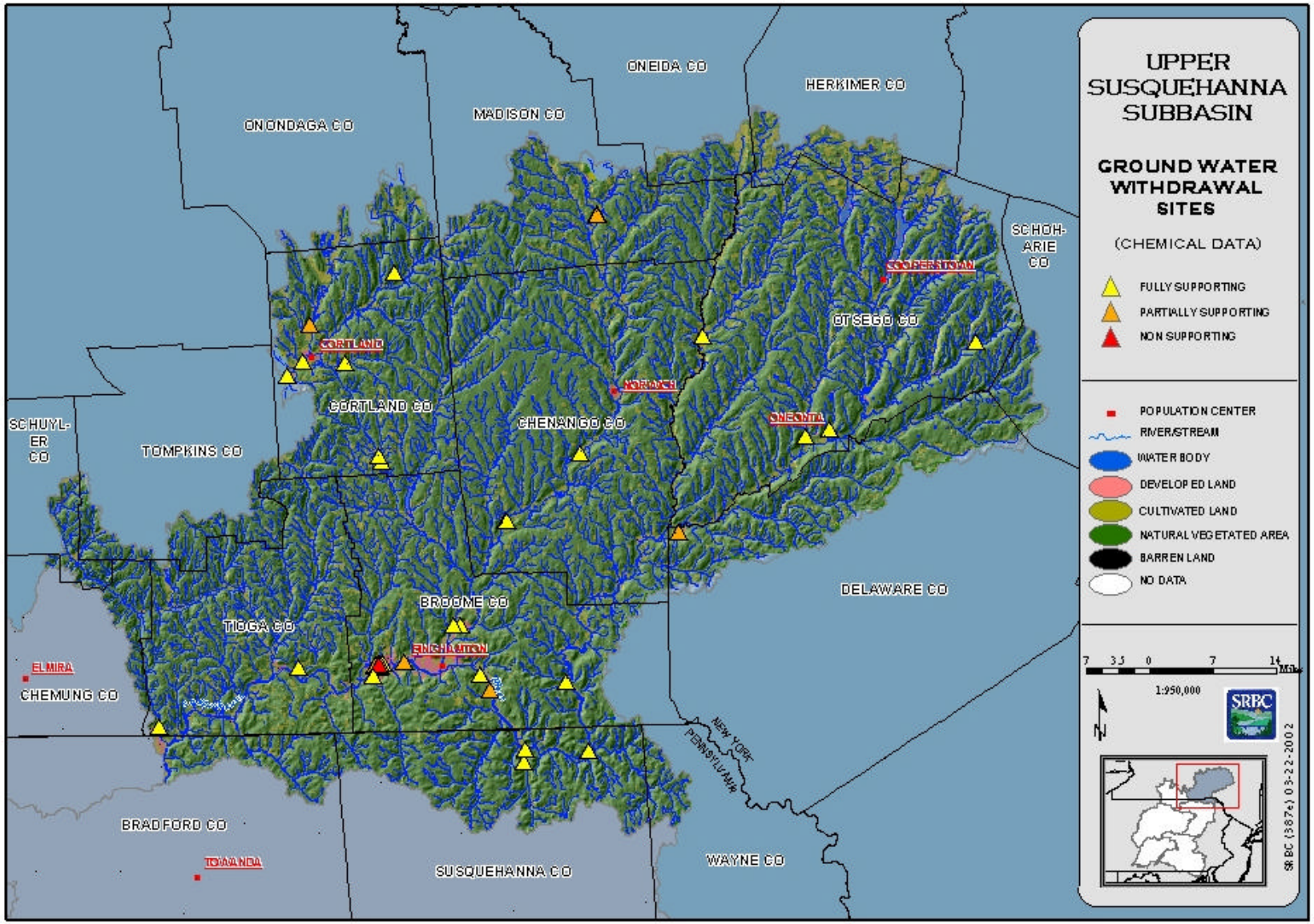

Figure 9. Upper Susquehanna Subbasin Ground-water Withdrawal Site Locations

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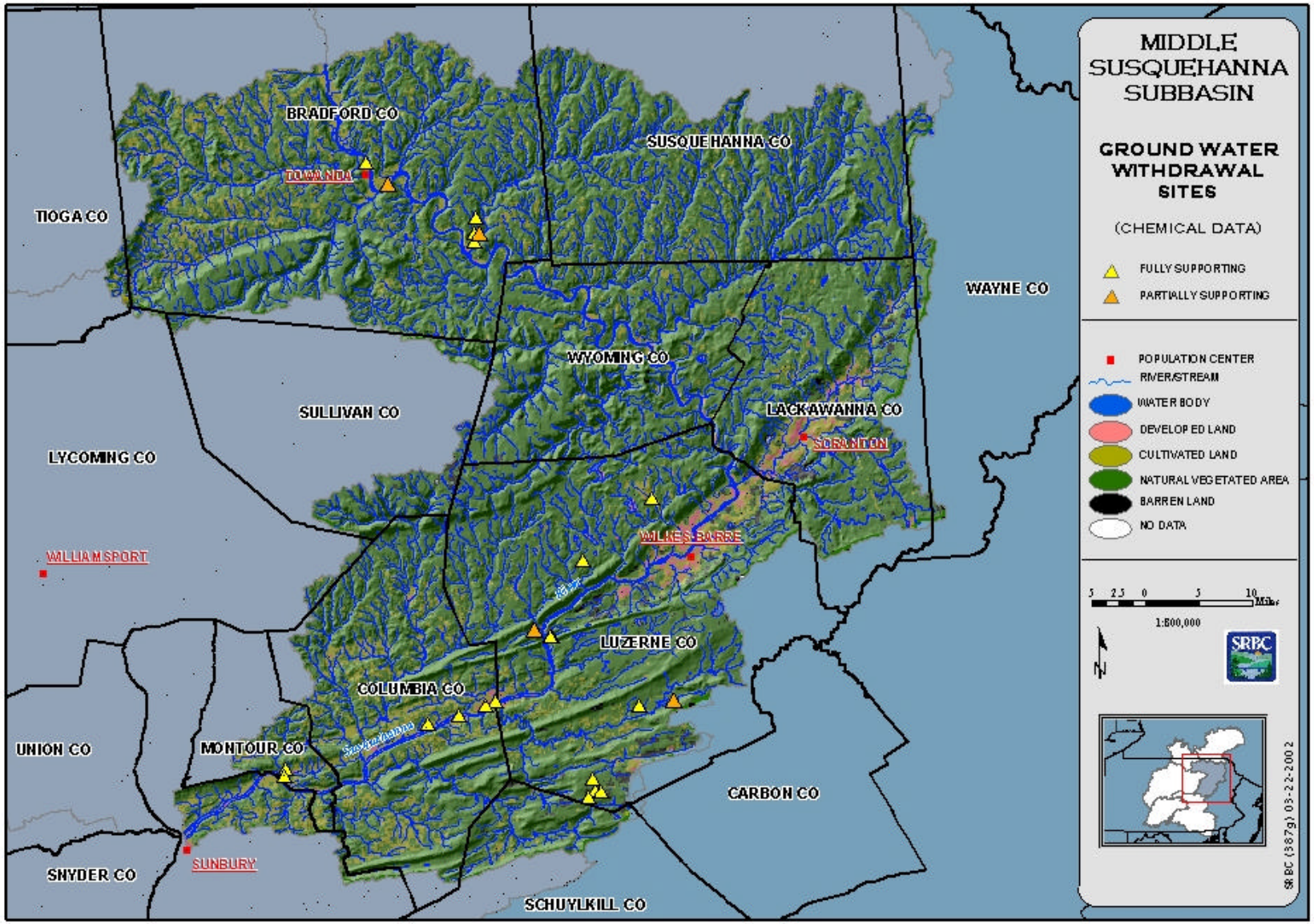

Figure 10. Middle Susquehanna Subbasin Ground water Withdrawal Site Locations

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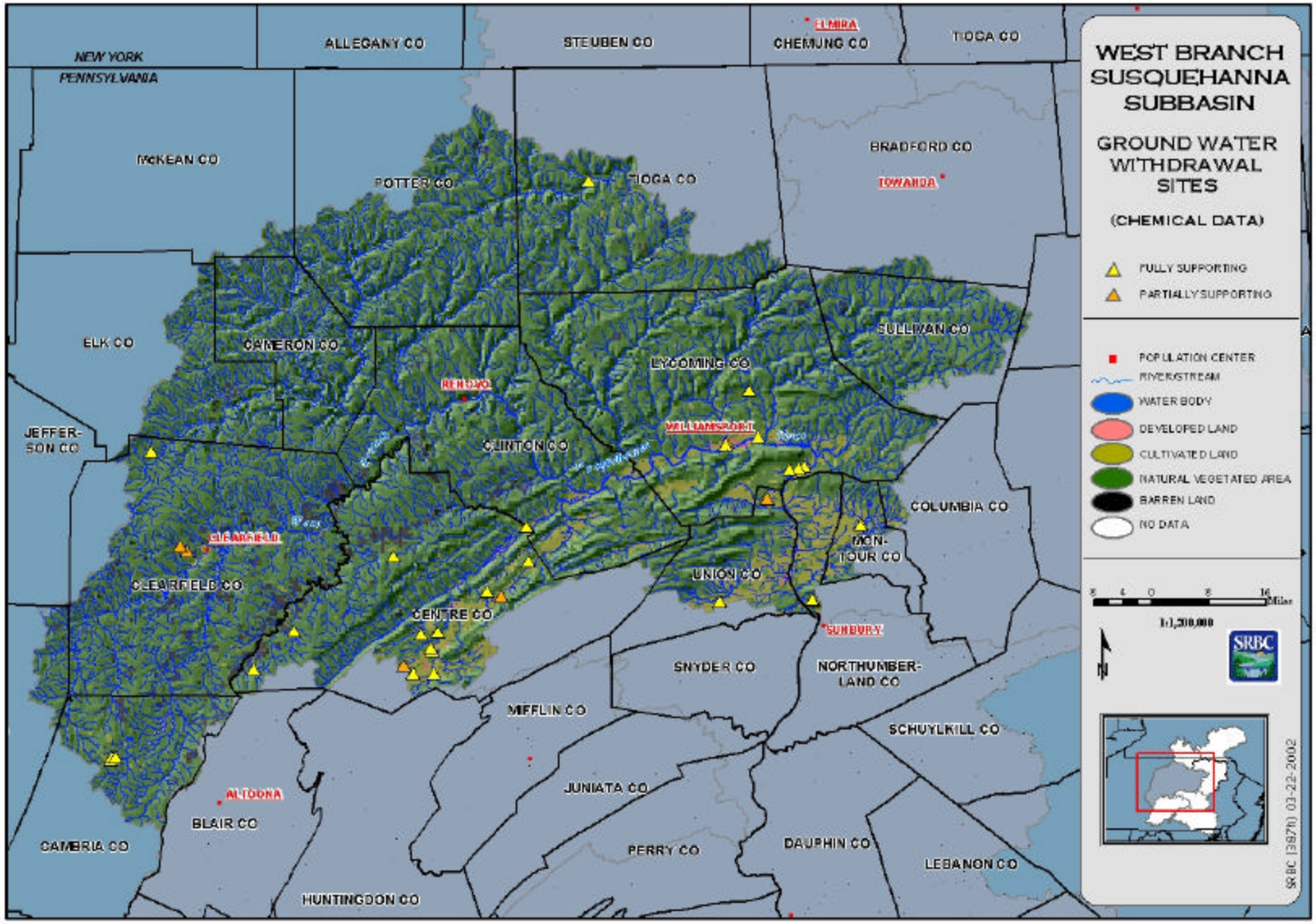

Figure 11. West Branch Susquehanna Subbasin Ground-water Withdrawal Site Locations

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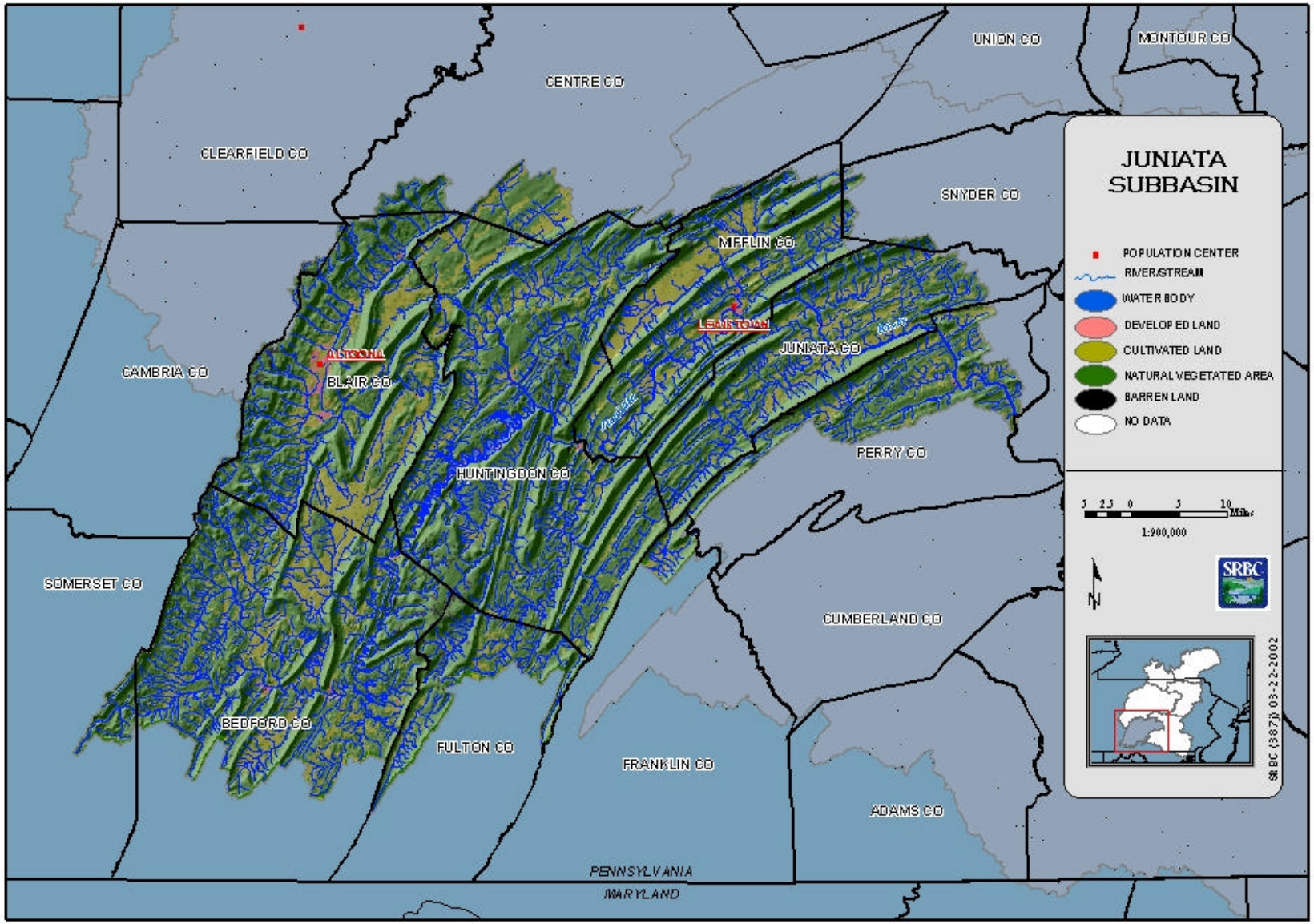

Figure 12. Juniata Subbasin Ground-water Withdrawal Site Locations

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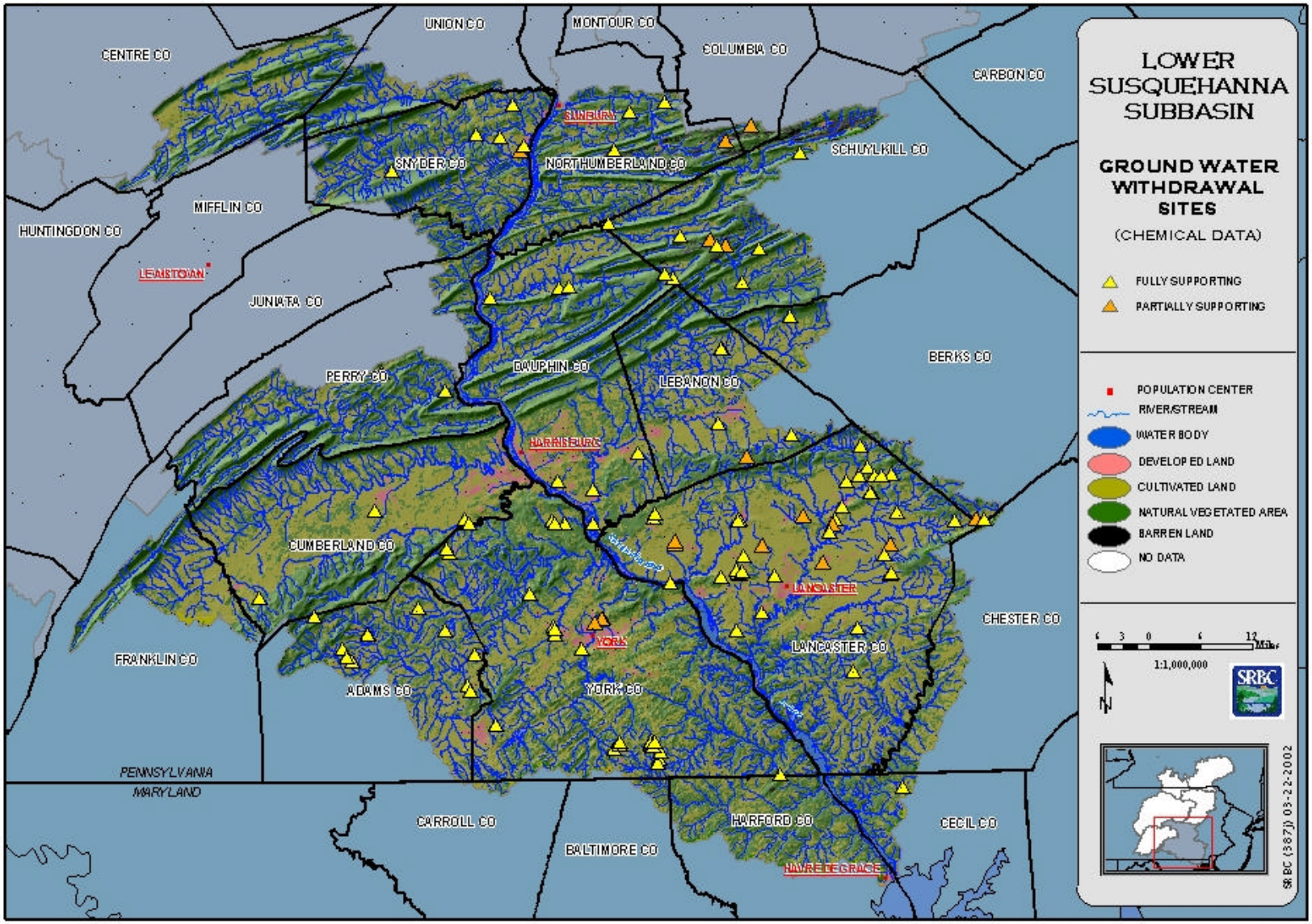

Figure 13. Lower Susquehanna Subbasin Ground-water Withdrawal Site Locations

PART V: WATER POLLUTION CONTROL PROGRAM

The SRBC recognizes that the states shall have the primary responsibility for water quality management and control. SRBC serves as a regional coordinator. SRBC coordinates local, state, and federal water quality management efforts, promotes uniform enforcement of, and compliance with, established standards and classifications, and encourages amendment and modification of standards and classifications within the basin, as deemed in the public interest.

SRBC's program objective is to control water pollution sufficiently to maintain and establish water quality capable of supporting multiple uses, such as: public water supply after treatment; recreation, fish, and wildlife; agriculture; industry; and other such uses. To meet that objective, the overall goal is to achieve compliance with water quality standards and criteria for intrastate and interstate waters of the basin, as established by the member jurisdictions.

Chapter One: Point Source Control Program

SRBC's point source control program goal is to encourage continued upgrading and development of needed public and private waste treatment facilities.

Chapter Two: Nonpoint Source Control Program

SRBC's nonpoint source program goal is the increased control of stormwater runoff and nonpoint source pollution through the fulfillment of the Chesapeake Bay Program's objectives. These objectives are related to monitoring and research recommendations, and baywide toxicant recommendations.

Chapter Three: Cost/Benefit Analysis

Not performed.

Chapter Four: Special State Concerns and Recommendations

Acid mine drainage

Degradation of streams due to AMD from past coal mining activities is one of the most prevalent water quality problems in the basin. These discharges occur when coal and sulfur-bearing minerals (pyrite) are exposed to oxidizing conditions to form sulfuric acid. The low pH of the water also dissolves metals (iron, manganese, and aluminum) from the rock strata. These dissolved metals can enter nearby streams.

State and federal agencies are pursuing remedial action for this problem, but progress is slow due to the magnitude of the problem and the significant costs to clean up the degradation. Successful abatement projects have been implemented in small areas, but the scope of the problem is so large, it will take many years before streams affected by AMD meet designated uses.

This current 305(b) assessment does not contain a large number of AMD affected streams. Most of the streams affected by AMD in the Susquehanna River Basin are found in the West Branch and Middle Susquehanna Subbasins, which were not monitored in the time frame covered by this report.

Chesapeake Bay

Chesapeake Bay Program findings indicate the Susquehanna River Basin contributes the major portion of nutrients to the Chesapeake Bay. To create a water quality condition necessary to support the living resources of the Bay, the Chesapeake Bay Program states have agreed to reduce or control point and nonpoint sources of pollution. Programs and policies implemented by the Bay states to reduce nutrient and toxic transport to the Bay have produced water quality benefits in the Susquehanna River Basin. Future efforts should focus on a continued commitment to the reduction of nutrients and an expanded commitment to reducing toxics from acid-mine drainage and conventional pollutants.

Currently, SRBC participates in several Chesapeake Bay Program activities, including the Water Quality Steering Committee and monitoring for sediment and nutrients in the Susquehanna River Basin. Additionally, staff convened and participated in the Sediment Task Force and hosted a Sediment Symposium on December 7-8, 2000 in Hershey, Pennsylvania, to address concerns about sediment build-up in the Susquehanna River Basin and its current and potential effects on the Chesapeake Bay ecosystem.

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APPENDIX A
WATER CLASSIFICATION AND BEST USAGE RELATIONSHIPS

New York:

The New York State water quality classifications are summarized from Water Quality Regulations for Surface Waters and Groundwaters, 6NYCRR Parts 700-705 Effective September 1, 1991, NYSDEC Division of Water, Albany, N.Y.

Class AA - The best usages of Class AA waters are a source of water supply for drinking, culinary, or food processing purposes; primary and secondary contact recreation; and fishing. The waters shall be suitable for fish propagation and survival. This classification may be given to those waters that, if subjected to approved disinfection treatment, with additional treatment necessary to remove naturally present impurities, meet or will meet New York State Department of Health drinking water standards and are or will be considered safe and satisfactory for drinking water purposes.

Class A - The best usages of Class A waters are a source of water supply for drinking, culinary, or food processing purposes; primary and secondary contact recreation; and fishing. The waters shall be suitable for fish propagation and survival. This classification may be given to those waters that, if subjected to approved treatment equal to coagulation, sedimentation, filtration, and disinfection, with additional treatment necessary to remove naturally present impurities, meet or will meet New York State Department of health drinking water standards and are or will be considered safe and satisfactory for drinking water purposes.

Class B - The best usages of Class B waters are primary and secondary contact recreation and fishing. These waters shall be suitable for fish propagation and survival.

Class C - The best usage of Class C waters is fishing. These waters shall be suitable for fish propagation and survival. The water quality shall be suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes.

Class D - The best usage of these waters is fishing. Due to natural conditions as intermittency of flow, water conditions not conducive to propagation of game fishery, or streambed conditions, the waters will not support fish propagation. These waters shall be suitable for fish survival. The water quality shall be suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes.

(T) - Suffix added to Classes AA, A, B, and C waters where trout survival is an additional best use to the classification.

(TS) - Suffix added to Classes AA, A, B, and C waters where trout propagation is an additional best use to the use classification.

Pennsylvania:

The Pennsylvania State water quality classifications are summarized from Water Quality Standards of the Department's Rules and Regulations, 25 Pa. Code, Chapter 93.3-5, effective August 1989, Pa. DER, Division of Water Quality, Harrisburg, Pa. All surface waters must meet protected water uses for aquatic life (warm water fishes), water supply (potable, industrial, livestock, and wildlife), and recreation (boating, fishing, water contact sports, and aesthetics). The designated use classifications are as follows:

EV - Exceptional Value Waters: These waters must meet the statewide list, and are protected at their existing water quality. These streams constitute outstanding national, state, regional, or local resources. The water quality in these streams shall not be lowered.

HQ-TSF - High Quality Trout Stocking Fishery: The water quality can only be lowered if a discharge is the result of necessary social or economic development, the water quality criteria are met, and all existing uses are protected. Maintenance of stocked trout from February 15 to July 31 and maintenance and propagation of fish species and additional flora and fauna, which are indigenous to a warm water habitat.

HQ-CWF - High Quality Cold Water Fishery: The water quality can only be lowered if a discharge is the result of necessary social or economic development, the water quality criteria are met, and all existing uses are protected. Maintenance and/or propagation of fish species, including the family of Salmonidae and additional flora and fauna, which are indigenous to a cold water habitat.

HQ-WWF - High Quality Warm Water Fishery: The water quality can only be lowered if a discharge is the result of necessary social or economic development, the water quality criteria are met, and all existing uses are protected. Maintenance and propagation of fish species and additional flora and fauna, which are indigenous to a warm water habitat.

TSF - Trout Stocked Fishery: Maintenance of stocked trout from February 15 to July 31 and maintenance and propagation of fish species and additional flora and fauna that are indigenous to a warm water habitat.

CWF - Cold Water Fishery: Maintenance and/or propagation of fish species, including the family Salmonidae and additional flora and fauna, which are indigenous to a cold water habitat.

WWF - Warm Water Fishery: Maintenance and propagation of fish species and additional flora and fauna that are indigenous to a warm water habitat.

MF - Migratory Fishes: Passage, maintenance and propagation of anadromous and catadromous fishes and other fishes that ascend to flowing waters to complete their life cycle. The MF designation is in addition to other designations when appropriate.

Maryland

The Maryland State water quality classifications are summarized from Water Quality Regulations for Designated Uses, COMAR 26.08.02, effective November 1, 1993, Maryland Department of the Environment, Annapolis, Md. All surface waters must protect public health or welfare, enhance the quality of water, protect aquatic resources, and serve the purposes of the Federal Act. The designated uses are:

Use I - Water Contact Recreation and Protection of Aquatic Life. This use designation includes waters that are suitable for water contact sports; play and leisure time activities where individuals may come in direct contact with surface water; fishing; the growth and propagation of fish (other than trout), other aquatic life, and wildlife; and industrial supply.

Use I-P - Water Contact Recreation, Protection of Aquatic Life, and Public Water Supply. This use includes all uses identified in Use I and use as a public water supply.

Use II - Shellfish Harvesting Waters. This use designation includes waters where shellfish are propagated, stored, or gathered for marketing purposes; and actual or potential areas for the harvesting of oysters, softshell clams, hardshell clams, and brackish water clams.

Use III - Natural Trout Waters. This use designation includes waters that have the potential for or are suitable for the growth and propagation of trout; and capable of supporting self-sustaining trout populations and their food organisms.

Use III-P - Natural Trout Waters and Public Water Supply. This use includes all uses identified in Use III; and use as a public water supply.

Use IV - Recreational Trout Waters. This use designation includes cold or warm waters which have the potential for or are capable of holding or supporting adult trout for put-and-take fishing; and managed as a special fishery by periodic shocking and seasonal catching.

Use IV-P - Recreational Trout Waters and Public Water Supply. This use includes all uses identified in Use IV; and use as a public water supply.

APPENDIX B
ASSESSED STREAM REACHES IN THE SUSQUEHANNA RIVER BASIN BY SUBBASIN

Abbreviations used in Tables B1 through B3

Table Headings:

STRMNAME - Name of stream or river
UPMILES - Beginning of stream reach in miles upstream of mouth
DNMILES - Ending of stream reach in miles upstream of mouth
RCHCLASS - Designated use/classification of stream reach (see Appendix A)
MILASS - Total miles of stream reach that are assessed for use support
MILATT - Total miles of stream reach that attained (full support) designated use
MNOTATT - Total miles of stream reach that did not attain (not supporting) designated use.
MPARATT - Total miles of stream reach that partially attained (partial support) designated use.
CAUSE1 - Major cause of stream use impairment
CAUSE 2 - Minor cause of stream use impairment
SOURCE1 - Major source of stream use impairment
SOURCE2 - Minor source of stream use impairment

Source Codes:

MW - Municipal wastes
IW - Industrial wastes
DW - Domestic wastes
OPS - Other point sources
AMD - Acid mine drainage
AP - Acid precipitation
AGR - Agricultural runoff
URBRO - Urban runoff
ONS - Other nonpoint source
UNK - Unknown
RESEX - Resource extraction (non-coal)
LNDF - Landfills
HYDRO - Habitat/hydromodification

Cause Codes:

UNK - Unknown
TOX - Toxics
PEST - Pesticide
ORG - Organics
MET - Metals
NH3 - Ammonia
CL - Chlorine
OIN - Other inorganics
NUTR - Nutrients
PH - pH
SILT - Siltation
DO - Organic enrichment/ Dissolved oxygen
TDS - Total dissolved solids
THRM - Thermal modification
FLOW - Flow alteration
HAB - Habitat alteration
BAC - Bacteria/pathogens
OIL - Oil and grease
ODOR - Taste and odor
SUSP - Suspended solids
AQPL - Noxious aquatic plants
FILL - Filling and draining
SO4 - Sulfate

Table B1. Assessed Stream Reaches in the Chemung Subbasin

STRMNAME	UPMILES	DNMILES	RCHCLASS	MILASS	MILATT	MILNOATT	MILPARATT	CAUSE1	CAUSE2	SOURCE1	SOURCE2
Bentley Creek	1.50	0.00	C	1.50			1.50	HAB		HYDRO	
Bentley Creek	11.30	1.50	WWF	9.80	5.80	3.00	1.00	HAB		HYDRO	
Holden Creek	4.20	0.00	WWF	4.20	4.20						
Holden Creek	6.60	4.20	C	2.40	2.40						
North Fork Cowanesque River	7.80	4.50	CWF	3.30			3.30	NUTR		AGR	
North Fork Cowanesque River	9.90	7.80	C(T)	2.10	2.10						
South Creek	6.00	0.00	C	6.00	6.00						
South Creek	16.30	6.00	TSF	10.30	10.30						
Chemung River	11.50	9.50	WWF	2.00	2.00						
Chemung River	9.50	6.80	C	2.70	2.70						
Chemung River	6.80	0.00	WWF	6.80	6.80						
Cowanesque River	0.70	0.00	WWF	0.70	0.70						
Cowanesque River	2.20	0.70	C	1.50		0.50	1.00	MET	HAB	HYDRO	HYDRO
Seeley Creek	13.40	10.40	CWF	3.00			3.00	HAB		HYDRO	
Seeley Creek	6.90	0.00	C(T)	6.90			6.90	HAB		HYDRO	
Seeley Creek	10.40	6.90	C	3.50			3.50	HAB		HYDRO	
Tioga River	13.10	0.00	C	13.10	13.10						
Tioga River	20.00	13.10	WWF	6.90			6.90	SILT		HYDRO	
Tioga River	54.00	20.00	CWF	34.00	7.88	26.12		PH	MET	AMD	AMD
Troups Creek	14.70	5.20	C(T)	9.50	5.50		4.00	NUTR		MW	
Troups Creek	5.20	0.00	CWF	5.20	4.70		0.50	HAB		HYDRO	
Cook Hollow	2.72	0.42	C	2.30	2.30						
Cook Hollow	0.42	0.00	CWF	0.42	0.42						
Bulkley Brook	5.10	2.10	C	3.00	3.00						
Bulkley Brook	2.10	0.00	WWF	2.10	2.10						
Bird Creek	3.30	2.30	CWF	1.00	1.00						
Bird Creek	2.30	0.00	C	2.30	1.90		0.40	SILT	NUTR	AGR	AGR
Smith Creek	3.20	0.00	WWF	3.20	3.20						
Strait Creek	2.10	0.00	WWF	2.10	2.10						

Table B1. Assessed Stream Reaches in the Chemung Subbasin - continued

STRMNAME	UPMILES	DNMILES	RCHCLASS	MILASS	MILATT	MILNOATT	MILPARATT	CAUSE1	CAUSE2	SOURCE1	SOURCE2
Strait Creek	2.50	2.10	C	0.40	0.40						
White Hollow	0.80	0.00	C	0.80	0.80						
White Hollow	1.80	0.80	WWF	1.00	1.00						
White Hollow	2.10	1.80	C	0.30	0.30						
Dry Brook	0.50	0.00	WWF	0.50			0.50	HAB		HYDRO	
Bill Hess Creek	3.90	1.90	C	2.00	2.00						
Bill Hess Creek	1.90	0.00	WWF	1.90	1.90						
Camp Brook	5.80	3.00	C	2.80	2.80						
Camp Brook	3.00	0.00	WWF	3.00	3.00						
Red House Hollow	1.80	0.00	WWF	1.80	1.70		0.10	HAB		HYDRO	
Biscuit Hollow	2.51	1.59	C	0.92	0.92						
Biscuit Hollow	1.59	0.00	CWF	1.59	1.59						
White Branch Cowanesque	3.10	1.80	C	1.30	1.30						
White Branch Cowanesque	1.80	0.00	WWF	1.80	1.80						

Table B2. Assessed Stream Reaches in the Upper Susquehanna Subbasin

STRMNAME	UPMILES	DNMILES	RCHCLASS	MILASS	MILATT	MNOTATT	MPARTATT	CAUSE1	CAUSE2	SOURCE1	SOURCE2
Apalachin Creek	13.20	6.44	CWF	6.76	6.76						
Apalachin Creek	6.44	0.00	CWF	6.44	6.44						
Beaver Creek	2.30	2.30	C(T)	2.30	2.30						
Butternut Creek	37.30	0.00	C	37.30	37.30						
Cascade Creek	4.00	0.17	C(T)	2.30	2.30						
Cascade Creek	1.70	0.00	CWF	1.70	1.70						
Catatonk Creek	22.30	0.00	C	22.30	22.30						
Cayuta Creek	30.30	22.48	B(T)	7.82	7.82						
Cayuta Creek	6.45	1.70	B	4.75	4.75						
Cayuta Creek	1.70	0.00	WWF	1.70	1.70						
Center Brook	1.00	0.00	C(TS)	1.00	1.00						
Charlotte Creek	14.70	2.60	C	12.10	12.10						
Chenango River	30.00	0.00	B	30.00	30.00						
Chenango River	32.80	30.00	C	2.80	2.80						
Chenango River	76.80	32.80	B	44.00	44.00						
Choconut Creek	9.10	0.00	C	9.10	9.10						
Choconut Creek	16.00	9.10	WWF	6.90	6.90						
Cherry Valley Creek	29.90	0.00	C	29.90	29.90						
Canasawacta Creek	6.40	0.00	B	6.40	3.90		2.5	SILT		HYDRO	
East Branch Tioughnioga River	10.60	0.00	C	10.60	10.60						
Elk Creek	13.80	0.00	C	13.80	13.80						
Mud Creek	5.30	0.00	C	5.30	5.30						
Geneganslet Creek	10.90	0.00	C	10.90	10.90						
Hayden Creek	4.00	0.00	C(T)	4.00	4.00						
Kelsey Creek	9.60	0.00	C	9.60	9.60						
Kortright Creek	10.90	0.00	C	10.90	10.90						
Little Snake Creek	6.74	0.00	C	6.74	6.74						
Little Snake Creek	10.62	6.74	CWF	3.52	3.52						
Nanticoke Creek	7.80	0.00	C	7.80	7.80						

Table B2. Assessed Stream Reaches in the Upper Susquehanna Subbasin - continued

STRMNAME	UPMILES	DNMILES	RCHCLASS	MILASS	MILATT	MNOTATT	MPARTATT	CAUSE1	CAUSE2	SOURCE1	SOURCE2
Oaks Creek	13.30	0.00	C	13.30	13.30						
OcQuinous Creek	9.00	0.00	C(T)	9.00	9.00						
Otego Creek	28.60	0.00	C	28.60	28.60						
Otselic River	32.30	0.00	C	32.30	32.30						
Ouleout Creek	26.20	0.00	C	26.20	26.20						
Owego Creek	6.40	0.00	C(T)	6.40	6.40						
Parks Creek	2.80	0.70	WWF	2.10	2.10						
Prince Hollow Run	5.60	4.80	C	0.80	0.80						
Prince Hollow Run	4.80	0.00	WWF	4.80	4.80						
Russell Run	2.40	0.00	WWF	2.40	2.40						
Russell Run	2.70	2.40	C	0.30	0.30						
Sackett Creek	4.30	2.10	WWF	2.20	2.20						
Sackett Creek	2.10	0.00	C	2.10	2.10						
Salt Lick	13.50	0.00	HQ-CWF	13.50	11.50		2.00	NUTR		ONS	
Sangerfield River	2.30	0.00	C	2.30	2.30						
Schenevus Creek	28.60	0.00	C	28.60	28.60						
Snake Creek	22.50	1.80	CWF	20.70	20.70						
Starrucca Creek	17.40	0.00	CWF	17.40	17.40						
Susquehanna River	291.00	284.00	WWF	7.00	7.00						
Susquehanna River	303.00	291.00	B	12.00	12.00						
Susquehanna River	307.00	303.00	C	4.00	4.00						
Susquehanna River	330.00	316.00	C	14.00	14.00						
Susquehanna River	339.00	330.00	A	9.00	9.00						
Susquehanna River	343.00	339.00	B	4.00	4.00						
Susquehanna River	442.00	343.00	B	99.00	99.00						
Tioughnioga River	28.70	0.0	B	28.70	28.70						
Trout Brook	3.30	0.00	C	3.30	3.30						
Trowbridge Creek	7.70	2.00	C	5.70	5.70						
Trowbridge Creek	2.00	0.00	CWF	2.00	1.50		0.50	HAB		HYDRO	

Table B2. Assessed Stream Reaches in the Upper Susquehanna Subbasin - continued

STRMNAME	UPMILES	DNMILES	RCHCLASS	MILASS	MILATT	MNOTATT	MPARTATT	CAUSE1	CAUSE2	SOURCE1	SOURCE2
Unadilla River	50.20	0.00	B	50.20	50.20						
Wappasening Creek	1.90	0.00	C	1.90	1.90						
West Branch Handsome Brook	6.00	0.00	C(TS)	6.00	6.00						
West Branch Owego Creek	9.20	2.20	C(T)	7.30	7.30						
West Branch Owego Creek	2.20	0.00	C	2.20	2.20						
West Branch Tioughnioga River	7.50	0.00	C	7.50	7.50						
Wharton Creek	29.50	0.00	C	29.50	29.50						
Wappasenning Creek	19.70	1.90	WWF	17.80	17.80						
Deep Hollow Brook	1.70	1.40	C	0.30	0.30						
Briggs Hollow	0.40	0.00	wwf	0.40	0.20		0.20	HAB		HYDRO	
Briggs Hollow	2.71	0.40	C	2.31	2.31						
Little Wappasenning Creek	0.50	0.00	C	0.50	0.50						
Little Wappasenning Creek	1.90	0.50	WWF	1.40	1.40						
Babcock Run	3.10	2.50	C	0.60	0.60						
Babcock Run	2.50	0.00	WWF	2.50	2.10		0.40	HAB		HYDRO	
Denton Creek	2.60	2.40	C	0.20			0.20	HAB		HYDRO	
Denton Creek	2.40	0.00	WWF	2.40			2.40	HAB		HYDRO	
Fall Brook	4.50	0.00	CWF	4.50	4.50						
Rhiney Creek	4.20	0.00	CWF	4.20	4.20						
Jones Creek	2.10	0.00	CWF	2.10	2.10						
Silver Creek	4.90	0.00	CWF	4.90	4.90						
West Fork Little Snake Creek	13.50	0.00	C	13.50	12.80		0.70	HAB		HYDRO	
Fuller Hollow Creek	1.90	0.00	C	1.90			1.90	HAB	UNK	HYDRO	UNK

Table B3. Assessed Stream Reaches in the Lower Susquehanna Subbasin

STRMNAME	UPMILES	DNMILES	RCHCLASS	MILASS	MILATT	MNOTATT	MPARTATT	CAUSE1	CAUSE2	SOURCE1	SOURCE2
Ebaughs Creek	7.44	1.25	CWF	6.19	4.11		2.08	TDS	CL	MW	MW
Ebaughs Creek	1.25	0.00	III-P	1.25			1.25	TDS	CL	MW	MW
Long Arm Creek	2.90	0.00	WWF	2.90			2.90	NUTR		AGR	
Long Arm Creek	4.00	2.90	I-P	1.10			1.10	NUTR		AGR	
Mt. Rock Spring Creek	4.44	0.00	WWF	4.44			4.44	SILT	NUTR	AGR	AGR
Big Branch Deer Creek	4.28	0.00	III-P	4.28	4.28						
Big Branch Deer Creek	5.64	4.28	CWF	1.36	1.36						
Conowingo Creek	19.60	4.00	CWF	15.60	5.60		10.00	SILT	NUTR	AGR	AGR
Conowingo Creek	4.00	0.00	I-P	4.00			4.00	SILT	NUTR	AGR	AGR
Deer Creek	51.70	44.50	CWF	7.20	7.20						
Falling Branch Deer Creek	4.95	4.70	IV-P	0.25			0.25	SILT	NUTR	AGR	AGR
Falling Branch Deer Creek	4.70	0.00	CWF	4.70	4.70						
Octoraro Creek	8.60	0.00	IV-P	8.60	8.60						
South Branch Conewago Creek	22.10	16.60	WWF	5.50	5.50						
Scott Creek	3.00	0.00	TSF	3.00		3.00		DW		DO	TDS
Susquehanna River	15.00	0.00	I-P	15.00	15.00						
Susquehanna River	56.20	15.00	WWF	41.20	41.20						