

1.0 Project Area Characteristics

1.1 Location/Size

For the purpose of this project, the study area of the North Branch of the Susquehanna River was initially defined as a two-mile wide corridor (1 mile on each side of the river) from the confluence of the Lackawanna River and the Susquehanna River to the Pennsylvania/ New York border and the section of the river known as the Great Bend area of Susquehanna County. After the project was started, several municipalities south of the confluence expressed strong interest in the project and the desire to conduct rivers conservation projects. Due to this interest, the southern border of the study area was extended southward approximately four miles to terminate at Exeter Borough on the west side of the river and Jenkins Township on the east side of the river. The final designated study corridor is illustrated in Figure 1.

The study corridor (Corridor) is approximately 120 miles long and includes Bradford, Lackawanna, Luzerne, Susquehanna and Wyoming counties. There are 52 municipalities in the river corridor. The region is generally rural with several fairly populated boroughs along the river including (from south to north) West Pittston Borough, City of Pittston in Luzerne County; Tunkhannock and Lacyville in Wyoming County; Wysox, Towanda, and Sayre in Bradford County; and Great Bend, Hallstead, and the Tri-Borough area of Susquehanna Depot, Lanesboro, and Oakland in Susquehanna County.

The North Branch Corridor is a diverse landscape consisting of former anthracite coalfields in Luzerne and Lackawanna Counties, and agriculture lands and heavily forested hillsides along the upper reaches. The Corridor's river towns are long-settled communities with a rich history. North Branch Corridor communities are listed in Table 1.

1.2 Topography/Geology

The Lackawanna, Luzerne and lower Wyoming County sections of the Corridor are located in the Ridge and Valley Physiographic Province. The Bradford, Susquehanna and the upper section of the Wyoming County are located in the Appalachian Plateaus Physiographic Province (see Figure 2 for Geologic Ages).

The Ridge and Valley Physiographic Province is composed of Sedimentary Rocks including limestone, coal, shale, siltstone, sandstone and conglomerates, formed 290 to 570 million years in the Paleozoic Age. During the Alleghanian Orogeny, a mountain building episode that began approximately 290 million years ago when North America collided with Africa, these sedimentary rocks were folded to up to 90 degrees from their original horizontal position. Erosion by water movement and rain has formed a surface topography of a series of parallel valleys that include softer shale and limestone rocks and ridges composed of harder sandstone and conglomerate rocks.

The Appalachian Plateau Physiographic Province also consists of Paleozoic Age sedimentary rocks. The Appalachian Plateau rocks were not significantly affected by the Alleghanian Orogeny and remain fairly flat lying. However, stream erosion in this province has created a very hilly topography with deep valleys (The Geologic Story of Pennsylvania, PA DCNR, 1996). The corridor's geologic ages are shown in Figure 2.

The surface topography in both Physiographic Provinces of the North Branch of the Susquehanna Corridor has most recently been sculpted by a succession of three glaciations that occurred from 800,000 to 15,000 years ago. The crests of ridges and mountaintops were lowered by tens of feet by the eroding ice. Valleys were deepened and rounded. When the ice melted and receded, till deposits of clay, silt, sand and gravel remained in the floor of valleys and along stream-beds. These glacial episodes created a fairly narrow flood plain and nearly vertical adjoining slopes along the North Branch Corridor. The resulting topography makes for spectacular vistas that attract tourists from many areas, particularly in the autumn when the forest cover is at the height of color.

Today, tills deposits are being mined by sand and gravel companies and are used in a variety of ways, including asphalt production. Coal seams exposed at the surface due to the high degree of folding of the rocks supplied a major coal mining industry in the Wyoming Valley. Bluestone, a dimension stone laid down in the upper Devonian era, has become a valuable commodity, and quarries are common in Susquehanna County.

1.3 Major Tributaries/Corridor Drainage Area

The Corridor drainage area is approximately 240 square miles and includes 18 major tributaries that have a drainage area of greater than or equal to 25 square miles that discharge into the Susquehanna River. These tributaries are listed in Table 2. Several tributaries are classified as Exceptional Quality or High Quality according to Chapter 93 Water Quality Standards. In some cases, the section of the tributaries with either of these designations is located outside of the study corridor. Classifications of Exceptional Quality or High Quality tributaries can be found at the website, www.pacode.com/secure/data/025/chapter93/s93.9i.html and www.pacode.com/secure/data/025/chapter93/s93.9ikhtml.

There are eleven (11) Watershed Organizations in the Corridor. These are listed in Table 9 and further discussed in Section 3.7. Rivers Conservation Plans have been completed for Tunkhannock Creek (1997) and the lower and upper Lackawanna River. Rivers Conservation Plans are underway for Bowman's Creek and Mehoopany Creek.

1.4 Social/Economic Profile

1.41 Population Centers

The major population centers in the Corridor are located at the confluence of tributaries and along the main stem of River. While the Corridor is generally rural, thirteen (13) boroughs with a majority of land area within the Study Corridor have populations of greater than 1,000. Table 3 lists these population centers in **BOLD** by county based on 2000 population U.S. Census data. These figures are illustrated in Figure 3: 2000 Population and in Figure 4: 1990-2000 Population Change.

The total population of North Branch municipalities has increased by 1.02 % or 1,832 people between 1990 and 2000. Figure 4 illustrates a shift in population throughout the Corridor. In general, Bradford, Susquehanna and northern Wyoming Counties have seen an increase in population from 1990 to 2000. Pittston Township in Luzerne County has experienced the greatest increase of population, showing a 26.60% increase. Southern Bradford County, which includes Asylum, Standing Stone, Terry, Tuscarora, Wilmot, and Wyalusing Townships have experienced the second greatest increase in population, with ranges from 11.35% to 17.78 %. Wyalusing Borough (Bradford County) has experienced that greatest loss of population, showing a 17.78 % decrease. Tunkhannock Borough (Wyoming County) and City of Pittston (Luzerne County) have also experienced population decreases of 15.10% and 13.69%, respectively.

1.42 Transportation Facilities

Several state routes are located adjacent to the River throughout the Corridor and act as the region's major transportation routes. State Route 92, a two-lane road, follows the western shore of the Susquehanna from West Pittston in Luzerne County to Tunkhannock in Wyoming County. From Tunkhannock northward to Towanda in Bradford County, State Route 6 follows the eastern shore of the River. Route 6 crosses the River in Towanda Borough and proceeds westward away from the River. State Route 220 follows the River from Towanda to the New York Border. Major roads are illustrated in Figure 1.

These routes follow the historic location of the Pennsylvania North Branch Canal. This canal was built to connect Pennsylvania's waterways to the New York canal system and the Chesapeake Bay in order for the northeast regional anthracite and semi-bituminous coal to compete in the Philadelphia, New York and Boston markets.

The Commonwealth began construction of the North Branch canal in 1836, but was plagued by a lack of funds and various political and economic agendas. In 1842, the privately held North Branch Canal Company attempted to complete construction but again, lack of funds prevented the completion of the canal and the Commonwealth regained control of the canal. The North Branch Canal was finally completed in 1856.

Two years later, in 1858, in the face of strong local opposition, the Commonwealth sold the North Branch Canal as well as other connecting canals across the state to the Sunbury and Erie Railroad. A newly formed North Branch Canal Company then purchased the North Branch Canal from the Sunbury and Erie Railroad later that year.

In 1859 and 1869 competition from various canal and railroad lines drove down the price of coal and weakened the usefulness of the North Branch Canal. Another blow was struck in 1864, when a massive flood hit the Susquehanna Basin and nearly destroyed the canal between Tunkhannock and Pittston. After the flood, the North Branch Canal company was re-designated as the Pennsylvania and New York Canal and Railroad Company, which had the additional power to build a railroad and branch lines along the former canal route.

The Lehigh Valley Railroad built rail lines along the canal route in Bradford and Wyoming Counties in the late 1860s. This event was the beginning of the end of the canal system in the North Branch. In 1900, the North Branch canal was officially closed.

The Norfolk Southern Railroad still operates on the east shore of the Susquehanna River from the Pittston area to the Sayre Rail yards just below the New York State line in Bradford County. In Susquehanna County, the Norfolk Southern runs trains along SR 171 into New York State and the Canadian Pacific Railroad runs north through the county to intersect with the river in Hallstead, following the river north into New York State. Efforts are currently underway to encourage these railroads to develop freight and passenger stops in Susquehanna County. Potential sites include the SOLIDA Industrial Park along SR 171, Oakland Township, which borders the Susquehanna River.

1.43 Major Sources of Employment in North Branch Counties.

The economy of a region plays an important role in maintaining a strong community. Local business and industry enhances the region by providing a strong tax base, community leadership, and financial support for projects that have a positive impact on the quality of life in the river corridor. Concurrently, open space, greenway, river and land recreation programs enhance quality of life that has been proven to be a positive force in attracting new businesses to an area. Table 4 identifies the top ten employers in the region.

1.5 Land Use/Zoning

In Pennsylvania, land use is primarily controlled at the municipal level through zoning and subdivision ordinances. If a local municipality chooses not to enact land use ordinances, the municipality may follow county level ordinances. Planning Commissions can be created at the municipal or county level for the purpose of overseeing land management. Additionally, municipal or county governing bodies can develop a local Comprehensive Plan to guide

future land use within the municipality or county according to an agreed upon set of standards. In the North Branch corridor, all five counties have a planning commission and only Lackawanna County does not have a Comprehensive Plan or a Subdivision Plan. Susquehanna and Bradford Counties are currently updating their comprehensive plan. To date, Luzerne is the only county to have a Zoning Ordinance. See Table 5 for a Municipal/County Ordinance Data Summary. Figure 5A illustrates Zoning and Subdivision ordinances. Figure 5B illustrates Planning Commissions, Comprehensive Plans and Stormwater Management ordinances. Twenty-nine (29) of the corridor's municipalities have a planning commission and twenty-four (24) have zoning ordinances. Twenty (20) North Branch municipalities have a subdivision ordinance and eighteen (18) have a comprehensive plan. Figure 10, General Land Cover depicts the various land covers found within the watershed.

2.0 LAND RESOURCES

2.1 Soil Characteristics

Silt loam soils on the flat floodplain areas of the Corridor have developed from loamy to coarse textural glacial outwash deposits derived from reddish and brown upland glacial till and alluvial material deposited by the rivers and streams. These soils tend to be nearly level, thick and well drained and are often cultivated. Permeability is high to very high and soils are subject to flooding.

Many of the outside meanders of the river have steep to near vertical profiles. Soil profiles include loose stones and boulders are very low in organic material. Soil profiles are generally thin and runoff rates are high. Due to the steep slopes, these areas are not suited to cultivation and are mostly woodland.

2.2 Ownership (Public vs. Private)

Publicly owned lands include Municipal Parks, County Parks, Pennsylvania State Game Lands and Pennsylvania Fish and Boat Commission facilities (see Figures 11 and 12). There are no federal lands or state parks and forests within the Corridor. These properties are discussed in detail in Section 5.1 of this report. Public lands comprise a very small percentage of the Corridor therefore limiting public access to the Susquehanna River.

2.3 Landfills

There are no active landfills in the study corridor.

2.4 Hazard Areas

Refer to Figure 6A and Figure 6B for Disturbed Land and Hazardous Sites.

2.41 Waste Sites

The federal Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) established the Superfund Program. “Superfund” sites are listed on the National Priorities List (NPL). No Superfund sites identified on the NPL are in the Corridor. However, a number of hazardous waste sites were identified in the Corridor by the Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) and are presented in Appendix B. CERCLIS contains information on site inspections, preliminary assessments and remedial status. The Pennsylvania Department of Environmental Protection (PADEP) also maintains a listing of hazardous waste sites and toxic release sites. Multiple sites were found within the Corridor and are presented in Appendix B.

It is beyond the scope of this plan to determine whether or not contamination migration from these known hazardous waste sites has resulted in environmental impact within the study corridor. It is recommended that an evaluation for the potential impact to future site-specific projects within the study corridor from these waste sites be conducted on a case- by- case basis.

2.42 Abandoned Mine/Quarries

The Wyoming Valley in Luzerne County has been extensively mined for anthracite coal. The municipalities located in the southernmost section of the Corridor in the upper Wyoming Valley have extensive abandoned underground mines and above ground waste coal piles. Some areas have been reclaimed by either public or private entities, however many abandoned areas still exist. These areas adversely impact water quality, are sources of subsidence and affect the course of surface creeks (such as Hicks Creek in Luzerne County). The Hick Creek Watershed Association is working with local and state agencies to address water quality issues and restore the natural surface flow of the creek (rather than infiltrating back into the abandoned mines). Multiple abandoned mining facilities still require extensive reclamation and are included as an Implementation Project in the Action Plan of this report.

Due to the prevalence of glacial deposits along the Susquehanna, some areas have been previously or are currently mined for sand and gravel. Additionally, Blue Stone, a popular landscaping stone, is located in many of the cliffs along the river and has been or is currently being quarried. Concerns that these mining activities will negatively affect the water quality of the river and tributaries and viewsheds of the river valley were expressed during the public participation process.

Historical industrial mineral (quarry) mining sites have been mapped statewide by Pennsylvania Spatial Data Access (PASDA) and can be found at www.pasda.psu.edu. Active mining sites statewide are permitted by the Pennsylvania Department of Protection and can be found at www.emappa.dep.state.pa.us.

3.0 WATER RESOURCES

3.1 Major Tributaries

Major tributaries are listed in Table 2 and previously discussed in Section 1.3

3.2 Wetlands

The United States Fish and Wildlife Service's (USFWS) have identified wetland areas through out the United States, including Pennsylvania. Wetland areas are located on the National Wetland Inventory (NWI) maps, which are available from the United States Department of Interior. There are extensive wetland areas located within the study corridor due to the proximity of the Susquehanna River. Since the NWI maps are dated (20-30 years in age) and not all inclusive, the presence or absence of wetlands should be evaluated on a case by case basis by a professional.

3.3 Floodplain

Today, we are beginning to recognize that periods of flooding help to maintain a healthy river system, and we are developing an understanding of how a river changes form and moves soil, and floods. The protection of floodplains remains a major issue along the North Branch. Preservation of the floodplain is critical to reducing damage from flooding events. Floodplains along the upper reaches of rivers and streams allow rising waters to spread out and slow down, reducing potential damage down stream. "Floodplains," writes Ron Wigal of the Canaan Valley Institute, "are an integral part of stream systems...Floodplains provide a conduit for the large amounts of water that exceed the stream channel capacity during floods (Wigal, 2000, p.1)." Wigal notes that soil rich, fertile floodplains in rural areas are prized for agricultural while in urban areas watercourses have been relocated and floodplains filled for development (Wigal, 2000, p. 8). The locations of Susquehanna River Basin Commission Stream Gauges and Flood Plan Data are illustrated in Figure 7A. The SRBC gauges were installed to monitor river levels for flood forecasting and to study changes in river levels.

Recent flooding events include May 1946, March 1956, June 1972 (Hurricane Agnes) and January 1996. The North Branch communities of Athens, Sayre, Towanda, (Bradford County) and Tunkhannock (Wyoming County) and the Luzerne County corridor area were greatly impacted by Hurricane Agnes in June 1972. Severe agricultural, residential and business losses were recorded, along with damage to roads, bridges, and utilities (SRBC, 1975,p.87-91). Table 6A contains a list of Stream Gauges. For a list of flood prone communities, and Flood Damage from Hurricane Agnes, see Table 6B.

While Hurricane Agnes remains the benchmark for flooding along the North Branch, it is closely followed by the January 1996 flash flood event. On January 18 –19, 1996 a warming

trend was quickly followed by a cold front accompanied by heavy rain, creating an estimated 3 to 4 inches of runoff along the entire Susquehanna River Basin. (SRBC, 1998, p. 2). The runoff created ice jams in the river and along feeder creeks, further raising the water levels and setting new record stages on Towanda Creek, Monroeton, Bradford County and at Tunkhannock Creek, near Tunkhannock, Wyoming County (SRBC, 1998, p. 2). In response to the ice jam problems experienced in January, 1996, the National Weather Service established a Susquehanna Basin Ice Observation Network that includes stations at Towanda and Wilkes-Barre (SRBC, 1998, p. 9). Locations that were affected by the ice-jam flooding included West Pittston (SRBC, 1998, p. 10). The US Geological Service (USGS) has also established websites and updates stream gauge data every two hours. The Pennsylvania USGS website is <http://water.usgs.gov/pa/nwis/nwis> and the New York State website is <http://water/usgs.gov/ny/nwis/nwis> (SRBC, 1998, p. 10). Penn State University also has a web site that gives real time stream flow data and flood stage at each gauge: <http://.marfchp1.met.psu.edu/Stages/>.

Today there is concern that the river suffers from development of the flood plain and filling of the flood plain. In June 2000, Litchfield Township, Bradford County, reported 4 inches of rain. Bradford County committee members recalled that a combination of head pressure and a delta restriction flooded the Athens bridge and the flats across from the Athens Bridge. The water simply could not get into the river. Flooding is also linked to erosion and run-off concerns. Committee members noted that while flood control dams level out flood events, they cause deposition in front of dams where the water flow slows down. In Susquehanna County, Great Bend Township, a similar situation exists where a delta is building up at the mouth of Trowbridge Creek.

Land along the riverbank is disappearing, eroded away over the last 30 years. Bradford County committee members also felt that the practice of upstream dams to release water over several days along the New York State portion of the river now seems to hold the river level up longer, saturating the soil and washing more of it away instead of allowing for a quick rise and fall after storm events. There are four U.S. Army Corps of Engineers flood control projects on the N.Y state portion of the river, upstream from Bradford County. These are located in Nichols, Owego, Johnson City, Binghamton and Kirkwood (See Figure 7B for Water Supply, Dams, Well Usage, & State Water Plan).

Along the Susquehanna County portion of the river, the major flood hazard identified by the county committee was the dam above Sidney, NY letting water out without warning. There are three U.S. Army Corps of Engineers flood control projects in New York state that are upstream from Susquehanna County, located in Bainbridge, Unadilla, and East Sidney Lake. The dam is electronically controlled by the US Army Corps of Engineers, Baltimore Division. The area's geography creates a flume effect that causes erosion of riverbanks, flooding and backing up of the river's feeder creeks into Main Street, Lanesboro at a local spot called the Bennicle, a 19th century canal dug for boats to circumnavigate the Narrows.

Committee members based on their personnel experiences reported little damage from Hurricane Agnes in 1972 and noted that in their areas more damage occurred because of a

rising water table rather than flooding from the river. Also, springs flowing down from the mountains around the Tri-Borough area tend to shift roads and split water lines, particularly in Oakland Borough where municipal water lines were reported broken 3 times in the last 18 months due to road heaving. Of the three boroughs, Susquehanna, Lanesboro and Oakland, Lanesboro is the most susceptible to flooding due to a rising water table.

There is a dam along the Susquehanna River stretching between Oakland Borough and Susquehanna Borough. Penelec Corporation sold the dam to Oakland Borough in the 1970's. An undershot wheel generated electricity, with Barnes-Kasson Hospital, Susquehanna Borough and Oakland Borough sharing the profits. Income from the hydroelectric plant was split between industrial, development, recreation and community service funds. The hydroelectric plant is currently not producing due to contract negotiations with the lessee, American Hydro.

Wyoming County undertook a flood protection buyout program following the 1972 flood along River Street in Tunkhannock Borough. The County used the land to create the River Street Park. The Park is now a reality with plans to construct a 5.5-mile trail, linking this park to Lazybrook Park, located along the Tunkhannock Creek. Properties were also purchased along Mile Beach in Meshoppen Township, Black Diamond Beach in Tunkhannock Township. The property was resold with deed restrictions – any rebuilding on the property had to be designed according to flood plain regulations.

Regulations

The Governor's Center for Local Services assists municipalities in complying with state and federal floodplain management requirements along with coordinating these provisions with local land use regulations and guidelines. Pennsylvania Department of Community and Economic Development publications available to guide municipalities include Technical Information on Floodplain Management: Administrative Guidelines for Development (Planning Series #11). This publication explains: "To be considered in compliance with the National Flood Insurance Program (NFIP), a municipality must enact an ordinance which meets flood plain management requirements established by the Federal Emergency Management Agency (PA DCED, p. 1). This ordinance regulates all construction and development within floodprone areas of the community through a permitting process, allowing: "no encroachments, including fill, new construction, substantial improvements, and other developments are allowed within the floodway which would cause any increase in flood heights (PA DCED, p. 11)." Additionally, state law recognizes that PADEP "has jurisdiction over all obstructions located within floodway areas identified on flood plain maps as well as those areas 50 feet landward from the top of the bank of any watercourse for which a floodway is not identified." State encroachment permits as well as a local floodplain management permit must be obtained before conducting any development activities in the floodway (PA DCED, p. 10).

A Storm Water Management Plan has been completed for Wysox Creek in Bradford County and Bowman's Creek Watershed in Wyoming County. A Storm Water Management Plan is

being prepared for Bentley Creek. Storm water management plans are being considered for a number of North Branch watersheds.

There are also a number of Flood Control programs in the North Branch Corridor. These include:

- **Hazard Mitigation Grant Program (HMGP).** This is a federal program, administered by PEMA. The program provides funds to purchase and remove flood-damaged homes from the flood plain. Small-scale structural projects to reduce flood damage can also be funded. In Bradford County, an application was made for one property in 1998. In Wyoming County, according to PEMA records, following the January 1996 flooding event, 74 properties were purchased.
- **Project Impact Mitigation Program:** A federal program, administered by PEMA. According to the US Army Corps of Engineers, four communities in Bradford County are involved in this program. These communities are Sayre, Athens, and South Waverly boroughs and Athens Township.
- **US Army Corps of Engineers Projects:** Satterlee Creek, Athens Township received \$50,000 in funding for snagging and clearing for flood damage reduction in Athens Borough and Athens Township. A planning and design analysis was initiated in June, 2000. The study's recommendations were to conduct an engineering, hydraulic and hydrology analysis to determine if the gravel bar is causing, or has the potential to cause, flooding in Athens Borough. The US Army Corps of Engineers terminated the project under the Corp.'s Section 208 program for lack of economic justification and recommended pursuing a watershed type study under Section 206. In June 2001, DEP was working with Athens Township to study the impact of the creek's delta on the Athens shore of the Susquehanna River. Additionally, the Satterlee Creek Watershed Association applied for a PADEP Growing Greener grant for FY 2001-2002 to study the entire length of Satterlee Creek. This grant also provides for restoration of two sample areas of the creek (US Army Corps of Engineers).

3.4 Lakes and Ponds

Lakes and ponds are not a significant component of the River Corridor.

3.5 Water Quality

3.51 Point Sources and Non-Point Sources/Monitoring

Water resource surveys to characterize river and stream quality are often based on a triad of three indicators: water quality, biological condition, and habitat assessment. Water quality data can be used to assess compliance with water quality standards,

evaluate seasonal variations, and investigate changes or trends over time. Biological conditions are assessed using benthic macroinvertebrate populations (small bottom dwelling aquatic insects), which provide an indication of biological health of a stream and serve as indicators of water quality. Habitat assessments provide information concerning the potential impairment of a stream to erosion and sedimentation and are indicators of the stream's ability to support a healthy biological community.

Over the last three decades, water resource surveys of the Susquehanna River and its tributaries have provided information on water quality, biological conditions and changes in stream health along the study corridor. Historical surveys provide a baseline on the conditions of the river and the tributaries that flow into the river with changes being noted with successive and more recent surveys. Overtime, the database of information also allows investigators to look at trends in water quality.

1970 to 1980

While the headwaters of the Susquehanna River are located in New York, the river first enters Pennsylvania and the study corridor near Great Bend, Pennsylvania. While there are no major discharges along this section, elevated nutrient levels attributed to non-point sources will continue to occur (Rudisill, 1976). Downstream of Sayre to the confluence of the Lackawanna River, the Susquehanna River has adequate alkalinity to remain near neutral pH and supports a warm water fishery. There are minimal point source discharges along the river with some non-point impacts being from agricultural sources. The overall water quality was good in 1979 upon arrival to the confluence of the Lackawanna and Susquehanna Rivers in the Wyoming Valley where the character of the river changes due to the extensive anthracite coal mining and combined sewer overflows (CSOs).

An assessment of the Susquehanna River in 1976 (Rudisill, 1976) indicated no major changes in the water quality from Brainbridge, New York downstream through the Great Bend section of the Susquehanna River. A subsequent report in 1979 (Rudisill, 1979) made reference to untreated discharges from Hallstead and Great Bend degrading the river during periods of low flow, but that the river quality remains sufficiently good as a water supply source. Rudisill (1979) further reports on a 1976 heavy metal and PCB study of river sediment in the Susquehanna River from Milford Center, New York to Smithboro, New York. Results from a sampling station at Great Bend, Pennsylvania indicated no high concentrations of heavy metals and no significant problems with Polychlorinated Biphenyls (PCBs) in the sediments. PCBs were a commonly used insulating agent in oils in electrical equipment that were found to be potentially carcinogenic.

Between Sayre and Mehoopany, Rudisill (1979) reports that the Susquehanna River was of good quality and unaffected by any major point source discharges, except discharge points at GTE Sylvania and Charmin Paper Company (currently Proctor & Gamble Paper Products Company). An ecological study (Aquatic Ecology

Associates, 1976) of the GTE Sylvania plant near Towanda revealed that increased ammonia concentrations were observed downstream of the plant's discharge point, but there was no evidence of detrimental effects on the biological community. Reported treated discharges from the Charmin Paper Company of 11 million gallons a day did not violate any water quality standards.

A number of tributaries were reported to be affected by raw or inadequately treated wastes. Near Mehoopany, the Meshoppen Creek enters the Susquehanna River. A referenced 1977 Pennsylvania Department of Environmental Resources (predecessor to Pennsylvania Department of Environmental Protection (PADEP)) report by Rudisill (1979) indicates that the discharge from Aldovin Dairy degrades 24 miles of stream in Meshoppen Creek. Further downstream on the Susquehanna River is a tributary named Tunkhannock Creek. Rudisill (1976) reports of the South Branch Tunkhannock Creek being degraded by raw sewage discharges, but that these localized problems have little impact on the Susquehanna River.

The last section of the study Corridor from the confluence of the Lackawanna River and Wyoming Borough is degraded from abandoned mine drainage from abandoned mines and culm piles. A significant tributary to the Susquehanna River, the lower reach of the Lackawanna River is severely degraded by abandoned mine drainage, municipal and industrial point source discharges, and siltation from strip-mined areas (Rudisill, 1979). In turn, the biological community is stressed from iron precipitate, siltation and the effects of other mine drainage constituents.

1980-1990

Malione and others (1984) described the Susquehanna from Waverly, New York to the Wyoming Valley as having high water quality and a diverse and abundant population of fish and macroinvertebrates. Malione and others (1984) compared their results from 1982 to a study conducted by LaBuy (1967) and concluded that due to the increased diversity of benthic macroinvertebrates collected, the water quality over the last seventeen years had improved.

A 1984 survey (McMorran, 1985) of the Susquehanna River within the Great Bend area described the resource as having high water quality supporting an exceptionally healthy biological community throughout the section. Water quality analyses indicated low concentrations for a suite of nutrients, metals, and major ions. Field chemistry did indicate acidic impacts from an upstream tributary in New York, but the impact was minimal with alkalinity reaching normal levels at the end of the Great Bend section of the river.

Within the Great Bend area of Pennsylvania, two tributary streams, Starrucca Creek near Lanesboro and Salt Lick Creek at Hallstead, enter the Susquehanna River. McMorran (1985) reports that both Starrucca Creek and Salt Lick Creek have good aquatic habitat supporting exceptionally healthy biological communities and the

water quality is typical for headwater streams. Both creeks showed no signs of water quality degradation and contribute excellent quality to the Susquehanna River.

When the Susquehanna River re-enters Pennsylvania near Waverly, New York, Malione and other (1984) found that most water quality parameters met water quality standards except fecal coliform. However, results of the biological condition were indicative of a healthy aquatic environment. From the New York line to North Towanda, a 1980 Pennsylvania Fish Commission study characterized the Susquehanna River as a fertile stream. The major tributaries in this section contribute good water quality and the 1.30 million gallons per day discharge from the Athens-Sayre STP has little impact on the Susquehanna River (Malione and others, 1984). Another principal pollution source includes agricultural runoff.

At the U.S. Route 6 Bridge in Towanda, Malione and others (1984) found that the conditions that were fairly uniform at the two upper stream stations changed. Differences occurred in elevated concentrations of ammonia, iron and manganese with the highest concentrations observed at the right bank. This was attributed to the several discharges of the GTE Sylvania plant and a potential leachate source from a large sludge pile. All water quality parameters met standards except for an iron concentration that exceeded the limit by 3.5 times (Malione and others, 1984). Biological samples collected at the site indicated a healthy biological community and an increased diversity from what was collected in the LuBuy (1967) study.

Water quality results from several stations downstream to Wysox showed little concentration changes and uniform conditions across the river. Phosphorus concentrations were relatively high and consistent to the three upstream stations. While the water quality was good and biological conditions were healthy between Wysox and Wyalusing, there was an increase in ammonia concentrations and a dramatic increase in the fecal coliform count which exceeded water quality standards (Malione and others, 1984). Considering there were no known point sources, the high fecal coliform were attributed to non-point sources related to agricultural use of the flood plain.

Downstream of Wyalusing, several tributaries including Wyalusing Creek, Sugar Run and Meshoppen Creek contribute good water quality to the Susquehanna River. Malione and others (1984) concluded that the tributaries contributed to decreasing concentrations of dissolved solids, chlorides, sulfates and aluminum sample near the U.S. Route 87 bridge at North Mehoopany. However, there were increases in phosphorus attributed to non-point sources and higher concentrations of ammonia, nitrite and nitrate along the left side of the River.

Just downstream of the Route 87 bridge, was the Proctor and Gamble Paper Products Company (P&G) paper mill discharge. Sampling showed a degrading effect in dissolved oxygen, ammonia, pH and conductivity, but well within water quality standards. Also, the discharge did not appear to detrimentally affect the biological

community. Sampling at several stations downstream of the P&G discharge to Tunkhannock show some changes in water quality related to the recovery effects of the paper mill effluent. Malione and others (1984) compared their data with data from an Academy of Natural Sciences study (1966) for the reach of the Susquehanna River from Mehoopany to Tunkhannock and concluded that the paper mill does not have a marked negative effect on the aquatic biological community, although it is obvious that the paper mill does alter the chemical characteristics of the river, somewhat.

From Tunkhannock to the entrance of the Wyoming Valley, sampling showed that the abundance of macro-invertebrates and fish is a clear indicator of the excellent quality water in the Susquehanna River (Malione and others, 1984).

Although only a short sub-reach of the Corridor extends into the Wyoming Valley, the Susquehanna River in the valley is the recipient of major pollution from abandoned mine drainage, treated and untreated sewage, urban runoff, and poor quality water from several tributaries in the area. The effect is a significant degradation of both the water quality and biological conditions as compared to the reach above the Wyoming Valley. Malione and others (1984) reported a moderate biological community that was an improvement when compared to the results found in the LuBuy (1967) study. The improvement is attributed to the institution of municipal and industrial waste treatment and the natural improvement of mine drainage.

1990-2000

Surveys during this period generally confirm pre-1990 water quality and biological condition surveys of the Susquehanna River. Sections of the River containing good water quality support healthy biological communities. High nutrient concentrations and low alkalinity River sections coincide with locations of treatment plants and population centers and showed some stressed biological communities. Where biological communities were severely impaired, the habitat was good to excellent, suggesting that the habitat would support a healthy biological community if water quality was significantly improved.

The Pennsylvania Department of Environmental Resources (1994) examined water quality concentration trends at its Water Quality Network (WQN) stations for the period 1984 to 1992 for seven general parameters and 1988 to 1992 for seven metals. The locations of the WQN stations are presented spatially in Figure 7A Stream Gages and Flood Prone Areas map. For eleven WQN stations, trends were detected for 18 parameters out of the possible 132 parameters. Of the 18 parameters, 5 parameters showed trends in deteriorating water quality. Total iron and manganese concentrations were increasing on Sugar Creek, but did not exceed the state water quality standards. Total alkalinity was decreasing on both Sugar Creek and Towanda Creek that lowers the buffering capacity of toxics and acids and also correlates with

low biological productivity. On the Susquehanna River at Towanda, dissolved solids were increasing suggesting that pollution is entering the river.

A Susquehanna River Basin Commission study (1997) characterized water quality results in the Susquehanna River into three categories: 1) Category R1 are sites with high pH where acidity was low or nonexistent and total organic carbon was relatively higher than surrounding tributary streams; 2) Category R2 are sites were similar to the first category, but where there was an increase in ammonia and decrease in sulfate suggesting point source influence; and 3) Category R3 are sites where there was an increase in nutrients and indication of mine drainage constituents. These sites are presented in Figure 8, Water Quality and Biological Resource Condition Map, and provide a spatial distribution of the general water quality of the Susquehanna River.

In 1998, Stoe (1999) characterized the Susquehanna River in the Great Bend section upstream of the confluence with Starrucca Creek as fair water quality supporting a slightly impaired biological community even though aquatic habitat conditions remained excellent. Water quality analyses showed slightly elevated ammonia and dissolved phosphorus concentration. For the two Susquehanna River tributaries, Starrucca Creek provides good water quality and Salt Lick Creek provides fair water quality to the Susquehanna River.

Hoffman and others (2001) indicated that, based on combined measures of water quality, biology and habitat, the Susquehanna River at Sayre was not impaired during the monitoring period July 1, 1999 to June 30, 2000. Water quality analysis indicated that while total iron exceeded standards in February 2000 and ammonia, nitrite and nitrate concentrations were elevated, trends in these concentrations along with total phosphorus, total sulfate, and total iron were decreasing. However, total chloride concentrations were increasing. The investigators found several pollution intolerant macro-invertebrates that indicate good water quality.

Presently the New York Department of Environmental Conservation (NY DEC) has placed the entire reach of the Susquehanna River upstream of the Great Bend area under a fish consumption advisory for mercury from atmospheric deposition (NY DEC, 2001). Further testing is scheduled to determine mercury concentrations in fish flesh to verify whether the consumption advisory is warranted. On April 11, 2001, the Pennsylvania Department of Environmental Protection issued a mercury fish consumption advisory for several areas in the study area (PA DEP, 2001 and PA DEP, 2002): 1) the entire Great Bend section in PA from the NY line above Starrucca Creek to the NY line below Great Bend; 2) Chemung River from NY/PA line to mouth; 3) Sugar Creek from confluence of Bailey Run to mouth; 4) Towanda Creek from confluence of Schrader Creek to mouth; 5) Tunkhannock Creek from confluence of South Branch to mouth; and 6) PA Route 92 bridge at Falls to the confluence of the West Branch Susquehanna River. These river and stream reaches are illustrated in Figure 8, Water Quality and Biological Resource Condition map.

Table 8, SRBC Study Sites, presents a Summary of Trends at WQN stations in the RCP Study Area (After PA DER, 1994). Station Location presented in Figure 8. Water Quality and Biological Resource Condition map.

3.6 Water Supply

3.61 Public/Private

478 domestic wells are located in the Corridor (not depicted on the Figure 7B for visual purposes). Multiple industrial, fire, commercial, irrigation, institutional, public supply, stock and unused wells are located within the Corridor. The Lackawanna, Meshoppen, Snake, Towanda, Tunkhannock, Wappasening, Wapwallopen and Wyalusing watersheds have State Water Plans. Consult Figure 7B for Well Usage and State Water Plans.

3.62 Well head Protection Areas

As required under the federal Safe Drinking Water Act, the Commonwealth of Pennsylvania, through the Bureau of Water Supply Management of the PADEP has developed a Wellhead Protection Program to protect ground-water sources used by public water systems from contamination that may have an adverse effect on public health. Participation in the program is voluntary and builds upon the basic requirement for water purveyors to obtain the best available source and to take the appropriate actions to protect the source, thereby ensuring a continual and safe water supply (DEP, Pennsylvania Wellhead Protection Program, 2000).

The Pennsylvania Safe Drinking Water Regulations define a three-tiered wellhead protection zone. Zone 1, the innermost, ranges from 100 to 400 feet radius, depending on source and aquifer characteristics. Zone 2 has been defined as the capture zone that is by default a ½ mile radius around the source, unless a rigorous hydrogeologic delineation is performed. Zone 3 is the area beyond Zone 2 that contributes to the recharge to the aquifer within the capture zone.

According to the PADEP Pennsylvania Wellhead Protection Program website there are no public water systems in the Study Corridor involved in local Well Head Protection Programs. However, according to the Bradford County Planning Commission, Towanda Borough performed a Well Head Protection Study within the past 5 to 7 years for their municipal system which lies within the corridor area.

3.63 Water Quantity

During the course of this report, the North Branch counties experienced periods of drought, punctuated by heavy participation. While drought conditions in the North Branch region were not as severe as in south central and southeastern Pennsylvania,

members of the North Branch RCP steering committees expressed concern for future water quantity in the region. Of particular concern was the potential for development in the corridor to affect ground water recharge. In addition to affecting agriculture and other commercial users of water, such as golf courses and athletic fields, drought conditions also have a marked effect on the North Branch of the Susquehanna's recreational potential. This section of the river is normally shallow and dry seasons can limit fishing and boating opportunities.

In July 2001, the State of Pennsylvania announced significant revisions to the state's drought regulations. These changes included a more streamlined approach to drought planning, and created a full time drought coordinator in the Department of Environmental Protection (DEP). DEP also hosts a Drought Information Center on its website: www.dep.state.pa.us, which includes information on the state's water regulations and informational guides.

Watershed organizations forming in the North Branch region are also sources of information on water conservation and can also contribute to water quantity resource planning.

State Regulations Pertaining to Water Resource Management:

- Chapter 118. Reductions of Major Water Use in a Commonwealth Basin Drought Emergency Area
- Chapter 119. Prohibition of Nonessential Water Uses in a Commonwealth Drought Emergency Area
- Chapter 120. Local Water Rationing Plans Guidelines

Guidelines Available through DEP for Water Resource Planning:

- General Guidelines for an Individual Public Water Supply Drought Contingency Plan
- Drought Triggers for Public Water Suppliers Using Reservoir Sources
- Drought Triggers for Public Water Suppliers Utilizing Well Sources
- Drought Triggers for Public Water Suppliers Utilizing Streams, Rivers or Springs
- Guidelines for the Development of a Local Water Rationing Plan (PDF)
- Guidelines for Designing a Water Conservation Program

3.7 Watershed Organizations

With the advent of the Growing Greener state funding programs and the growing water quality concerns, many communities have created watershed organizations to examine and address water quality and quantity issues at the local level. To date, the following 11 watershed organizations, along with the Wyoming Valley Watershed Coalition (a program of the Pennsylvania Environmental Council), Countryside Conservancy and the Rail Trail Council of Northeast PA, are actively addressing water quality and quantity issues (See Figure 9):

- Satterlee Creek Watershed Organization
- Wysox Creek Watershed Organization
- Laning Creek Watershed Organization
- Mehoopany Creek Watershed Association
- Sugar Creek Watershed Organization
- Towanda Creek Watershed Organization
- Wyalusing Creek Watershed Organization
- Snake Creek Mehoopany Creek Watershed Organization
- Bowman's Creek Watershed Association
- Hicks Creek Watershed Organization
- Lackawanna River Corridor Association

A Rivers Conservation Plan was completed for the Tunkhannock Creek Watershed in 1997. The Wyoming County Conservation District is currently working with local citizens to create four watershed organizations for the Tunkhannock Creek Watershed. Due to the large size of this watershed, the local citizens have decided to create four organizations on a sub-basin size rather than one organization for the entire watershed. These new watershed organizations will work with other local entities to continue the implementation of the RCP.

The Lackawanna River Corridor Association has completed a RCP for the Lower Lackawanna River Watershed and the Rail Trail Council of Northeast PA has completed a RCP for the Upper Lackawanna River Watershed.

A RCP for the Bowman's Creek Watershed is near completion and an RCP is currently being prepared for the Mehoopany Creek Watershed. Both watersheds have a watershed association that has been an active partner in the preparation of the RCPs and will be a critical link in the implementation of these plans.

4.0 BIOLOGICAL RESOURCES

4.1 Wildlife

4.13 Terrestrial

According to the recently published “Luzerne County Natural Areas Inventory”, the North Branch of the Susquehanna River and its contributing watersheds are one of the corridors for the movement of biota in Pennsylvania. Both game and non-game species abound in these areas and the fertile forest habitats found along this drainage provide critical habitat for both resident and transient species.

Avian species of interest or special concern that are found within the watershed include such species as the great blue heron (*Ardea herodias*), northern saw-whet owl (*Aegolius acadicus*), black-crowned night heron (*Nycticorax nycticorax*), osprey (*Pandion haliaetus*), american bittern (*Botaurus lentiginosus*), peregrine falcon (*Falco peregrinus*), and the bald eagle (*Haliaeetus leucocephalus*). Waterfowl species are also very common and swans, geese and ducks of all kinds utilize the river corridor for nesting and resting locations during their annual migration. Several of the more common duck species that can be observed within the basin include mallards (*Anas platyrhynchos*), american black duck (*Anas rubripes*), common merganser (*Mergus merganser*), blue-winged teal (*Anas discors*), and the wood duck (*Aix sponsa*).

The northern water snake (*Nerodia sipedon*), snapping turtle (*Chelydra serpentina*), and painted turtle (*Chrysemys picta*) are a few of the more common reptiles that are found in the littoral and open-water habitats along this section of river. The adjacent forested and shrub/scrub habitats provide habitat for the box turtle (*Terrapene carolina*) and wood turtle (*Clemmys insculpta*), whereas the forested uplands contain the red-bellied snake (*Storeria occipitomaculata*), smooth green snake (*Opheodrys vernalis*), and common garter snake (*Thamnophis sirtalis*).

The bull-frog (*Rana catesbeiana*), green frog (*Rana clamitans*), and red eft (*Notophthalmus viridescens*) are representative of the amphibian species that can be found in the vegetated shorelines, backwaters and moist woodlands. Slimy salamanders (*Plethodon glutinosus*) and the red-backed salamander (*Plethodon cinereus*) are more common in the moist ravines and wooded floodplains within the basin.

Mammalian species found along the river corridor include muskrat (*Ondatra zibethica*), raccoon (*Procyon lotor*), river otter (*Lutra canadensis*), beaver (*Castor canadensis*), and little brown bat (*Myotis lucifugus*). Beaver and muskrat are most common and have become a nuisance in many portions of the watershed due to the

decline of trapping. There also has been a decline in the abundance of the little brown bat as a result of habitat loss.

A mammal species of special concern within the North Branch is the eastern fox squirrel (*Sciurus niger vulpinus*). This particular species has been reported in the forested islands found throughout the river, and the quantity of the population is not known. However, the preservation of the forested floodplains within the basin is needed to ensure the survival of this small mammal.

4.14 Aquatic

The aquatic biota within the North Branch have been affected by acid rain, abandoned mine drainage, industrial wastes, timbering, and agricultural runoff. However, the water quality remains suitable to maintain diverse and abundant fish and macro-invertebrate communities throughout most of the basin. Continued improvements in water quality have resulted from improved industrial and municipal wastewater treatment facilities, abandoned mine reclamation projects, and the implementation of agricultural best management practices in the heavily farmed portions of the watershed.

Recreational fishing is a primary concern in this portion, as well as in the other portions of the Susquehanna drainage. Game species such as smallmouth bass (*Micropterus dolomieu*), largemouth bass (*Micropterus salmoides*), walleye (*Stizostedion vitreum*), channel catfish (*Ictalurus punctatus*), and muskellunge (*Esox masquinongy*) are the primary species of concern. However, rock bass (*Ambloplites rupestris*), bluegill (*Lepomis macrochirus*), and yellow perch (*Perca flavescens*) are also considered valuable and are sought after by many anglers. Although not commonly found in the mainstem of the Susquehanna, wild populations of coldwater species such as brook trout (*Salvelinus fontinalis*) and brown trout (*Salmo trutta*) can be found in the faster flowing headwater tributary streams located in the outer reaches of the basin. The following is a summary of the most common game and non-game fish species found within the main stem of the North Branch copied with permission from Ecology III, Inc. (2001):

Common Name	Scientific Name
Carps and Minnows	Cyprinidae
Spotfin Shiner	<i>Cyprinella spiloptera</i>
Common Carp	<i>Cyprinus carpio</i>
River Chub	<i>Nocomis micropogan</i>
Spottail Shiner	<i>Notropis hudsonius</i>
Bluntnose Minnow	<i>Pimephales notatus</i>
Suckers	Castostomidae
Quillback	<i>Carpoides cyrpinus</i>
White Sucker	<i>Catastomus commersoni</i>
Northern Hog Sucker	<i>Hypentelium nigricans</i>
Shorthead redhorse	<i>Moxostoma macrolepidotum</i>
Bullhead Catfishes	Ictaluridae
Channel Catfish	<i>Ictalurus punctatus</i>
Pikes	Esocidae
Northern Pike	<i>Esox lucius</i>
Muskellunge	<i>Esox masquinongy</i>
Chain Pickerel	<i>Esox niger</i>
Killifishes	Cyprinodontidae
Banded Killifish	<i>Fundulus diaphanous</i>
Sunfishes	Centrarchidae
Rock Bass	<i>Ambloplites rupestris</i>
Red-breasted Sunfish	<i>Lepomis auritus</i>
Green Sunfish	<i>Lepomis cyanellus</i>
Bluegill	<i>Lepomis macrochirus</i>
Smallmouth Bass	<i>Micropterus dolomieu</i>
Black Crappie	<i>Pomoxis nigromaculatus</i>
Perches	Percidae
Tessallated Darter	<i>Etheostoma olmstedii</i>
Yellow Perch	<i>Perca flavescens</i>
Walleye	<i>Stizostedion vitreum</i>

In recent years much attention has been given to macro-invertebrate communities as indicators to water quality. Macro-invertebrate communities found within the North Branch are indicative of good water quality and contain an abundance of pollution intolerant species.

Ephemeroptera (mayflies), Plecoptera (stoneflies), and Tricoptera (caddisflies) are abundant in samples collected throughout the basin. In ongoing studies being performed by the Pennsylvania Power and Light Company at their Susquehanna River Steam Generation Plant in Luzerne County, more than 70 percent of the aquatic insects collected in their surveys were represented by pollution intolerant taxa. A total of 33 different taxa representing more than eight different orders of macroinvertebrates were identified in these samples. The following provides a summary of the Benthic macro-invertebrate taxa most commonly found in the samples collected during this ongoing survey (Ecology III, Inc. 1994):

Order Taxon	Order Taxon
Crustacea	Tricoptera (cont.)
Amphipoda	<i>Macrostenum spp.</i>
Plecoptera	<i>Brachycentrus spp.</i>
Ephemeroptera	Leptoceridae
<i>Ephoron spp.</i>	Coleoptera
<i>Potamanthus spp.</i>	<i>Dineutes spp.</i>
<i>Caenis spp.</i>	<i>Psephenus spp.</i>
<i>Isonychia spp.</i>	Elmidae
Heptageniidae	<i>Optiservus spp.</i>
Tricoptera	<i>Stenelmis spp.</i>
<i>Chimarra spp.</i>	Diptera
<i>Neireclipsis spp.</i>	Chironomidae
<i>Polycentropus spp.</i>	Empidae
Hydropsychidae	Mollusca
<i>Cheumatopsyche spp.</i>	<i>Ferrissia spp.</i>
<i>Hydropsyche spp.</i>	<i>Pisidium spp.</i>
Odonata	<i>Sphaerium spp.</i>
Coenagrionidae	Crustacea
Megaloptera	Amphipoda
<i>Sialis spp.</i>	

4.2 Vegetation

More than 568 species of vascular plants have been identified within the basin of the North Branch. Of this total, 112 species were woody plants and 456 were herbaceous species. Herbaceous plants included a total of 36 ferns and fern-allies, and 420 flowering plants. The most common plants identified were members of the families Asteraceae, Gramineae, Rosaceae, Cyperaceae, and Leguminosae (Montgomery 1993).

Typically, there are five general plant communities found within the river corridor. These community types are: floodplain forest, upland forest, abandoned field, agricultural field, and wetland. The wetland plant community type includes submergent, emergent, shrub/scrub and forested wetland habitats.

Floodplain forests occur along the banks of the river and its tributaries. Typically, this plant community is dominated by large trees such as silver maple (*Acer saccharinum*), river birch (*Betula nigra*) and red oak (*Quercus borealis*). The understory in these areas contain spicebush (*Lindera benzoin*), and the herbaceous community contains a combination of flowering species and ferns. Trout lily (*Erythronium americanum*), dutchman's breeches (*Decentra cucullaria*), may apple (*Podophyllum peltatum*), dame's rocket (*Hesperis matronalis*) and ostrich fern (*Matteuccia struthiopteris*) are a few of the more common species found in this habitat.

Oaks are the dominant species found in the upland forests. However, this plant community can contain a mixture of pine and hardwood species. Red oak (*Quercus rubrum*), white oak (*Quercus alba*) and black oak (*Quercus velutina*) are the most common oak species and are commonly associated with red maple (*Acer rubrum*), white pine (*Pinus strobus*), pignut hickory (*Carya glabra*) and black cherry (*Prunus serotina*).

With the exception of agricultural crops, plant communities found along the outer margins of agricultural fields is quite similar to that which is found in abandoned fields. Flowering species typically found at these locations include: goldenrod (*Solidago spp.*), Canada thistle (*Cirsium arvense*), burdock (*Arctium minus*), blackberry (*Rubus allegheniensis*), milkweed (*Asclepias syriaca*), clasping-leaf dogbane (*Apocynum cannabinum*), and pokeweed (*Phytolacca americana*).

Wetland plant communities tend to be diverse, but have been threatened by invasive species such as purple loosestrife (*Lythrum salicaria*) and reed canary grass (*Phalaris arundinacea*). Sedges (*Carex spp.*) and rushes (*Juncus spp.*) are the most common emergent species, although cattail (*Typha spp.*), sweetflag (*Acorus calamus*) and skunk cabbage (*Symplocarpus foetidus*) are commonly associated with these species when there are found in littoral areas and along floodplains. Shrub species include spicebush, silky dogwood (*Cornus amomum*), red-osier dogwood (*Cornus stolonifera*), arrowwood (*Viburnum recognitum*), and elderberry (*Sambucus canadensis*).

4.3 Pennsylvania Natural Diversity Inventory Species

The Pennsylvania Natural Diversity Inventory (PNDI) describes significant natural resources (plant and animal life, geologic features and natural communities) utilizing a site-specific information system. As of June 28, 2002, thirty-five (35) species, natural communities, and geologic features were reported for a two-mile corridor along the northern Susquehanna River (Pennsylvania Department of Forestry). The majority of the species reported were plants (12), followed by insects and natural communities, five (5) each respectively. The

natural communities included river gravel communities, various cliff environments and riverside outcrops. Two (2) geologic features, including meandering channels and an erosional remnant were reported. Three (3) bird, three (3) mollusks, two (2) mammals, two (2) reptile species and one (1) fish were reported. A summary of the PNDI information is included in Table 10 including State and Global rank and State Status.

County Natural Areas Inventories (CNAIs) in eastern Pennsylvania and County Natural Heritage Inventories (CNHIs) in western Pennsylvania showcase conservation science efforts by combining and presenting information on unique plants, animals, and natural ecological communities throughout the commonwealth. These projects identify, map and discuss important ecological places within a county; prioritize them based upon their attributes; and provide recommendations regarding their management and protection (PNDI, September 2002). CNAIs have been completed for Luzerne, Lackawanna and Wyoming counties. A CNAIs is being conducted in Bradford County

CNAIs and CNHIs are designed to inform the residents of a county about their living heritage and give them a tool to use in planning the future of their communities. County and municipal planners; federal, state and local agencies; businesses; environmental consultants; developers; local conservation organizations; and many other people and groups use these studies to help make land-use decisions within their counties and municipalities. With increasing emphasis on planning within the state, these studies will become more and more important for considering the resources of the commonwealth wisely and comprehensively.

County Inventory Staff scientists collect, analyze and compile ecological information from examination of aerial photography, aerial reconnaissance, on-the-ground field surveys, interpretation of geologic maps, interviews with knowledgeable people and the review of historic information and literature. The Pennsylvania Natural Diversity Inventory, Pennsylvania Game Commission, Pennsylvania Fish and Boat Commission, and county agencies also furnish information pertaining to the county under study.

CNAIs and CNHIs were conceived as tools to assist in planning at both the county and municipal levels and have been used effectively in that capacity. They have been incorporated into comprehensive plans, consulted to plan development projects, and utilized by conservation organizations to prioritize their work. County Inventories can actually streamline economic and infrastructure development by providing sensitive environmental information early in the planning process when adjustments can be made at little cost or delay. Additionally, these studies can be used to help in the development of recreational amenities, to promote tourism industries and to assist in community development. Of particular note is the use of these studies as essential information for DCNR's Greenway and Open Space planning efforts. Regional entities, counties, municipalities and watershed groups undertaking such planning should assure that County Inventory Information is incorporated into their planning process.

The utility of these studies is becoming increasingly prominent as initiatives such as Growing Greener and Growing Smarter focus attention and funds on conservation and planning

throughout the state. With greater emphasis on municipal-level planning and more flexibility within the Municipalities Planning Code (MPC) through the state's Growing Smarter legislation, County Inventories will provide important insight into resources that are shared assets among municipalities and allow those local governments to be more effective in the integration of their conservation efforts (PNDI, September 2002).

4.4 Important Habitats

The riparian corridor along the North Branch provides important habitat to a variety of plant and animal species. Species of special concern have been identified through the PNDI search (Table 10) that has been performed as part of the development of this conservation plan. Forested and herbaceous buffers along the river and its tributaries are critical for the long-term maintenance of water quality and the delicately balanced riverine ecosystem that it supports. Therefore, it is essential that large tracts of land adjoining the river corridor be protected and left undisturbed in order to maintain the diverse plant and animal communities that currently thrive within the basin of the North Branch of the Susquehanna River. Table 11A and 11B provides a summary of state and local properties that currently are protected within the basin.

5.0 CULTURAL RESOURCES

5.1 Recreational

There are numerous private and publicly owned recreational facilities within the watershed. These sites are depicted on Figures 11 and 12.

Non-Profit Owned Lands

Several organized athletic associations own and operated facilities throughout the corridor. The majority are baseball/softball organizations. See Table 11A for a listing.

Municipal Owned Lands

There are many locally owned and operated public parks within the study corridor. Most of the parks are centered on baseball or soccer fields and playground equipment. A complete list and description of facilities is presented in Table 11 A. Several of the larger parks are as follows:

Riverside Park, Sayre Borough, Bradford County: This well developed park consists of baseball fields, playground equipment, boat launch and a walking trail. Local residents and tourists heavily use the park.

Riverfront Memorial Park, Wysox Township (across river from Towanda Borough), Bradford County: This park consists of a soccer field, picnic area with a pavilion, walking trail and provides a boat launch. Concerts in the park are held through out the summer are held at the pavilion.

Morris Park, West Pittston Borough, Luzerne County: The facilities include a baseball field, playground equipment and basketball court. The park is in need of some upkeep, but is somewhat used by local residents.

River Street Park, Tunkhannock Borough, Wyoming County: This park is located adjacent to the Susquehanna River and provides river access. Facilities include playground equipment, ice skating rink and a picnicking area. This park is heavily utilized by the local residents and will be a destination point for the proposed Iroquois Trail.

Lee Baumgartner Park, Tunkhannock Township, Wyoming County: This park is also located adjacent to the Susquehanna River and consists of several baseball fields. These fields are very heavily used by the local baseball association during the spring and summer months and were the former location of the Wyoming County Fair.

Oakland Park, Oakland Borough, Susquehanna County: The facilities consist of baseball fields, tennis courts and playground equipment. This park is well utilized by the local residents.

Frank J. Reddon Park, Susquehanna Depot, Susquehanna County: The facilities consist of baseball fields, bleachers and a walking trail. This park is also well utilized by the local residents.

The boroughs of Exeter, West Pittston, West Wyoming and Wyoming in Luzerne County are in the process of preparing a Trail Master Plan for the proposed West Side Trail. This will be an approximate 15-mile looping trail owned and operated by the four boroughs.

County Owned Lands

Bradford County owns and operates Hornbrook Park in Sheshequin Township. This park has a variety of facilities including baseball fields, playground, a swimming pool and a boat launch. Bradford County also owns the former Lehto Property in Wyalusing Township (Marie Antoinette Overlook). Approximately two-acres including an industrial building are to be converted into a Visitor's Center. The other four counties in the study area do not own any parks in the study corridor. Bradford County does own and operate three boat launches that are under utilized. The remaining four counties do not own any boat access facilities.

The Wyoming County Fairgrounds are located in Meshoopan Township. The Wyoming County Fair, the American Kennel Club Dog show, equestrian competitions, motor sporting events and other community activities are held throughout the spring, summer and fall.

State Owned Lands

There are no State Parks or State Forests along the entire North Branch river corridor.

State Game Land #35 is located in Susquehanna County along the river and is well utilized during all game seasons, generating tourist dollars for the local communities. Neighboring farmers cut hay off the fields within the game lands. The Quality Deer management Association is active in Susquehanna County. PA Fish and Boat Access #798 is located within Game Lands #35 but is not well utilized due to shallow water permitting only small boats to be launched. There are no Game Lands in the Wyoming County section of the River Corridor, however the PA Game Commission is currently managing a 1400-acre parcel of land owned by PENELEC in Scottsville. Purchase of this property would provide access to the river. There are no State Game lands in the Bradford, Lackawanna or Luzerne Sections of the River Corridor. A summary of the State Game Lands is found in Table 11B.

The PA Fish and Boat Commission owns and operates eight (8) boat access points within the study corridor of the North Branch. One (1) boat launch is located in Bradford County, none in Lackawanna County, one (1) boat launch is located in Luzerne County, two (2) boat launches are located in Susquehanna County and three (3) boat launches are located in

Wyoming County. Fish and Boat Access #797 in Oakland Township, Susquehanna County is well utilized. Boats and jet skies are launched here and the area is heavily used on weekends creating potential water traffic problems. A summary of all boat access points is presented in Table 12.

Federal Owned Lands

There are no federally owned lands within the North Branch river corridor.

5.2 Historical/Archeological

Bordered by tangled, nearly impassible forests, the North Branch was the first “highway” through the country, roughly paralleled by an Iroquois trail system called the Great Warrior Path. The North Branch of the Susquehanna River played a pivotal role in the settlement and the economy of the surrounding countryside. Early European explorers spoke of the beauty of the area, its bounteous wildlife and natural resources. The destruction of one nation, the formation of a new country and conflict between colonies occurred along the North Branch even as settlers struggled to develop cash crops, which were transported along the river. Today the history of the North Branch is itself a commodity as North Branch communities highlight the area’s unique role in the history of the United States. Outstanding historical events include the conflict between European Settlers and the Iroquois League, Sullivan’s March, the French Azilum, Development of Natural Resources, the North Branch Canal, the arrival of the railroad, and Joseph Smith, first prophet of the Church of Jesus Christ of Latter-Day Saints. Historic and Cultural Features are illustrated on Figures 13A and 13B. A complete list of Historic and Cultural Sites is listed in Table 13. Historic Organizations in the North Branch Corridor are listed in Appendix C.

Pre-Historic Era: The first hunter-gatherer societies moved along the North Branch about 10,000 years ago but it wasn’t until the late Archaic and Transitional periods (4000 BC-1000 BC) when a more moderate climate supported a wider variety of food sources that permanent settlements appeared along the North Branch, notably in Tioga Point, site of present day Athens. Cultivated crops appeared during the Woodland Period (1000 BC – 1600 AD) (EMHR, 1998, p. 27-30). In addition to recent excavations at Great Bend and Tunkhannock prior to bridge construction, eight prehistoric and proto-historic archaeological sites have been identified along the North Branch (Theime, 1999). Additionally, ongoing excavations at a site near the confluence of the Susquehanna and Lackawanna Rivers near Duryea have produced evidence of occupation from the Early Archaic through Middle Woodland periods (Theime, 1999). A mild climate (interrupted by the little ice age in A.D 1600 – A.D. 1850) supported agricultural efforts that enhanced the development of large towns with longhouses and sweathouses surrounded by earthen and timber stockades. By the beginning of the historic era, Tioga Point in present day Athens was established as the Southern Door of the Iroquois Longhouse (or League). The Great Warrior’s Path that ran along the North Branch was “at Tioga (present day Athens) fed by Indian highways from all parts of the Six Nations Home country, which at one time extended from the Hudson River to Niagara (Wallace, 1998, p. 72-74).” Established Native American towns along the North Branch included

Tioga, Queen Esther's Town, Sheshequin, Wyalusing, and Wyoming (Wallace, 1998, p. 72-74).

Historic Era: European Settlement and the Iroquois League: By the mid-1500's, six Northeastern tribes had organized into the Iroquois League. Together the Mohawk, Seneca, Onondaga, Cayuga, Oneida and Tuscarora tribes would play a crucial role in both the settlement of the North Branch and in the Revolutionary War. Tioga Point, in present day Bradford County, was considered the southern door of the Iroquois Longhouse (Eckert, 1978, p. 84). The History of Bradford County (1996, p. 39-44) credits Conrad Weiser as the first European to explore the area, said to arrive at Tioga Point in present day Athens, Bradford County on March 29, 1737. Weiser was traveling to Onondaga, the seat of power for the Iroquois League to attend a conference (History of Bradford County, 1996, p. 39-44). Weiser returned in 1743, accompanied by the English botanist John Bartram. Two years later Monrovia missionaries arrived at Wyalusing. In 1755 surveyor Lewis Evans published a map of the Middle British colonies that included lands along the North Branch. In the Wyoming valley, traders and missionaries arrived between 1737 and 1741 and by 1770 permanent homes were being established in present day Bradford County by European settlers (History of Bradford County, 1996, p. 5-6).

The League had formed a treaty with the British, reserving the lands along the North Branch for themselves while ceding lands to the east and south to the colonists. Complicating matters, two colonies – Pennsylvania and Connecticut laid claim to land along the North Branch. The History of Luzerne, Lackawanna and Wyoming Counties PA With Illustrations and Biographical Sketches of Some of Their Prominent Men and Pioneers, published in 1880 relates that in 1743, the Susquehanna Company formed in Connecticut for the purpose of settling lands along the North Branch. John Jenkins surveyed the Wyoming area for the Susquehanna Company in 1755 and by 1762 he accompanied 119 settlers to the Wyoming Valley, in direct opposition to the wishes of both Pennsylvania's Governor William Penn and the Iroquois League (Egle, 1876, p. 888-889). That year, Jenkins reported to the Susquehanna Company committee his discovery of iron and anthracite coal at Wyoming (Egle, 1876, p. 889). Coal fueled the possessive fires of the Susquehanna Company, who voted in April, 1763 "that there shall be eight townships laid out on said (Susquehanna) river...reserving for the use of the company for their after disposal all beds or mines of iron ore and coal that may be within the towns ordered for settlement." (Egle, 1876, p. 890). A bloody conflict resulted. By October 1763 twenty settlers at Wyoming were dead and their settlement destroyed (Egle, 1876, p. 890).

Settlers were moving in from southern Pennsylvania as well. Allan W. Eckert, in his book, The Wilderness War traces the development of a regional conflict that would outlast the American Revolutionary War: Eckert writes that the Moravian mission of Friedenshutzen was established in 1766 along the river near present day Wyalusing. Having at first received permission from the League to settle, by 1768 the Moravians were coming under increasing pressure from the League, Governor William Penn and the conflict between Pennsylvania and Connecticut and in 1772 the Moravians at Friedenshutzen departed for Ohio (Eckert, 1978, p. 411-413). As the Revolutionary War began, the League supported the British,

believing that the Crown would honor their treaties and protect the lands along the North Branch from incursion by settlers (Eckert, 1978, p. 25). Even as settlers from the Wyoming Valley traveled north from Pittston along the North Branch toward present day Tunkhannock, the British were forming a battle plan that specifically called for the Iroquois League to disrupt the frontier, forcing the Americans to spilt their forces in order to protect settlers (Eckert, 1978, p. 92). Settlers along the North Branch were caught in a see-saw battle between the British, the League and the Americans that would peak in the Battle of Wyoming Valley (or the Wyoming Massacre) in July, 1778 (Eckert, 1978, p. 223). This attack by British and Iroquois forces would prompt the young Congress to act to secure its frontier.

Sullivan's March: In September 1778 American forces were sent north from the Wyoming Valley, along the Susquehanna River to destroy the Iroquois villages of Sheshequin, Tioga Point and Queen Esther's Town in present day Bradford County (Eckert, 1978, p. 240). Settlers trickled back into the Wyoming Valley and by spring, 1779 General George Washington had made it a priority to destroy the Iroquois League. His first four choices to lead the campaign declined; Major General John Sullivan accepted the challenge (Eckert, 1978, p. 287). Brigadier General James Clinton was ordered to support Sullivan in his efforts. The former was ordered to form troops at Otsego Lake in present day New York State at the headwaters of the Susquehanna River (Eckert, 1978, p. 295). At Sullivan's signal, Clinton was to move down the Susquehanna River, "destroying all Indian villages as he progressed and join Sullivan at Tioga" (Eckert, 1978, p. 295). Sullivan's orders were even more direct: "The immediate objects," the commander in chief (Gen. George Washington) said, "are the total destruction of the hostile tribes of the Six Nations...you are to lay waste to all the settlements around, so that the country may not only be overrun but destroyed" (Eckert, 1978, p. 292). Toward this aim, Sullivan was assigned four brigades – "from its head to its rear, the army spread out for over two miles" (Eckert, 1978, p. 327). He did not have the unqualified support of Pennsylvania's Pennamite Party, whose powerful members held title to lands along the North Branch that were being claimed by Connecticut. Members felt that if Sullivan succeeded in securing the frontier, Connecticut settlers would pour down the North Branch, weakening Pennamite members' claims to the land (Eckert, 1978, p. 301-302). However, at the headwaters of the North Branch, General Clinton had 1800 men under his command, awaiting word from Sullivan to join his forces.

General Sullivan's troops moved north from Wyoming on July 31, 1779. Troops and wagons marched over the Great Warrior Road that roughly followed the North Branch while boats of supplies were ferried up the river (Eckert, 1978, p. 322). At one point, too ill to ride a horse, General Sullivan was transported up the North Branch by boat (Eckert, 1978, p. 335). To the east, by August 7, General Clinton's troops and supplies were floating down what had been the day before a nearly dry riverbed. Clinton's troops had been waiting since June along the shores of Otsego Lake. The troops had used their time wisely, in the construction of a dam that trapped nearly 3 feet of water behind it. When released, the reservoir of water offered enough clearance for the heavily laden boats to float over the roughest shoals of the North branch with relative ease (Eckert, 1978, p. 356-359).

Sullivan's troops roughly followed present day Route 92 in Luzerne and Wyoming Counties, Route 6 in Wyoming and Bradford Counties and Route 220 in Bradford County. Today, historical markers note the army's often slow and difficult progress. Clinton, in spite – or perhaps because of his early success at raising the river's level struggled through muck and nests of disturbed rattlesnakes, arriving in at the Great Bend of the river in present day Susquehanna County on August 17. The next morning, after destroying the deserted village of Ingaren (present day Great Bend Township), Clinton's troops followed the river northward, then west to Tioga, arriving at the hastily erected Fort Sullivan on August 22 (Eckert, 1978, p. 356-351).

By August 26 the combined forces were moving north on a campaign that would accomplish exactly what General George Washington had ordered. Over fifty villages were destroyed along with an estimated two hundred thousand bushes of grain, fifty thousand bushes of crops, and ten thousand fruit trees (Eckert, 1978, p. 439). There were few human losses on either side but with the infrastructure of the League destroyed, the League itself crumbled. Following the Revolutionary War, with the land dispute between Connecticut and Pennsylvania finally decided, the lands along the North Branch were being settled.

The French Azilum Refugees from another revolution sought safety on the 1600 acres along the North Branch. French émigrés, fleeing both revolutionary France and a slave revolt in Haiti settled along the North Branch, about ten miles south of Towanda in Fall, 1793. They named their settlement Azilum or (Asylum) and brought to the North Branch luxuries seldom seen to date, including wallpaper, window glass, shutters, and porches on homes quickly erected on a town plot of about 300 acres. A two-acre market square was planned that eventually included a theater along with shops, a schoolhouse and a chapel. Developers surveyed about 413 lots one-half acre in size. Dairying and sheep raising, a gristmill, blacksmith shop, a distillery and the manufacture of potash supported the community and pearlsh was established (www.frenchasylum.org).

The most imposing building in the colony was "La Grande Maison", a two-story log structure eighty-four feet long and sixty feet wide. It had numerous small-paned windows and eight large fireplaces, and it has been said, though hardly proven, that it was to be the dwelling of the Queen. It was the scene of many social gatherings, and among its most famous guests were Talleyrand and Louis Phillipe, who was later to become king. (www.frenchasylum.org)

By the late 1790's the community was floundering from a lack of financial support. The revolution in France had ended, enabling some of the émigrés to safely return to their former lives. Others sought a new refuge in the southern cities of Charleston, Savannah and New Orleans. A few families remained in the area (www.frenchasylum.org).

Natural Resources: Iron, coal and lumber were the first cash commodities sent down the North Branch. By 1795, according to the [History of Luzerne, Lackawanna and Wyoming Counties PA With Illustrations and Biographical Sketches of Some of Their Prominent Men](#)

and Pioneers. settlers were taking advantage of the high water in the spring and fall seasons to float lumber down the Susquehanna:

“The forests and its tributaries above the Wyoming Valley were filled with valuable timber...almost the only source of wealth to the settlers...when the business of rafting was at its height as many as one hundred rafts a day might be seen to pass in Tunkhannock Creek alone, and of course, many more in the river at this point (p. 90-91).”

Exploitation of these three natural resources would soon have a detrimental effect on the river. Pittston consisted of less than 10 houses in 1838. By 1854, twenty thousand people lived within the expanded township limits, “most of whom are more or less directly interested in the coal trade” (Egle, 1876, p. 911-912). In 1875 alone it was estimated that eight million tons of coal had been mined in the Wyoming Valley (Egle, 1876, p. 890). Wyoming, Bradford and Susquehanna counties remained largely agricultural, while actively participating in the lumber trade. As more people poured into the area, municipal divisions became smaller. Luzerne County was established out of Northumberland County in 1786. By 1810 Susquehanna and Bradford counties were formed out of Luzerne County. Luzerne lost more land to the newly formed Wyoming County in 1842 (Egle, 1876, p. 881). Lackawanna County was formed in 1878, also out of Luzerne County.

The North Branch Canal: By the early 1800’s established and peaceful communities along the North Branch north of Pittston began to look for methods of exporting their largess to markets. Trade books for the period record that freight haulers were struggling over rough roads, commanding high prices for transporting goods into and out of the North Branch counties (Susquehanna County Historical Society). Community leaders turned to the river to break the freight hauler’s monopoly. By 1826, entrepreneurs along the North Branch were experimenting with better methods of transportation. While, according to The History of Luzerne, Lackawanna and Wyoming Counties PA “a small stern-wheel steamboat” (History, p. 90) did make its way from York, PA to Binghamton, New York, it soon became obvious that the shallow, rock-strewn river did not lend itself to steamboat transportation. The History of Luzerne, Lackawanna and Wyoming Counties continues to relate that local leaders were not willing to concede the river as non-navigable, and spurred by the success of the Erie Canal, organized the construction of the North Branch Canal system. Working from the south, the canal was completed as far as the Lackawanna River by 1834 but progress along the North branch would prove much slower (History, p. 500). It wasn’t until 1838 that activity toward the construction of the canal began in the Tunkhannock area. Work continued sporadically. In 1852 the first boat arrived in present day Wyoming County (History, p. 500).

Canal fever had struck further north (in present day Bradford County) as well. The History of Bradford County relates that the first organizational meeting was held in 1828 and by 1836, construction started in Bradford County between Athens and Wyalusing. Here too, work stalled due to a lack of funds and difficulties with construction. By 1840 citizens were demanding action and a new engineer was brought in to oversee the project. William B.

Foster brought along with him to the North Branch, his younger brother Stephen, installing him at schools in Towanda and Athens (History of Bradford County, p. 5). In the spring of 1841, the Susquehanna flooded, damaging the canal and the Towanda dam. No funds were available for repairs until 1849. According to The History of Luzerne, Lackawanna and Wyoming Counties PA, it wasn't until 1854 that the first passage boat ran from Towanda to Athens. Flooding and continued seepage of water through the rock bed of the canal spelled the eventual demise of the North Branch Canal.

The Arrival of the Railroad. Even as the canal carried its first load of coal in 1856, investors were turning their interest to railroads, recognizing that a profitable canal system along the North Branch was an engineering impossibility. Towpaths of the canal were eventually utilized for rail beds and in 1867 the railroad arrived in Towanda, linking the area to the Wyoming Valley (History of Bradford County, p. 6). In 1853, the Lackawanna and Western Railroad completed a line from New York City to Owego, NY., traveling north from the Wyoming Valley, then following the North Branch at Great Bend into New York State (EMHR, 1996, p. 48). This corridor was primarily a “through” route, but railroads provided an economic boom for some communities, notably Sayre, Bradford County and Susquehanna Depot, Susquehanna County (EMHR, 1998, p. 48). Railroad shops were located in both towns. Sayre was the headquarters of the PA and New York Railroad in 1876 (later became the Lehigh Valley Railroad) and in 1884, a locomotive and car repair shop was built (EMHR, 1998, p. 48). Susquehanna Depot was the site of the Erie Railroad shops for nearly 100 years. These shops repaired passenger coaches, built locomotives and refurbished private cars beginning in the 1860's. The Erie Railroad closed the shops in the 1960's.

Joseph Smith and the LDS Church: The North Branch of the Susquehanna River in Oakland Township, Susquehanna County played a unique role in the history of the Church of Jesus Christ of Latter-day Saints. Joseph Smith, founder of the church, arrived in the area about 1828. In May 1829, he and follower Oliver Cowdery were baptized in the Susquehanna River (Hinkley, p. 20-22). Today, a monument along Route 171 marks that event and nearby sections of land have potential for development as a LDS church heritage center. During the course of this study, the Church of Jesus Christ of Latter Day Saints purchased a section of property that was the Smith homestead in Susquehanna County.

Historic Preservation and Development projects in the North Branch Corridor include:

Regional Projects

- Endless Mountains Heritage Region : The state's ninth state heritage park was designated in 1998 to celebrate the legacy of people living on the land. Includes the North Branch counties of Bradford, Susquehanna, and Wyoming along with Sullivan County. This organization distributes grant funds for historic preservation plans and projects in the region.
- Delaware and Lehigh National and State Heritage Corridor: Stretches from Wilkes-Barre to White Haven and includes a section of the Susquehanna River on the Lackawanna-Luzerne County border.

- Lackawanna Heritage Valley: The state's first heritage park centers on the coal mining history of the region. This heritage park also includes a section of the Susquehanna River along the Lackawanna-Luzerne County border.
- PA Route 6 Tourist Association: Includes parts of Wyoming and Bradford Counties. This organization promotes the history and attractions along PA Route 6.
- Endless Mountains Tourism Association: Considering developing a visitor's center at the Marie Antoinette Lookout on PA Route 6 in Bradford County.
- Hotel Tax: Bradford, Susquehanna, and Wyoming counties have passed room tax ordinances to assist in funding the Endless Mountains Tourism Association. Each of these counties has an opportunity to spend 25% of the total monies collected in their county in support of projects related to sustaining tourism.
- North Branch of Susquehanna Water Trail: A project of the Endless Mountain Heritage Region and PEC. The Water Trail when complete will connect the North Branch Communities to water trails to the south and eventually along the entire length of the Susquehanna River. Historical aspects of the local communities will be highlighted through interpretive signage and publications.
- Susquehanna Greenway Partnership (Partnership): The Partnership is a public-private network advocating development of the Susquehanna Greenway along 500 miles of the river corridor in 22 Pennsylvania counties. The Partnership seeks to foster pride, awareness, and stewardship through enhancement of local and regional river-related projects.

Bradford County

- Tioga Point Museum has been awarded a \$12,229.00 Keystone Historical Preservation grant from the PA Historic and Museum Commission to upgrade the museum's storage area.
- Lehigh Valley Railroad Station and Valley Railroad Museum: Sayre Borough has purchased the railroad station. A T-21 grant along with a Heritage Region grant have been obtained to renovate the station.
- A second historical district is planned for Athens area. Graduate students in historical preservation from Cornell University are surveying homes along South Main Street. in Athens.
- Asylum Township owns a 2-acre mill site across from Homet's Ferry that they will develop into a boat access recreation area.
- Towanda – three walking tours of the Historic District are being developed.
- The Eastern Delaware Nation is developing a cultural center and interpretive trails in the area of Wyalusing Rocks, Rt. 6.
- Bradford County is including a Heritage Tourism component to the Revised County Comprehensive Plan.

Luzerne County

- Frances Dorrance # 11 Chapter of the Society for Pennsylvania Archaeology, Inc. Archeological excavation, Duryea. Website: www.shol.com/spa20/spahome/SPA.htm

Susquehanna County

- Susquehanna Depot Area Historical Society: Founded in 1984. Includes all of the municipalities from the area originally known as Harmony. Maintains a museum in Susquehanna Depot, located in the last standing building of the Erie Railroad Shops Complex, dating back to the 1860's. Displays include old photographs, news clippings, manuscripts and artifacts from local railroads and towns in the area. Continuing to work to develop the museum.
- The Susquehanna Depot Restoration Committee lists several properties with unique architecture that were not included in the Historic Commercial District. Among them are the Erie Water Tower, the last standing building of the Erie Railroad Shops, the oldest home in Susquehanna Depot, the Clapper Mansion – a residence for dignitaries of the Erie Railroad that was heated by steam power from the shops, and the Episcopal Church.
- Oakland Borough has established a commercial historic district.
- Susquehanna Depot Borough Commercial/Historic District is in the final phase of the designation process.
- Susquehanna County is including a tourism component in its updated comprehensive plan.

Wyoming County

- Wyoming County Historical and Genealogical Society has proposed a historical marker at the site of the former Brown and Fassett Feed Mill noting that bricks from the mill were used to construct paths at Lazy Brook Park.
- Tunkhannock Borough Historic District Walking Tour has been developed.

6.0 ISSUES, CONCERNS, CONSTRAINTS

From the inception of the this RCP development process, the foremost challenge for PEC was to bring together the diverse communities along the North Branch. This challenge was met through a series of steering committee meetings held in different counties of the North Branch region and attended by representatives from each county, and through the formation of county sub-committees that met on a monthly basis to review and comment both on the data being collected by PEC and SRBC and on the companion maps that were created out of that data. As the maps were completed, a mapping subcommittee meeting was also held for review and comment of the data to be included on the maps.

6.1 Visioning Meetings

An organizational meeting for the development of a River Conservation Plan for the North Branch of the Susquehanna River was held in Tunkhannock, PA on February 8, 2000. Project Manager Julie McMonagle facilitated this meeting with assistance from Ellen Ferretti Howard, Director Northeast Regional Office, PEC; Bob Edwards, SRBC; and Elizabeth Janoski, Technical Assistant, PEC. The purpose of this meeting was to inform the public of the scope of work and the timeline for the RCP. Volunteers were solicited to join a steering committee that would participate in a visioning process and also develop a method for oversight of data collection and project development items. The initial meeting included municipal and county officials, planners, and residents of the river communities from Bradford, Lackawanna, Luzerne, Susquehanna, and Wyoming counties.

At this meeting it was explained that PEC's role was to work with public officials and private citizens from each river community in order to compile a non-regulatory and community oriented river conservation plan for the future management of the North Branch of the Susquehanna River. This plan would include a list of proposed projects that would be eligible for implementation funding from the PA DCNR River Conservation Grant Program, provided the applicant community had previously passed a resolution in support of the plan. It was further explained that PEC would do the actual work of organizing meetings, collecting data and writing and publishing the report while SRBC would provide GIS mapping support. SRBC also would assist in the data collection and participate in the report preparation.

The steering committee was asked to provide assistance through participation in regular meetings to review and update data compiled into maps from the previous study. (Developing a Regional Vision, PEC 1991). Examples of potential GIS data layers for the RCP included recreational layers, cultural features, flood plain boundaries, land use data, and public water supplies. It was explained that the corridor map would help communities to visualize further plans for their area and provide an opportunity to see missing links between river communities.

Outcomes of this meeting included:

- A need to begin the visioning process; and
- The need to set project goals along with the need for continued outreach to communities not yet represented in the plan's development.

PEC developed two newsletters and fact sheets to spread the word about the development of the plan. Following meetings in Susquehanna, Bradford and Lackawanna/Luzerne counties, the vision of the North Branch RCP was developed into six broad categories. Loosely correlated, the vision for the North Branch is one of increased public awareness both in and outside of the study area of the many attributes of the North Branch. This is achieved through education outreach and the development of enhanced recreational opportunities in a river corridor both renowned for its pristine and scenic qualities, and appreciated for its history and culture, supported by sustainable economic attributes based on heritage and "soft" adventure tourism. Common themes presented throughout the corridor were the need for education, along with developing a balance between private landowners and public use, and the need for economic development along the river. Information on the GIS mapping process was also presented. The May 17, 2000 steering committee meeting focused on a review of the visioning process.

Following is a summary of the information gathered from this series of visioning meetings:

Vision for the North Branch of the Susquehanna River

1. Recreation and Public Access

- River corridor abounds with quality recreational opportunities that are realized or created, heavily promoted and utilized. Local citizens are satisfied with available recreational facilities and have the ability to access them.
- Recreation carefully managed to protect environmental resources and needs of landowners.

2. Ecological/Environmental

- Corridor is renowned for pristine and scenic natural areas and wildlife.
- Sustainable land and water use has achieved a balance between economic development and conservation.
- Water resources support the needs of pristine natural areas and wildlife and community needs for quality drinking water, quantity of water and recreation.

3. Historical and Cultural

- River corridor's history and cultural heritage has been recorded, promoted, made accessible and utilized.

4. Economic and Tourism Development

- Traditional and cottage industries (farming, forestry, gravel and blue stone mining) continue to play a key role in the local economy.

- River related “green” industries/resources exist and are used to attract new business and industry to the region.
- Community has achieved/ developed economic/job opportunities that are attuned to conservation needs.
- An environment has been created that will attract citizens to live and work in the corridor.

5. Partnerships Outside of Study Corridor

- River conservation efforts are coordinated with partners up and down stream.

6. Information/Education

- Educational efforts have informed the local residents and tourists of the values of the river to the region and conserving the river corridor.
- Citizens, communities, tourists, business and industry are good stewards and are acting to both achieve and maintain our (steering committee) vision.

6.2 Mapping and Data Review Meetings

Following a full steering committee meeting held in Luzerne County in October 2000, at which concern was expressed over gaining public and local government involvement in the process, it was decided to form county sub-committees for Bradford, Susquehanna, and Wyoming counties to reduce travel time for steering committee members and to work more locally on a county-wide basis. Luzerne and Lackawanna sub-committee meetings were held jointly. The scope of work for the county sub-committees and a process for collecting and reviewing the data was outlined.

The purpose of county sub-committee meetings was to review and comment on data collected by PEC and SRBC. Committee members actively contributed to the development of historic sites, fishing and boating access locations, and municipal, county and state park locations. This data was also compiled in map form by SRBC. As the maps were drafted, the sub-committees reviewed these maps for accuracy. PEC would then present the topics to the full steering committee.

The county sub-committee meetings also served to develop action items for the RCP. Common themes soon emerged from all of the county sub-committees. Participants expressed a deep appreciation of the history of the region and its residents’ relationship to the river, a concern for use (or lack of use) of the river, and frustration with the state grant processes for projects. Water quality and quantity concerns were also raised. During the course of this study, the region was experiencing a period of drought. While it was generally believed that sewer contamination of the river had abated, concerns remained regarding agricultural and industrial pollution. There was also concern regarding the potential impact of activities up-river, particularly in New York State, on Pennsylvania communities along the corridor. The county sub-committees met between November 2000 and July 2001. Following is a summary of issues presented by each county sub-committee:

Bradford County: Six meetings were held in various locations throughout the county, including the Bradford County Conservation District, the Tioga Point Museum in Athens, the Athens Sewer Authority and the Wyalusing Borough Office. There were between 5 and 8 committee members in attendance at each meeting. The members of the Bradford County subcommittee had a strong interest in the history of the region, and in the environmental quality of the river. Throughout the meetings, concern was expressed for the potential development of gas-fired power plants to generate electricity on the river at Loudensbury, NY (North of Bradford County) and at Wysox, Bradford County that could affect the river in terms of turbulence, sediment and water use. The committee also struggled with recreational resources, noting that while they enhance a community, rural areas often struggle to keep recreational areas maintained and safe. Ways to settle issues arising out of conflicting use, such as ATV users on trails also used by hikers, were also addressed. While noting a insufficient access to the river throughout the Bradford County corridor, the committee also commented on a lack of enforcement of fishing and boating rules for current river users. Erosion was also a major concern, as well as sediment build-up, particularly at the mouth of Satterlee Creek in Athens. There was also a strong interest in developing relationships with New York State communities to further benefit the river. There was a great deal of concern for the future of the river from an environmental standpoint. One concern was a lack of timely state cooperation and support, with a slow and complicated grant process. Other concerns were a lack of knowledge by landowners around the river, and that fishing in the river has suffered with the introduction of non-native species and the disappearance of pan fish, grass and clams. The committee members felt that the river is the county's outstanding feature, and should be protected in some way -- a scenic river designation is possible, but potential conflict with private property owners would need to be addressed.

Lackawanna and Luzerne Counties: Four meetings for Lackawanna and Luzerne Counties were combined because each county contained only a small segment of the study corridor. The meetings were held in West Pittston at the Penn State Extension Office. Luzerne County was represented by the Conservation District, the North Branch Land Trust, and West Pittston and Exeter Boroughs. Lackawanna County was represented by the Conservation District, Countryside Conservancy, and the Lackawanna River Corridor Association. The Penn State Extension office serves both counties. The primary concerns were the need for recreational opportunities, water quality issues (the Lackawanna River discharges into the Susquehanna River in the vicinity of Pittston and is highly degraded from historical mining, industrial pollution and combined sewer overflows), and flooding concerns.

Susquehanna County: Five meetings were held in Susquehanna County. Following an initial meeting at the Great Bend Borough Building, the remaining meetings were held at the Oakland Borough Building. Susquehanna County has one of the shorter lengths of the river in the study, and like Bradford County, borders New York State. There were concerns among committee members about activities occurring up-river, though no specific projects were named. The communities along the river – the Tri-Boro Area of Susquehanna, Oakland and Lanesboro, along with Great Bend and Hallstead - are developing various community revitalization projects and the members' input reflected these goals. The primary concern of this committee was the development of the river as an asset to enhance the community and to

attract tourism dollars to the local economy. Local history was seen as an important component of that process. The Mormon Monument is located along this section of the river. The Tri-Boro area in particular was also an important railroad center (See History section). Therefore, the development of access to the river was a primary concern. Environmental issues such as flooding and sediment build up were secondary to economic development. There were concerns about the use of personnel watercraft on the river, but in general, the committee felt the river was under-used and unappreciated. The majority of the Action Plan items formulated by this committee involved community revitalization, with an economic development component. Frustration was also expressed over the application process for state grants.

Wyoming County: Three county sub-committee meetings were held in Wyoming County. Sub-committee members also shared an appreciation of the history of the river and its communities. One major concern was the lack of access to the river. It was noted that of the three counties along the upper reaches of the North Branch, Wyoming County alone had no state owned publicly accessible lands along the river. One action item was to work to develop a state park along the river. The Wyoming County corridor also contains three active watershed associations: Bowman's Creek, Mehoopany Creek and Tunkhannock Creek. There was also a commitment to develop recreational projects, such as the Iroquois Trail, that will link Riverside Park in the Borough of Tunkhannock to the Lazy Brook Park along Tunkhannock Creek in Tunkhannock Township. Sub-committee members also noted a concern about agricultural runoff.

Mapping Sub-Committee Meeting:

September 2000, Tunkhannock. This meeting included a discussion of the format and the types of data that should be collected for the maps. There was also discussion about the accessibility of the data via website or CD following the completion of the project, and about eventual updates of the data. The committee members felt that it was important that all interested parties could use and share the data.

Additional Full Steering Committee Meetings:

August 14, 2001, Tunkhannock. At this meeting, 12 updated data and mapping tables were presented to the committee for review and comment. Action Plan items for Susquehanna and Bradford counties were presented along with photographs of historic and scenic sites in Susquehanna and Bradford counties.

6.3 Survey Results

A questionnaire was sent to all municipalities in the study area to assist in determining the values and concerns along the river corridor from the local governmental perspective. A copy of the questionnaire and summary findings is attached in Appendix D. Of the 52 municipalities surveyed, 11 municipalities, or 21% responded.

The survey results indicated that most municipalities believed that multiple uses of the river corridor should be addressed in the Action Plan. These uses included fishing, hunting, hiking; protection of habitat; watershed protection; historic preservation; stream bank erosion, improved water quality; protection of open space; wetland protection; eco-tourism opportunities; and scenic beauty. Implementation would be on both a municipal and watershed basis.

If intergovernmental cooperation is necessary to implement the Rivers Conservation Plan, the majority of the survey respondents favored either informal relationships or the formation of a commission or authority (the survey results were tied with six votes for each category). The creation of a state park near the river was the second highest choice for this question.

Recreation Opportunities and Habitat Protection and Enhancement were the highest ranked important land and water protection issues. Stormwater/Flooding received the third highest ranking. Cultural Resources, Farmland Protection, Land Ownership, Management and Stewardship, State and Federal Regulation/Funding and Stream Water Quality and Quantity were tied at the fourth highest rank.

The municipalities provided a broad range of responses to the question “What are the three most critical water related needs or challenges in your municipality?” A detailed list of the responses is found in Appendix D. The needs and challenges brought forth by the respondents include stream bank erosion, water contamination from combined sewer overflows or leaking septic systems, need for parks, boat access and trails, and water contamination from the New York section of the river

Question six asked for information on special places in the community. This information has been added to the maps.

To the question “How does the public access the Susquehanna River in your community?” most respondents indicated that river access was primarily through private property or river lots. The third highest location was Fish and Boat Commission access points.

Question eight asked each community to rank the level of importance of loss of fish and wildlife habitat, loss of native vegetation, erosion of stream banks, conflicts between motorized and non-motorized boating, flooding and property damage, protection of special areas, protection of significant scenic views, access to historic resources, providing public access to river and providing connecting paths between communities and the river. All issues received the most votes in the Very Important category.

The last question in the survey asked for the most important recommendation(s) to include in a plan for conserving the North Branch of the Susquehanna River. A detailed list of the responses is found in Appendix D. In summary, suggestions included maintaining and improving water quality, riverbank protection, establishing greenways and protecting open areas.

7.0 ACTION PLAN AND MANAGEMENT OPTIONS

Discussions throughout the course of the county sub-committee meetings led to the development of action items. Items to be addressed throughout the corridor included both assessment and enhancement of the river's environmental condition and the development of river access for recreation and tourism. Action Plan Items and Management Options are correlated with the series of six visions created by the steering committee and are located in Appendix E.

7.1 Recreation and Public Access Development

During the public participation process, the public expressed many times that the region lacked recreational amenities. Stakeholders not only expressed a strong desire for more trails and parks, but, overwhelmingly, the need for more river access points and facilities. Many communities and organizations have suggested over 25 projects for the creation of community and nature parks, land and water trails and possibly a state park. The local communities desperately need new recreational facilities for use by local residents, and to enhance eco-tourism opportunities.

7.2 Ecological and Environmental Development

A variety of ecological and environmental issues were identified during the preparation of the River Conservation Plan. Historic mining activities, combined sewer overflows, and industrial pollution have impacted the southern section of the study corridor. Although the northern sections of the study corridor are fairly rural, sections of the corridor face industrial pressures particularly in the Wysox/Towanda/Sayre areas and in sections of the Great Bend in Susquehanna County. Blue Stone and other types of quarries are an on-going threat to the watershed. A variety of suggested projects to address these concerns include continued development of watershed organizations, creation of storm water management plans and comprehensive plans to address stream bank erosion problems. Projects whose scopes may be impacted by nearby industrial activity would benefit from collaborative efforts with these industries.

Additionally, open space and urban sprawl issues have or are beginning to impact the communities in the study corridor. Local agencies including county government are beginning to address these issues. Luzerne and Lackawanna Counties are currently conducting a joint Open Space, Greenways and Outdoor Recreation Master Plan. Bradford County is currently preparing an Open Space Master Plan and a Natural Area Inventories Study.

7.3 Historical and Cultural Development

The study corridor for this project is immensely rich with historic sites ranging in age from pre-historic to colonial to early Americana. A significant amount of effort was made by the Steering Committee to provide information on the historic sites within the study corridor. Several of the river communities have existing and proposed historic districts that are beautifully maintained by the residents. The Steering Committee suggested a variety of projects that include creating walking tours of historical areas, designation of new historic districts and restoration and preservation of a variety of historic buildings. The Steering Committee believed that preserving and enhancing historical aspects of the communities would not only provide educational opportunities, but also bring economic opportunities to the region through the development of eco-tourism.

7.4 Economic and Tourism Development

The Steering Committee recognized early on in the project that eco-tourism currently benefits the region and could be greatly enhanced. The Study Corridor and the surrounding region is historically significant and largely rural with many beautiful vistas, particularly of the Susquehanna River. Eco-tourism opportunities abound. The Steering Committee suggested multiple projects including Study Corridor wide projects and site-specific projects. The regional projects should be coordinated with the Endless Mountain Visitors Bureau and the Endless Mountain Heritage Region.

7.5 Partnerships Outside the Study Area

During the development of this plan, the Steering Committee recognized very early on that there was not only a geographical, but also a conceptual disconnect between the Great Bend section of the Susquehanna River and the remainder of the study corridor. Because the river flows back into New York State downstream of the Great Bend area and does not re-enter Pennsylvania until the Athens area there is a large section of the North Branch of the Susquehanna River that is not addressed in this plan. It is therefore imperative to develop further relationships with New York State agencies, non-profit organizations, municipalities and their Pennsylvania counterparts, and proposed North Branch River Coalition.

7.6 Information and Education Development

The Steering Committee suggested a limited number of projects regarding information and educational development. In Susquehanna County, discovered archeological artifacts during new bridge construction activities on the Susquehanna River could be shared with the general public. An Arts and the River celebration has been suggested for the communities in the Great Bend area. Finally, the Steering Committee suggested a project to create and install appropriate signage to better identify river access points for the entire study corridor.

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	County	Location	Action Plan Item	Lat	LAT	LAT	LON	LON	LON	Latitude	Longitude	Purpose
Recreation and Public Access Development												
1		River Corridor	Develop a mapped water trail from Sayre to Tunkhannock; and along the Great Bend									REC_ACCESS
2		River Corridor	Survey Potential camping sites and access points along the river corridor									REC_ACCESS
3		River Corridor	Study prospective overland trail locations. Consider both linear and loop trails									REC_ACCESS
4		River Corridor	Identify those communities lacking municipal parks and ball fields. Work to develop parks in those communities									REC_ACCESS
5		River Corridor	Develop larger Fish and Boat Commission Staff to enforce fishing and boating regulations on the river									REC_ACCESS
6	Bradford	Standing Stone Rock	Develop a 33 acre parcel of land overlooking Standing Stone as a campground	41	44	2	76	20	30	41.73389	-76.34167	REC_ACCESS
7	Bradford	McCarty farm	Develop location for RV camping	41	38	42	76	13	48	41.64500	-76.23000	REC_ACCESS
8	Susquehanna	River Bounty, Susquehanna Depot	Develop 1/8 acre of land adjacent to the railroad for recreation	41	56	52	75	36	9	41.94778	-75.60250	REC_ACCESS
9	Susquehanna	Great Bend Township	Develop a park along the river									REC_ACCESS
10	Susquehanna	Great Bend Township	Locate and develop a boat launch and picnic area	41	57	44	75	44	30	41.96222	-75.74167	REC_ACCESS
11	Wyoming	Scottsville	Develop former Penelec property as a game land/river access – possibly a state park	41	35	43	76	5	47	41.59528	-76.09639	REC_ACCESS
Ecological and Environmental Development												
12		River Corridor	Develop public support for the efforts of local watershed groups and county conservation districts to identify and remediate water quality issues									ECO_ENV
13		River Corridor	Develop a comprehensive plan for the management of the corridor									ECO_ENV
14		River Corridor	Address erosion, delta and gravel bar formation in feeder streams									ECO_ENV
15		River Corridor	Develop watershed-based stormwater management plans									ECO_ENV
16		River Corridor	Monitor game fish levels, reduce introduced species such as Muskees, Grass-eating Cark, and Northern Pike. Promote Native species such as Bass and Walleye									ECO_ENV
17	Bradford	Corridor municipalities	Develop a water quality testing program for homeowners									ECO_ENV
18	Susquehanna	Corridor municipalities	Develop a watershed association for the Susquehanna River watershed									ECO_ENV
19	Wyoming	Vosberg Neck	Develop a Bald Eagle observation area	41	32	3	76	1	47	41.53417	-76.02972	ECO_ENV
Historic and Cultural Site Development												
20	Susquehanna	Susquehanna Depot	Add to the historic register: Erie Water Tower, the Clapper Mansion, the Episcopal Church	41	56	39	75	36	30	41.94417	-75.60833	HIST_CULT
21	Susquehanna	Shops Plaza, Susquehanna Depot	Repair Erie Water Tower	41	56	48	75	36	16	41.94667	-75.60444	HIST_CULT
22	Susquehanna	Susquehanna Depot Historical Society	Acquire ownership of a building for the museum	41	56	47	75	36	15	41.94639	-75.60417	HIST_CULT
Economic and Tourism Development												
23		River Corridor	Identify, develop and promote clusters of activities for tourists									ECON_TOUR
24		River Corridor	Encourage the development and promotion of local motels, campgrounds									ECON_TOUR
25	Bradford	French Asylum – Homet's Ferry	Develop a ferry to connect the French Asylum with the village of Homet's Ferry	41	44	11	76	19	35	41.73638889	-76.32638889	ECON_TOUR
26	Bradford	Wyalusing Rocks	Develop the overlook and develop a Native American interpretive center	41	41	16	76	16	21	41.68777778	-76.27250000	ECON_TOUR
27	Bradford	Marie Antionette Lookout	Develop a visitor's center	41	43	49	76	17	52	41.73027778	-76.29777778	ECON_TOUR
28	Susquehanna	Susquehanna Depot	Develop Rail Excursions	41	56	41	75	36	35	41.94472222	-75.60972222	ECON_TOUR
29	Susquehanna	State Street, Oakland Borough	Begin beautification program	41	57	0	75	36	21	41.95000000	-75.60583333	ECON_TOUR
30	Susquehanna	Oakland Borough	Repair sidewalks	41	47	0	75	36	21	41.78333333	-75.60583333	ECON_TOUR
31	Susquehanna	Downtown	Develop a new building for police station, municipal offices and library	41	56	42	75	36	15	41.94500000	-75.60416667	ECON_TOUR
32	Susquehanna	Main Street	Renovate Main Street with new sidewalks and lighting	41	56	45	75	36	8	41.94583333	-75.60222222	ECON_TOUR
Develop Partnerships Outside the Study Area												
33	Bradford & Susquehanna	Corridor	Develop relationship with NY State agencies, organizations and municipalities along the river									PARTNERS
Information and Education Development												
34		River Corridor	Create and install appropriate signage to better identify river access points									INFO_EDUC
35	Susquehanna	Susquehanna Depot, Lanesboro, Oakland Boro	Develop an "Arts and the River" celebration	41	56	50	75	36	14	41.94722222	-75.60388889	INFO_EDUC

Appendix C

Historic Organizations along the North Branch Corridor

COUNTY	NAME	LOCATION	TELEPHONE/EMAIL HOURS
Bradford	Bradford County Historical Society & Museum	Towanda	(570) 265-2240 Thurs-Sat. 10 a.m.- 4 p.m.
Bradford	French Asylum Historic Site	Off Rt. 187 Asylum Twp.	(570) 746-3979 May – October: Wed.- Sunday 11 a.m. – 4 p.m.
Bradford	Tioga Point Museum	PO Box 143 Athens, PA 188010 (724 South Main St. Athens)	(570) 888-7225 tiogapoint@extrope.net
Bradford	Society for Pennsylvania Archaeology Inc. - Andaste # 5	Meets 3 rd Monday of the Month, Bradford County Library	www.shol.com/spa20/spahome/SPA.htm
Bradford	Wyalusing Valley Museum	Main St. Wyalusing	Friday 1 – 5 p.m.; Saturday 9 a.m.- 1 pm. (570) 746-3939
Lackawanna	Lackawanna Heritage Valley – The Pennsylvania Heritage Parks Program	1300 Old Plank Road, Mayfield, PA 18433	(570) 876-6188
Luzerne	Society for Pennsylvania Archaeology Inc.– Frances Dorrance # 11	Meets once month at Duryea Municipal Bldg.	www.shol.com/spa20/spahome/SPA.htm
Luzerne	Delaware and Lehigh Canal Heritage Park Corridor	10 East Church St. – P-208 Bethlehem, PA 18018	(610) 861-9345 ht://www.nps.gov/dele email: dele3 @fast.net
Susquehanna	Susquehanna Depot Area Historical Society	Museum in the Shops Plaza, Susquehanna Borough	PO Box 161 Susquehanna, PA 18847 Hours: memorial Day through Labor Day Sunday 1-4 p.m. or by appointment (570) 879-2508
Wyoming	Wyoming County Historical Society	Bridge & Harrison Sts., Tunkhannock	April 15 – Oct 15 by appointment (570) 836-5303

NORTH BRANCH SUSQUEHANNA RIVER CONSERVATION PLAN

-  STUDY CORRIDOR:
1 MILE BUFFER OF THE
SUSQUEHANNA RIVER
-  STATE ROUTE
-  INTERSTATE ROAD
-  US TRAFFIC ROUTE
-  RIVER/STREAMS
-  STATE LINE
-  COUNTY BOUNDARY
-  TOWNSHIP BOUNDARIES
-  BOROUGH, CITIES
-  SUSQUEHANNA RIVER BASIN
-  AREA OUTSIDE OF THE
SUSQUEHANNA RIVER BASIN
-  WATER BODY

See Table 1 - Corridor Municipalities



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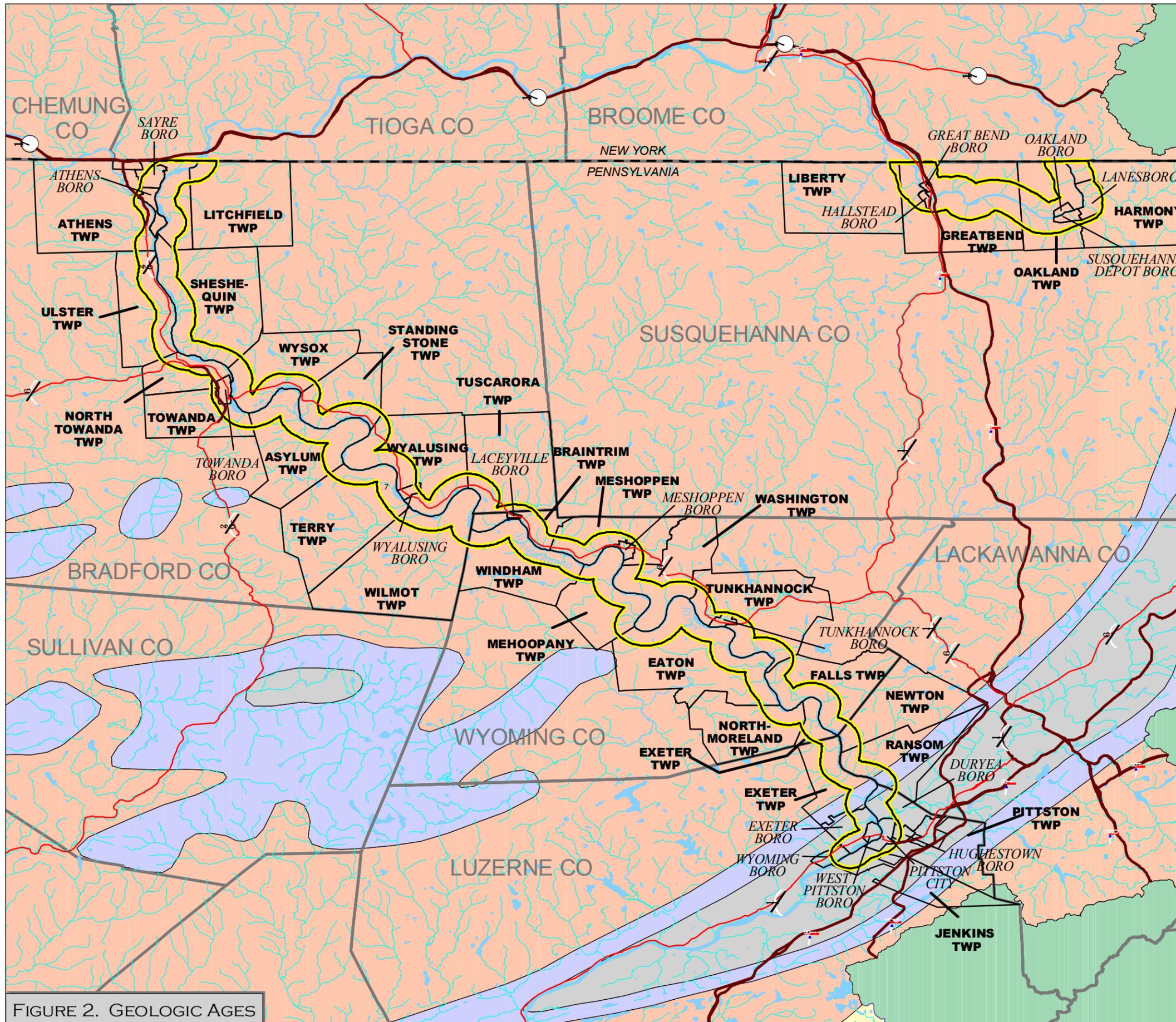


SRBC (FIG 1) 12-31-2002



FIGURE 1. STUDY AREA

NORTH BRANCH SUSQUEHANNA RIVER CONSERVATION PLAN



STUDY CORRIDOR:
1 MILE BUFFER OF THE
SUSQUEHANNA RIVER

GEOLOGIC AGES

- PENNSYLVANIAN**
(290-330 mil. yrs.)
Cyclic sequences of
sandstone, red and gray
shale, conglomerate,
clay, coal, and limestone.
- MISSISSIPPIAN**
(330-365 mil. yrs.)
Red and gray sandstone,
shale, and limestone.
- DEVONIAN**
(365-405 mil. yrs.)
Red sandstone, gray
shale, black shale,
limestone, and chert.

- STATE ROUTE**
- INTERSTATE ROAD**
- US TRAFFIC ROUTE**
- RIVER/STREAMS**
- STATE LINE**
- COUNTY BOUNDARY**
- TOWNSHIP/BOROUGH BOUNDARIES**
- SUSQUEHANNA RIVER BASIN**
- AREA OUTSIDE OF THE SUSQUEHANNA RIVER BASIN**
- WATER BODY**

See Section 1.2 - Topography and Geology



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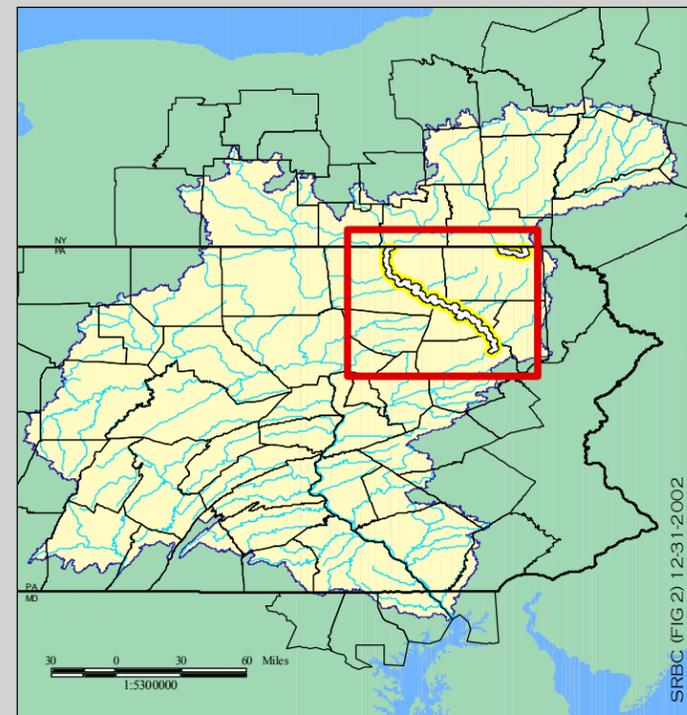
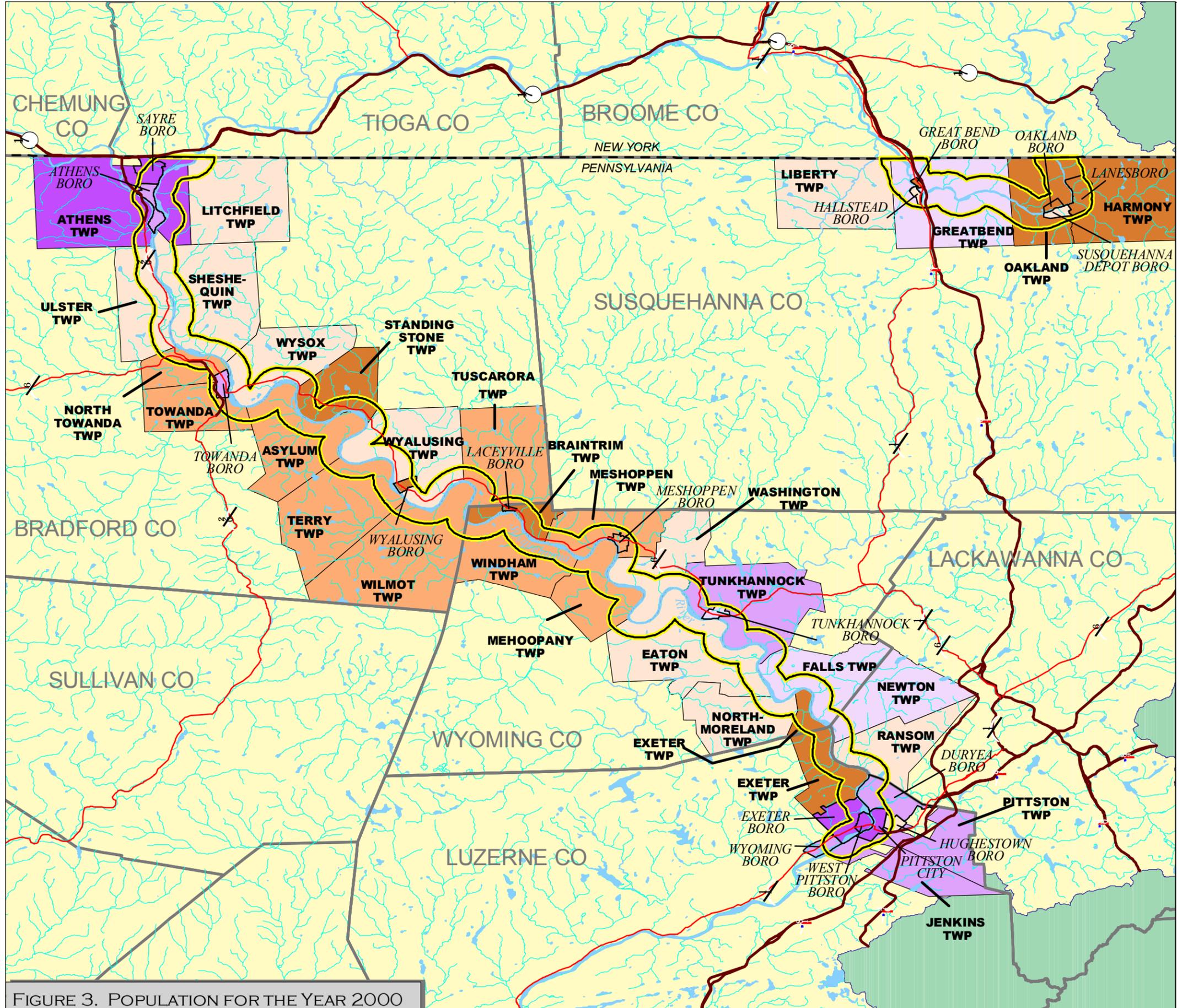


FIGURE 2. GEOLOGIC AGES

NORTH BRANCH SUSQUEHANNA RIVER CONSERVATION PLAN



STUDY CORRIDOR:
1 MILE BUFFER OF THE
SUSQUEHANNA RIVER

**YEAR 2000 POPULATION
FOR CITIES, TOWNSHIPS
AND BOROUGHS**

Dark Orange	396 - 800
Orange	801 - 1200
Light Orange	1201 - 1800
Light Purple	1801 - 3000
Medium Purple	3001 - 4700
Dark Purple	4701 - 8200

- STATE ROUTE
- INTERSTATE ROAD
- US TRAFFIC ROUTE
- RIVER/STREAMS
- STATE LINE
- COUNTY BOUNDARY
- TOWNSHIP/BOROUGH BOUNDARIES
- SUSQUEHANNA RIVER BASIN
- AREA OUTSIDE OF THE SUSQUEHANNA RIVER BASIN
- WATER BODY

See Table 3 - Population

Scale: 0 to 8 Miles
1:445000

Scale: 0 to 60 Miles
1:5300000

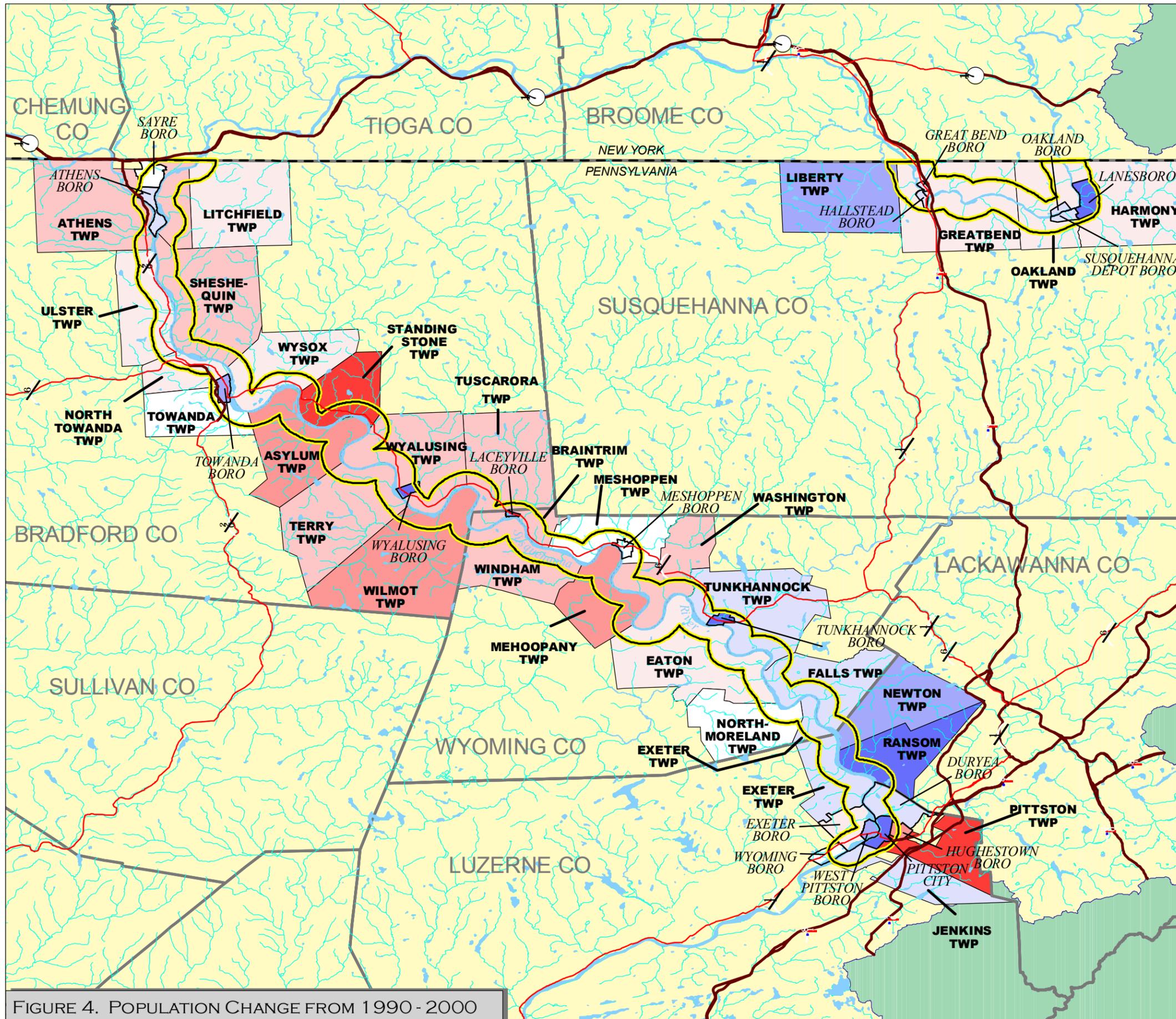
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FIGURE 3. POPULATION FOR THE YEAR 2000



SRBC (FIG 3) 12-31-2002

NORTH BRANCH SUSQUEHANNA RIVER CONSERVATION PLAN



STUDY CORRIDOR:
1 MILE BUFFER OF THE
SUSQUEHANNA RIVER

**PERCENT POPULATION
CHANGE FROM
1990 TO 2000**

- < -10
- 10 to -5
- 5 to -0.5
- 0.5 to 0.5
- 0.5 to 5
- 5 to 10
- 10 to 15
- > 15

See Table 3 - Population

- STATE ROUTE
- INTERSTATE ROAD
- US TRAFFIC ROUTE
- RIVER/STREAMS
- STATE LINE
- COUNTY BOUNDARY
- TOWNSHIP/BOROUGH BOUNDARIES
- SUSQUEHANNA RIVER BASIN
- AREA OUTSIDE OF THE SUSQUEHANNA RIVER BASIN
- WATER BODY

4 0 4 8 Miles
1:445000

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LINEAR HYDROLOGY IN PENNSYLVANIA WAS DELINEATED AT 1:24,000 SCALE.
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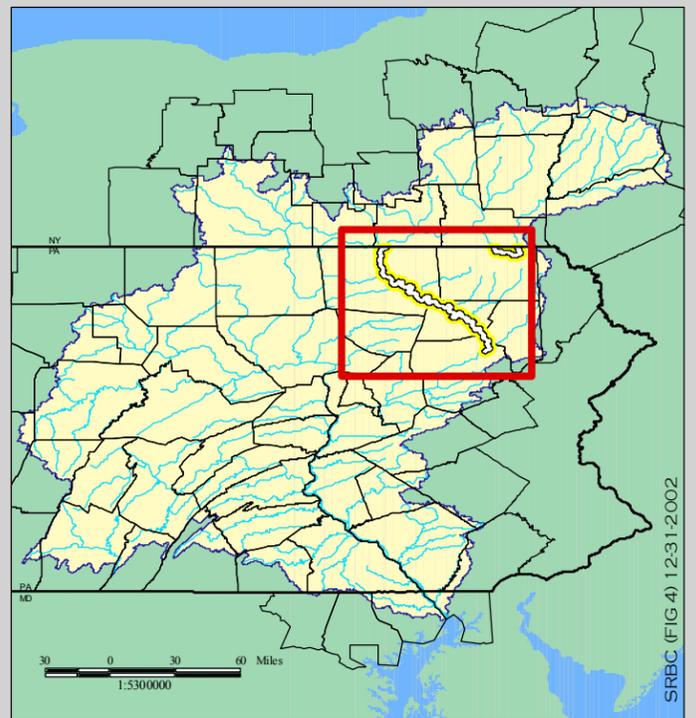
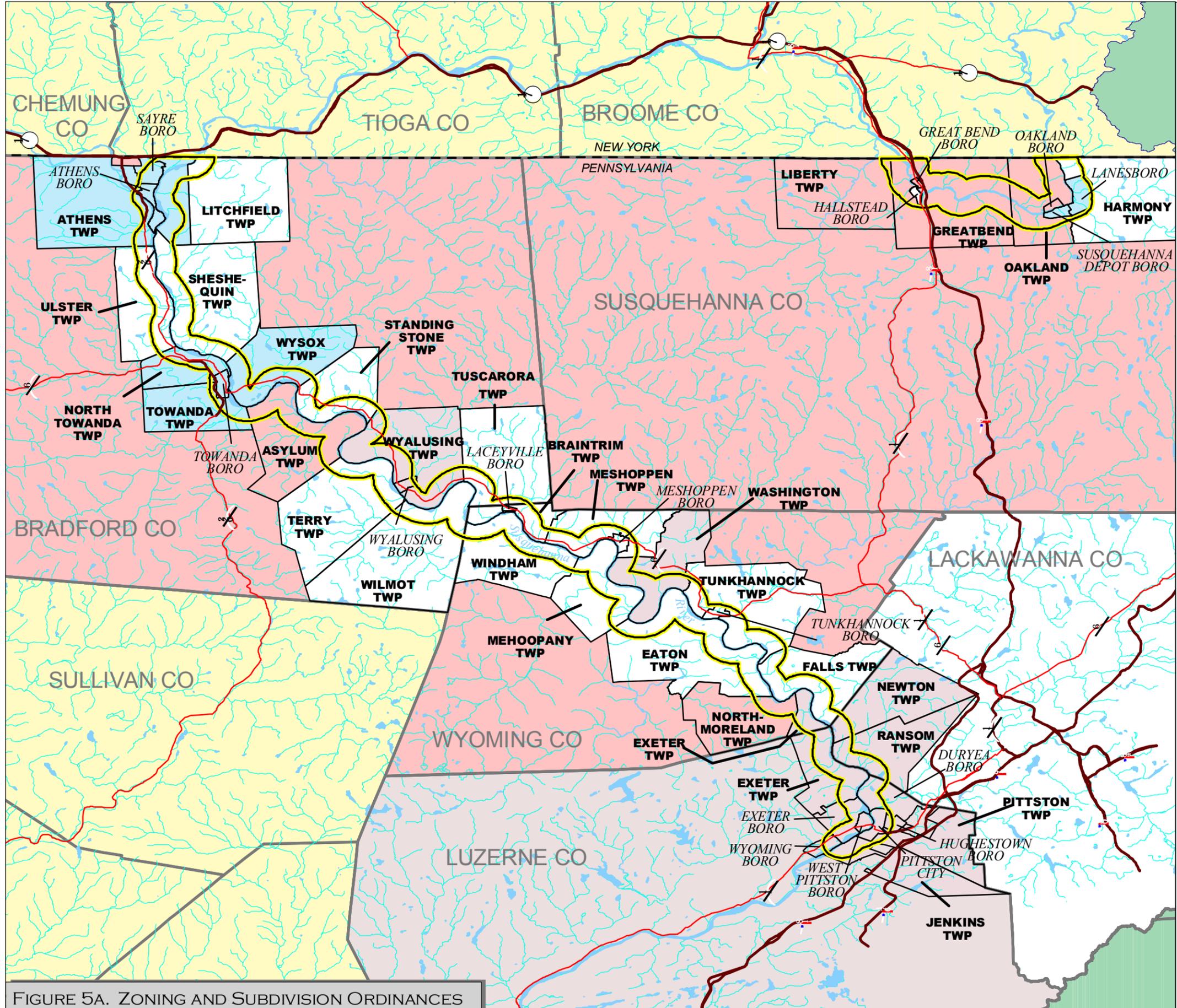


FIGURE 4. POPULATION CHANGE FROM 1990 - 2000

NORTH BRANCH SUSQUEHANNA RIVER CONSERVATION PLAN



- STUDY CORRIDOR:
1 MILE BUFFER OF THE
SUSQUEHANNA RIVER
 - STATE ROUTE
 - INTERSTATE ROAD
 - US TRAFFIC ROUTE
 - RIVER/STREAMS
 - STATE LINE
 - COUNTY BOUNDARY
 - TOWNSHIP/BOROUGH
BOUNDARIES
 - SUSQUEHANNA
RIVER BASIN
 - AREA OUTSIDE OF THE
SUSQUEHANNA
RIVER BASIN
 - WATER BODY
- ZONING AND
SUBDIVISION
ORDINANCES**
- SUBDIVISION
ORDINANCE
 - ZONING
ORDINANCE
 - ZONING AND
SUBDIVISION
ORDINANCE
 - NO ZONING OR
SUBDIVISION
ORDINANCE

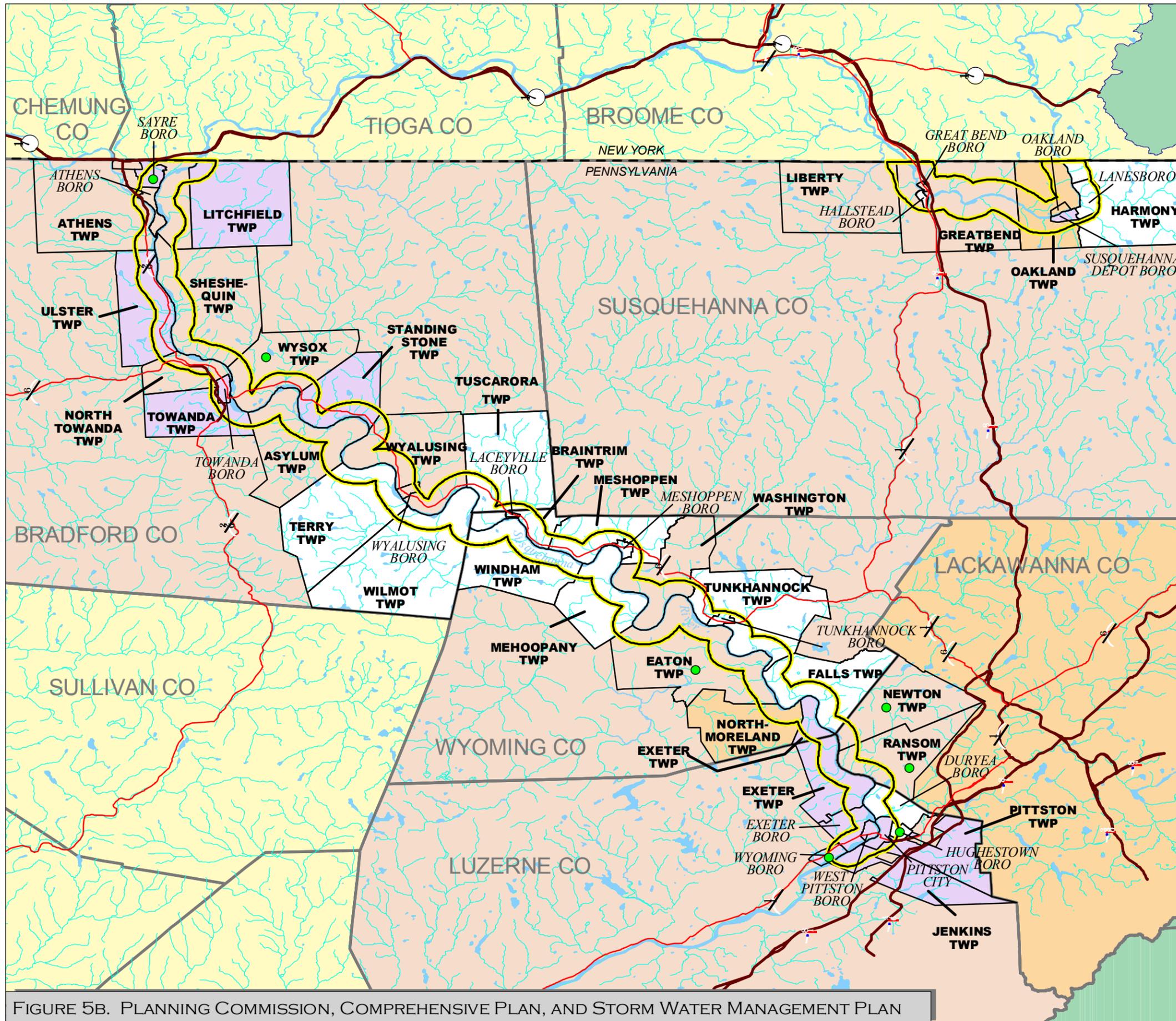
See Table 5 - Zoning,
Ordinances, and Plans



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FIGURE 5A. ZONING AND SUBDIVISION ORDINANCES



NORTH BRANCH SUSQUEHANNA RIVER CONSERVATION PLAN

- PLANNING COMMISSION, COMPREHENSIVE PLAN, AND STORM WATER MANAGEMENT PLAN
 - STUDY CORRIDOR: 1 MILE BUFFER OF THE SUSQUEHANNA RIVER
 - STATE ROUTE
 - INTERSTATE ROAD
 - US TRAFFIC ROUTE
 - RIVER/STREAMS
 - STATE LINE
 - COUNTY BOUNDARY
 - TOWNSHIP BOUNDARIES
 - BOROUGH, CITIES
 - SUSQUEHANNA RIVER BASIN
 - AREA OUTSIDE OF THE SUSQUEHANNA RIVER BASIN
 - WATER BODY
 - ONE OR MORE STORM WATER MANAGEMENT PLANS
- See Table 5 - Zoning, Ordinances, and Plans*

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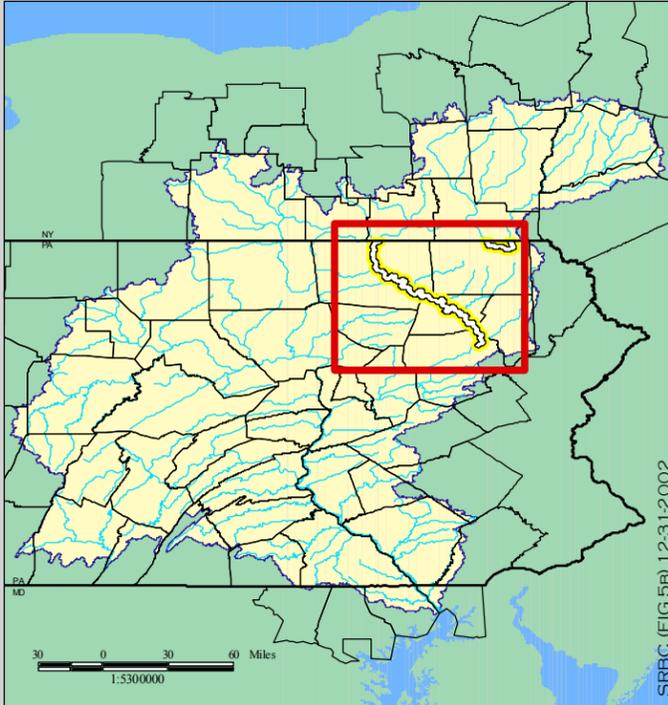
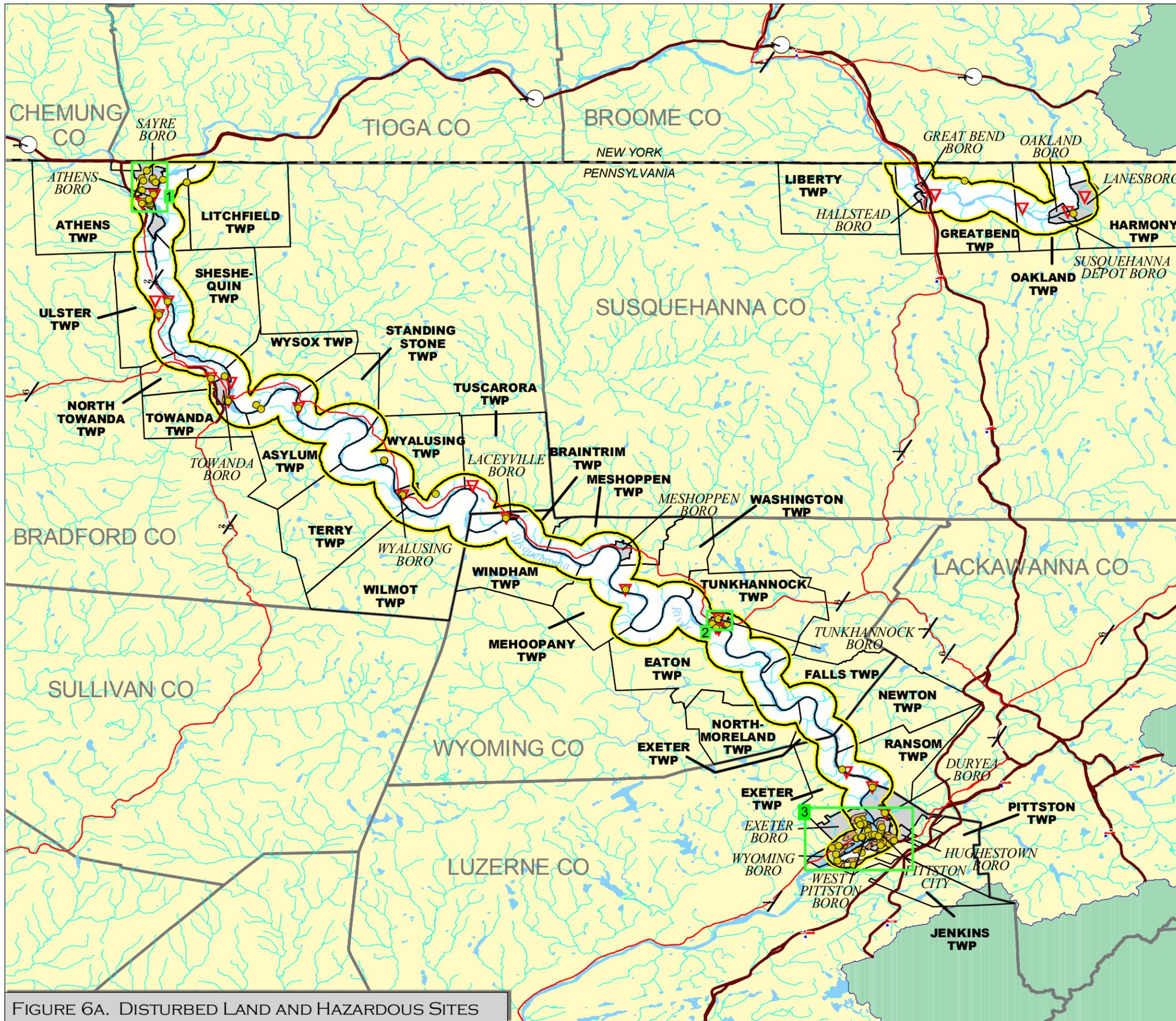


FIGURE 5B. PLANNING COMMISSION, COMPREHENSIVE PLAN, AND STORM WATER MANAGEMENT PLAN

SRBC (FIG 5B) 12-31-2002



NORTH BRANCH SUSQUEHANNA RIVER CONSERVATION PLAN

STUDY CORRIDOR: 1 MILE BUFFER OF THE SUSQUEHANNA RIVER	STATE ROUTE
ACID MINE LANDS	INTERSTATE ROAD
ACID MINE PROBLEM AREAS	US TRAFFIC ROUTE
HAZARDOUS SITES NPDES	RIVER/STREAMS
RCRIS, TRI, and/or IFD	STATE LINE
INSET IN FIGURE 14B	COUNTY BOUNDARY
<i>See Section 2.5 - Hazardous Areas</i>	TOWNSHIP BOUNDARIES
AREA OUTSIDE OF THE SUSQUEHANNA RIVER BASIN	BOROUGHS, CITIES
WATER BODY	SUSQUEHANNA RIVER BASIN

LINEAR HYDROLOGY IN NEW YORK WAS DELINEATED AT 1:100,000 SCALE.
 LINEAR HYDROLOGY IN PENNSYLVANIA WAS DELINEATED AT 1:24,000 SCALE.
 PROJECTION: GEOGRAPHIC, NORTH AMERICAN DATUM 1983
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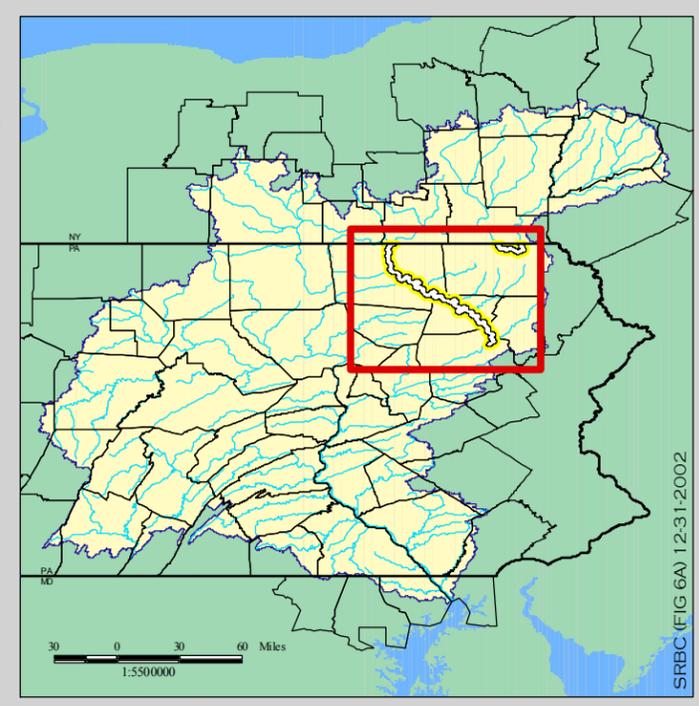


FIGURE 6A. DISTURBED LAND AND HAZARDOUS SITES

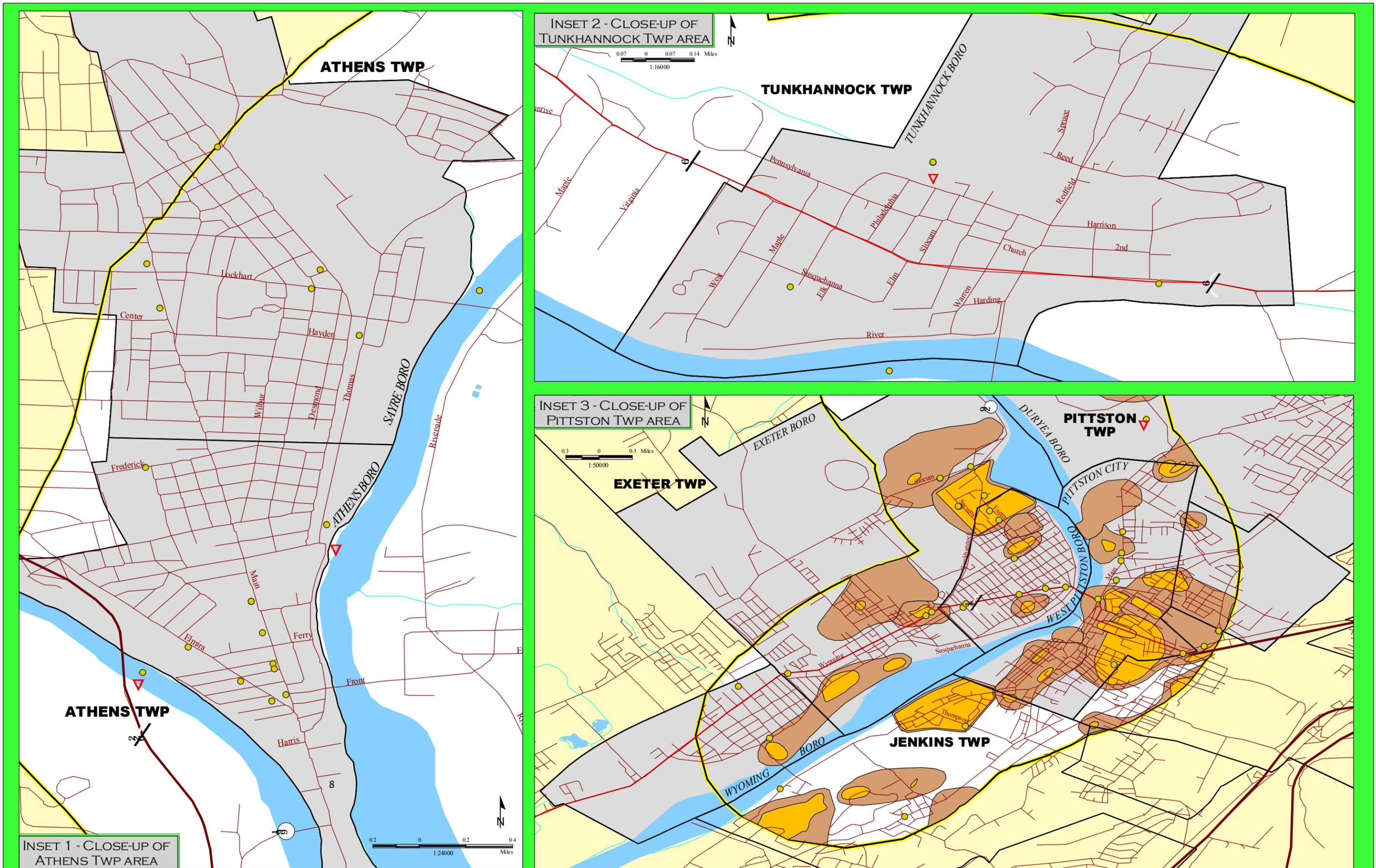
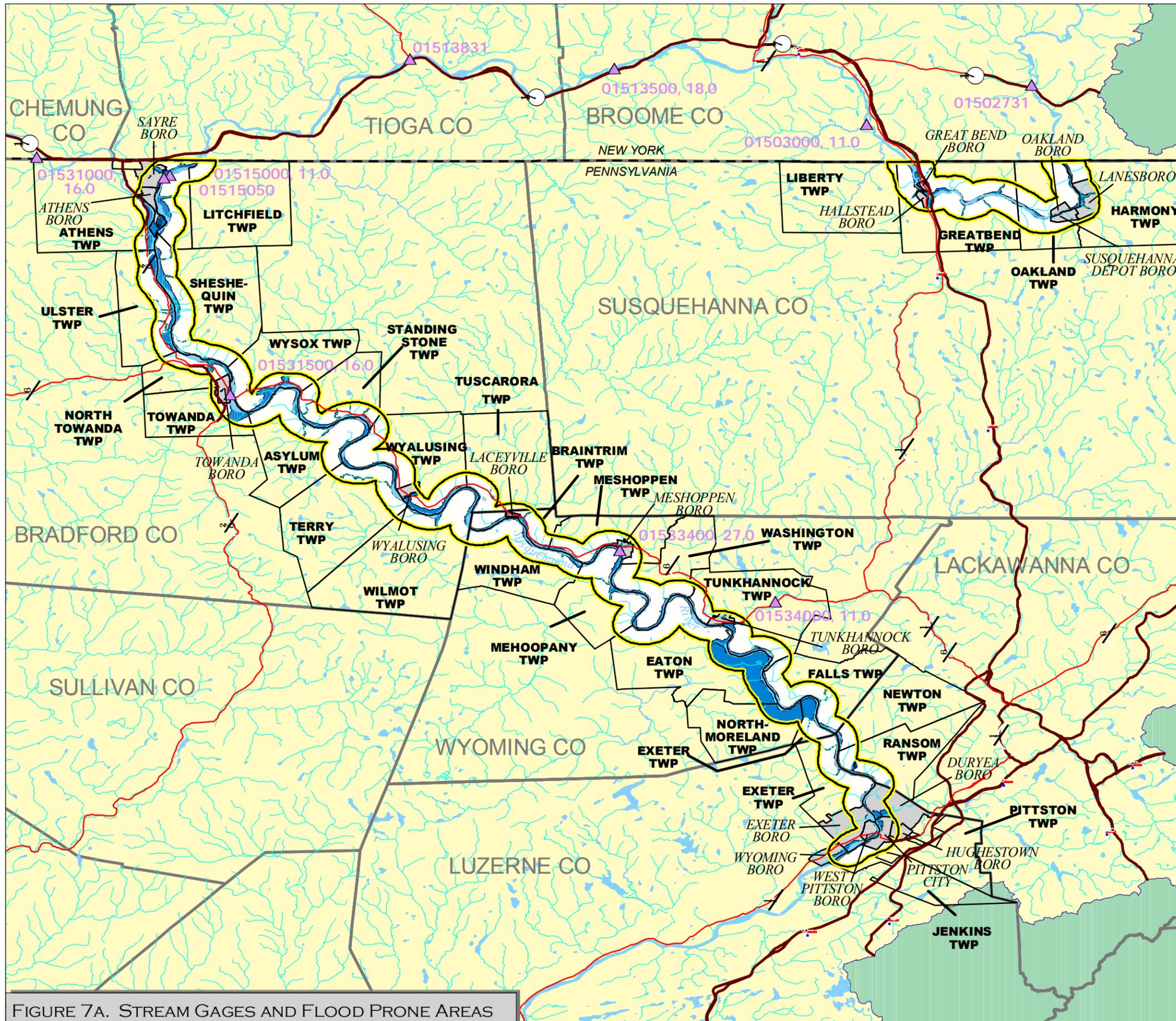


FIGURE 6B: ENLARGED AREAS OF CONCENTRATED DISTURBED AND HAZARDOUS SITES

SEE FIGURE 6A FOR CORRESPONDING LEGEND.



NORTH BRANCH SUSQUEHANNA RIVER CONSERVATION PLAN

- GAGES STATION NUMBER, FLOOD STAGE (FT)
- FLOOD ZONE 01534000, 11.0
- STUDY CORRIDOR:
1 MILE BUFFER OF THE
SUSQUEHANNA RIVER
- STATE ROUTE
- INTERSTATE ROAD
- US TRAFFIC ROUTE
- ~ RIVER/STREAMS
- STATE LINE
- COUNTY BOUNDARY
- TOWNSHIP BOUNDARIES
- BOROUGHS, CITIES
- SUSQUEHANNA RIVER BASIN
- AREA OUTSIDE OF THE
SUSQUEHANNA RIVER BASIN
- WATER BODY

See Table 6 - SRBC River Gages

4 0 4 8 Miles

1:445000

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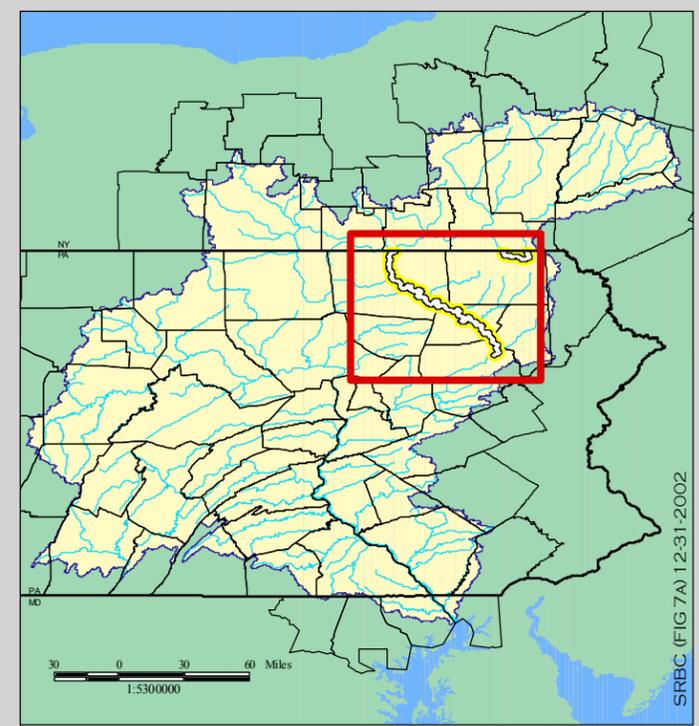


FIGURE 7A. STREAM GAGES AND FLOOD PRONE AREAS

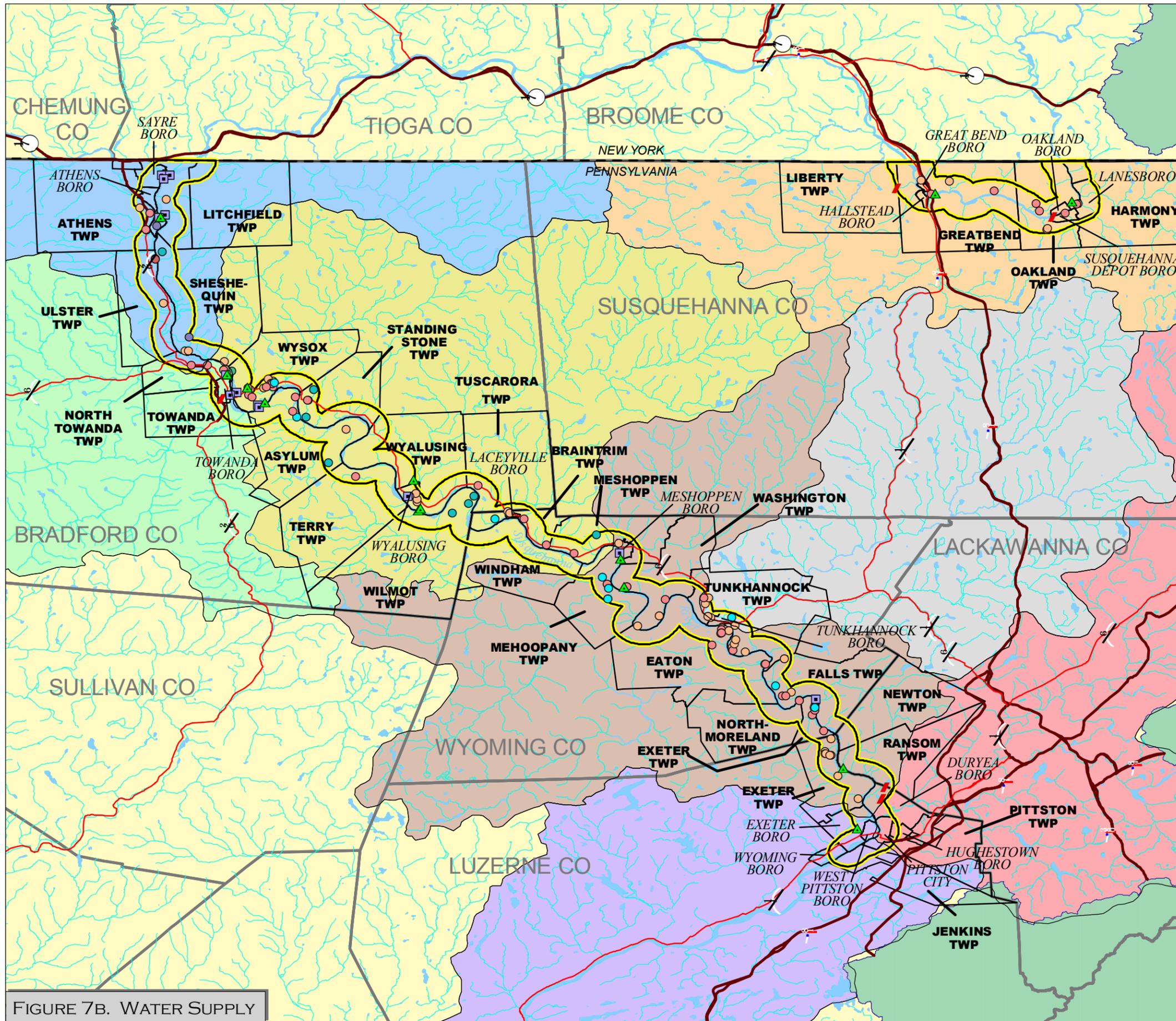


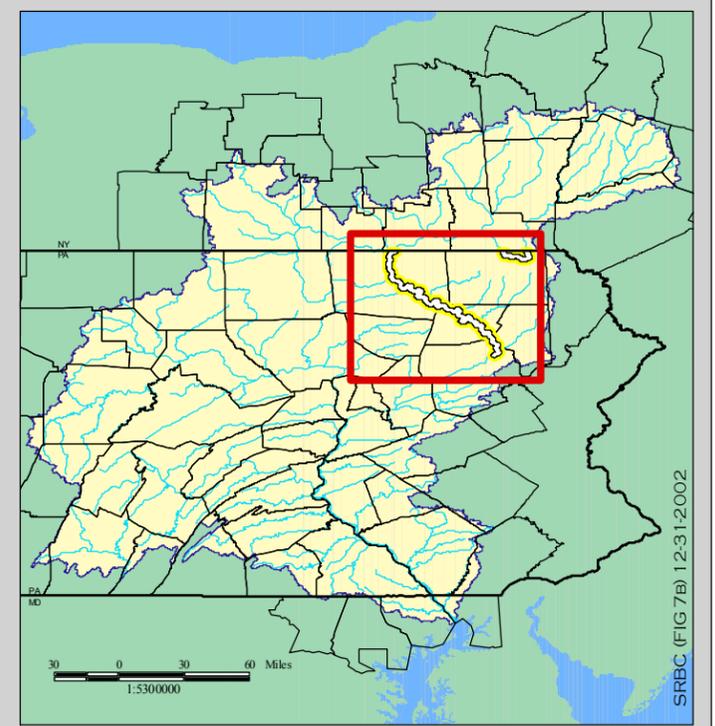
FIGURE 7B. WATER SUPPLY

NORTH BRANCH SUSQUEHANNA RIVER CONSERVATION PLAN

▲ SRBC APPROVED PROJECTS	▭ STUDY CORRIDOR: 1 MILE BUFFER OF THE SUSQUEHANNA RIVER
▬ DAMS	○ STATE ROUTE
▣ STREAM GAGES	▬ INTERSTATE ROAD
● WELL USAGE (DOMESTIC WELLS (478) HAVE NOT BEEN DISPLAYED FOR VISUAL PURPOSES)	▬ US TRAFFIC ROUTE
○ COMMERCIAL	▬ RIVER/STREAMS
○ FIRE	▬ STATE LINE
○ INDUSTRIAL	▬ COUNTY BOUNDARY
○ INSTITUTIONAL	▬ TOWNSHIP/BOROUGH BOUNDARIES
○ IRRIGATION	▬ SUSQUEHANNA RIVER BASIN
○ PUBLIC SUPPLY	▬ AREA OUTSIDE OF THE SUSQUEHANNA RIVER BASIN
○ STOCK	▬ WATER BODY
○ UNUSED	

See Tables
2 - Major Tributaries
6 - Stream Gages & Flooding
7 - Susquehanna River Dams

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SRBC (FIG 7B) 12-31-2002



NORTH BRANCH SUSQUEHANNA RIVER CONSERVATION PLAN

SRBC STUDY SITES (1997)

- R1
- R2
- R3

WATER QUALITY NETWORK (WQN) STATIONS

- ▲

STREAM DESIGNATIONS

- ▬ FISH ADVISORY
- ▬ IMPAIRED
- ▬ UNASSESSED
- ▬ ATTAINED

FISH ADVISORY LAKES

-

STUDY CORRIDOR: 1 MILE BUFFER OF THE SUSQUEHANNA RIVER

-

STATE ROUTE

-

INTERSTATE ROAD

-

US TRAFFIC ROUTE

-

RIVER/STREAMS

- ▬

STATE LINE

-

COUNTY BOUNDARY

-

TOWNSHIP BOUNDARIES

-

BOROUGHS, CITIES

-

SUSQUEHANNA RIVER BASIN

-

AREA OUTSIDE OF THE SUSQUEHANNA RIVER BASIN

-

WATER BODY

-

See Tables 8a - SRBC Study Sites and 8b - Water Quality Network Stations

1:445000

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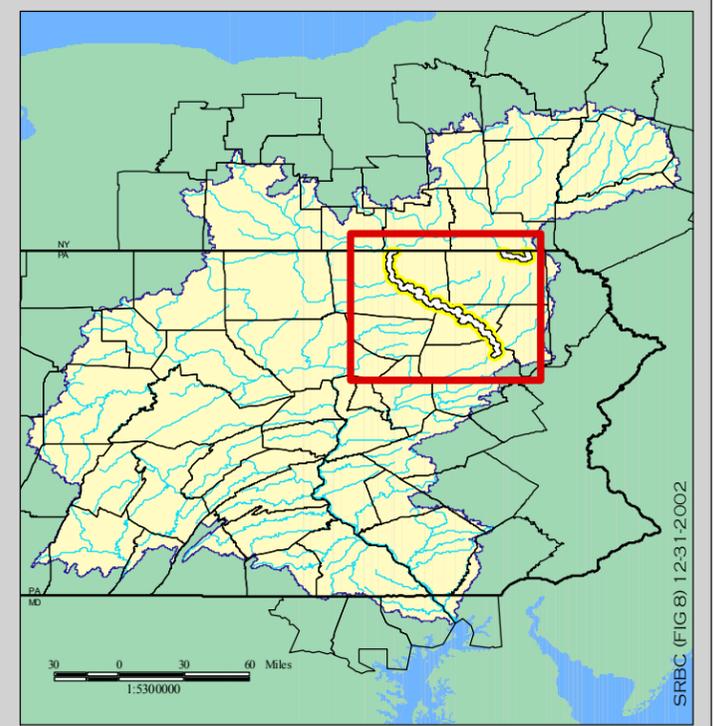
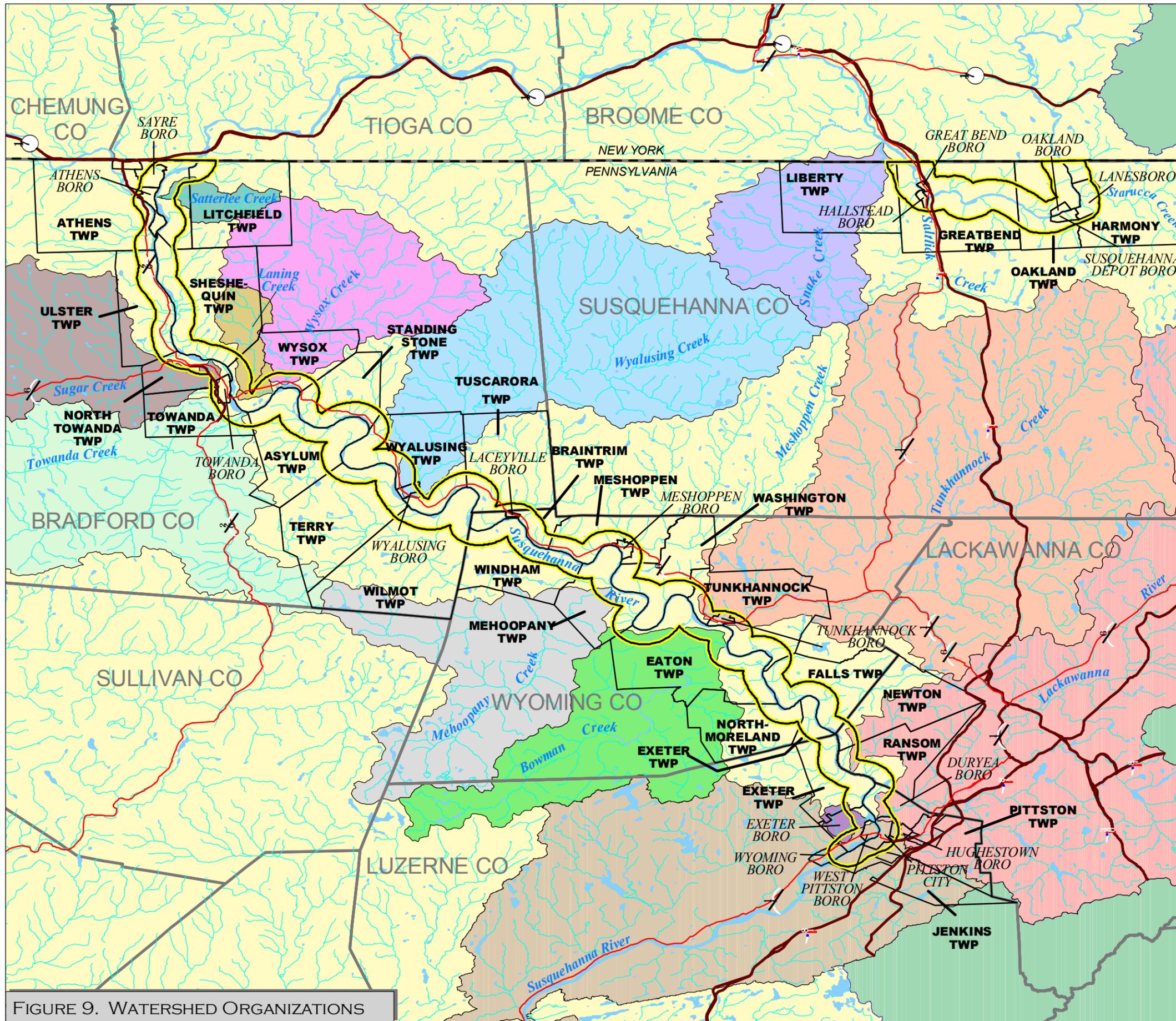


FIGURE 8. WATER QUALITY AND BIOLOGICAL RESOURCE CONDITION



NORTH BRANCH SUSQUEHANNA RIVER CONSERVATION PLAN

- WATERSHED ORGANIZATIONS**
- SATTERLEE CREEK WATERSHED ASSOC
 - WYSOX CREEK WATERSHED ASSOC
 - LANING CREEK WATERSHED ASSOC
 - SUGAR CREEK WATERSHED ASSOC
 - TOWANDA CREEK WATERSHED ASSOC
 - WYALUSING CREEK WATERSHED ASSOC
 - SNAKE CREEK WATERSHED ASSOC
 - MEHOOPANY CREEK WATERSHED ASSOC
 - COUNTRYSIDE CONSERVANCY
 - BOWMANS CREEK WATERSHED ASSOC
 - LACKAWANNA RIVER CORRIDOR ASSOC
 - HICKS CREEK WATERSHED ASSOC
 - WYOMING VALLEY WATERSHED COALITION
 - STUDY CORRIDOR: 1 MILE BUFFER OF THE SUSQUEHANNA RIVER
 - STATE ROUTE
 - INTERSTATE ROAD
 - US TRAFFIC ROUTE
 - RIVER/STREAMS
 - STATE LINE
 - COUNTY BOUNDARY
 - TOWNSHIP BOUNDARIES
 - BOROUGH, CITIES
 - SUSQUEHANNA RIVER BASIN
 - AREA OUTSIDE OF THE SUSQUEHANNA RIVER BASIN
 - WATER BODY

See Table 9 - Watershed Organizations

4 0 4 8 Miles
1:445000

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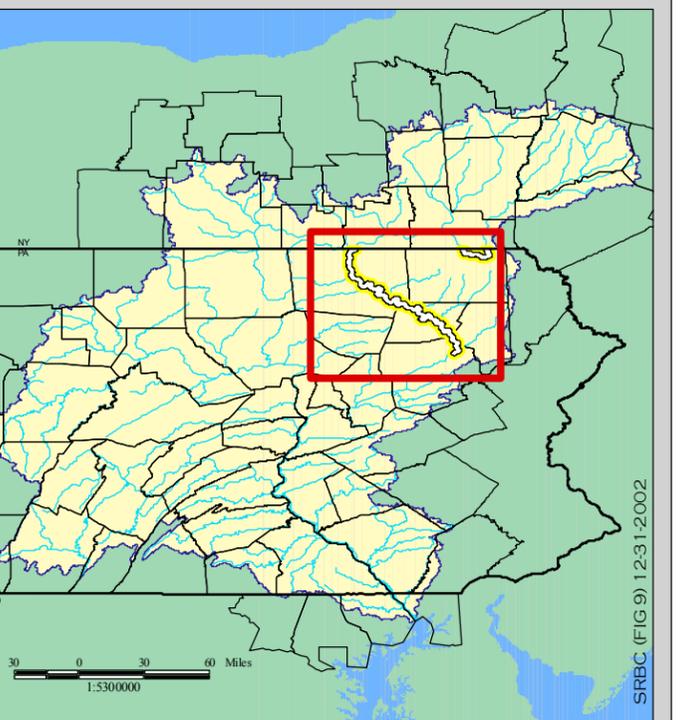
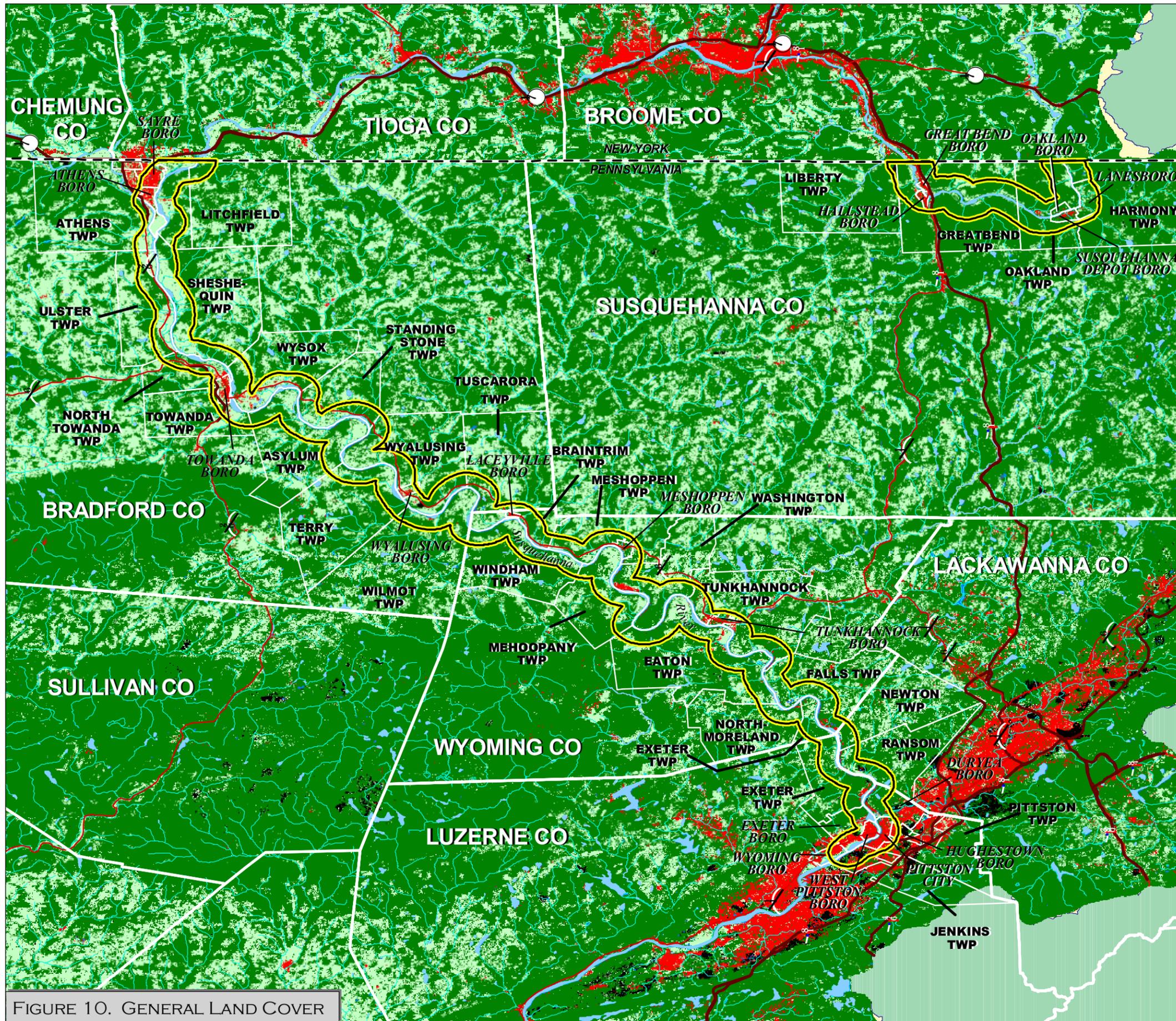



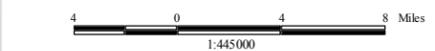
FIGURE 9. WATERSHED ORGANIZATIONS



NORTH BRANCH SUSQUEHANNA RIVER CONSERVATION PLAN

- STUDY CORRIDOR: 1 MILE BUFFER OF THE SUSQUEHANNA RIVER
- LAND COVER CLASSIFICATIONS**
 - WATER
 - DEVELOPED
 - CULTIVATED
 - NATURAL VEGETATED AREA
 - BARREN
 - NO DATA
- STATE ROUTE
- INTERSTATE ROAD
- US TRAFFIC ROUTE
- RIVER/STREAMS
- STATE LINE
- COUNTY BOUNDARY
- TOWNSHIP/BOROUGH BOUNDARIES
- SUSQUEHANNA RIVER BASIN
- AREA OUTSIDE OF THE SUSQUEHANNA RIVER BASIN
- WATER BODY

See Section 4.0 - Biological Resources



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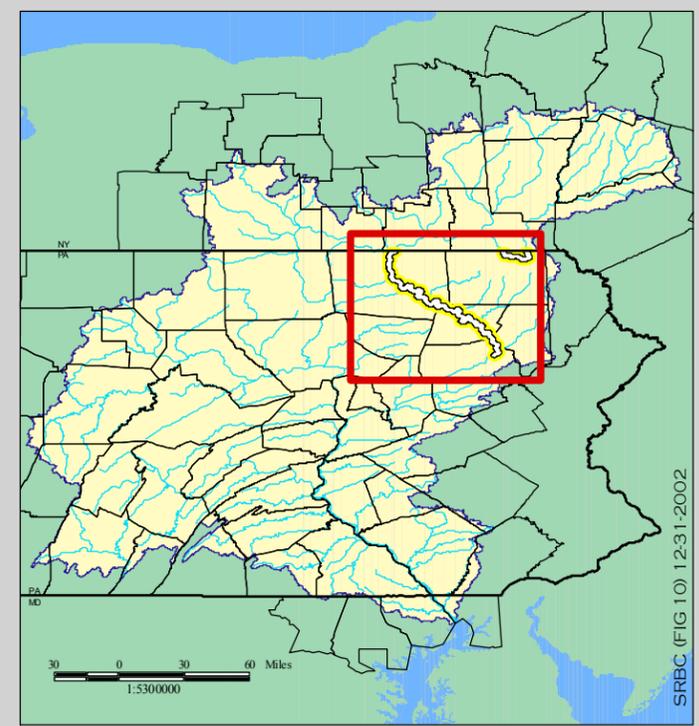
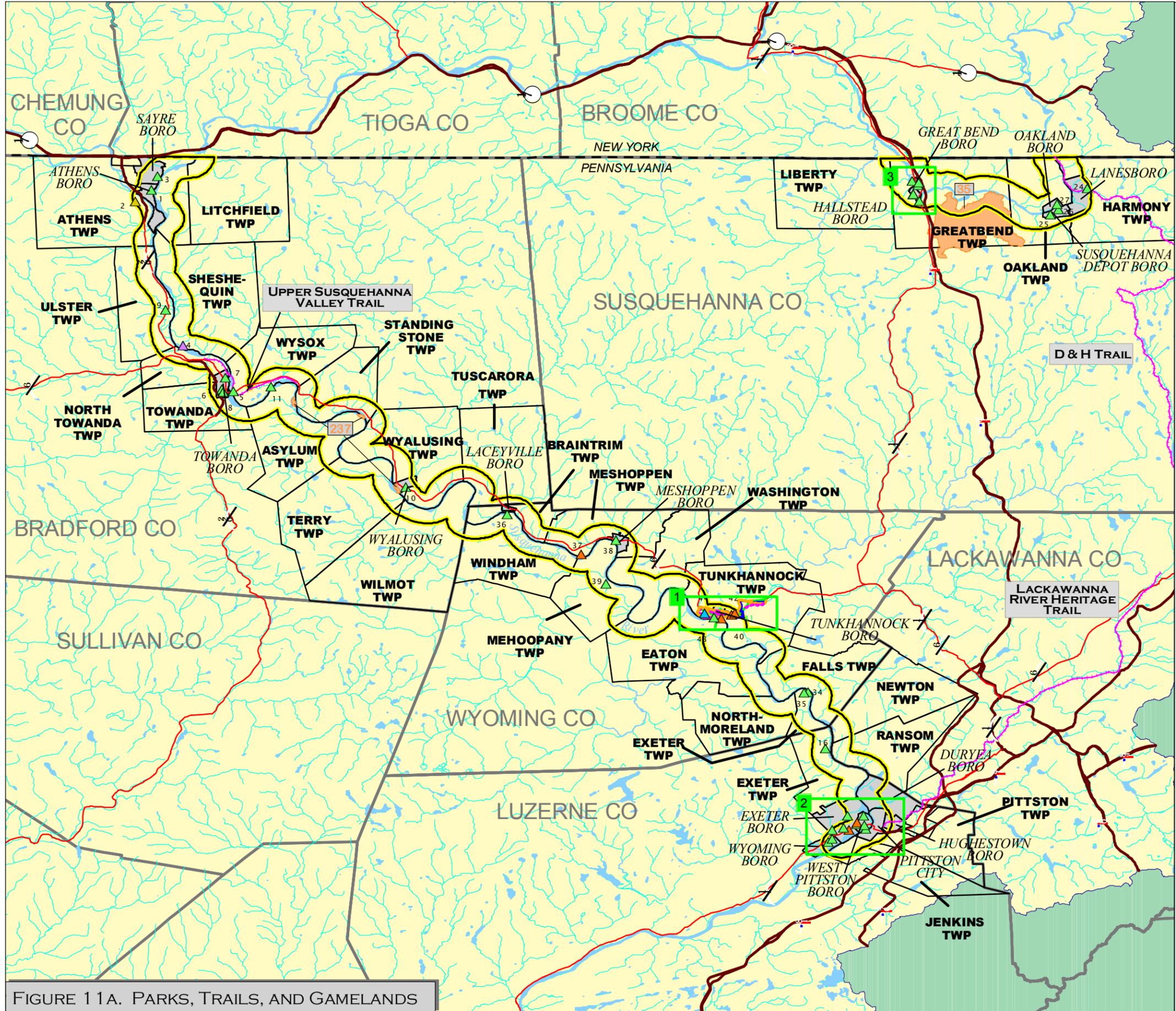


FIGURE 10. GENERAL LAND COVER

NORTH BRANCH SUSQUEHANNA RIVER CONSERVATION PLAN



- STUDY CORRIDOR: 1 MILE BUFFER OF THE SUSQUEHANNA RIVER
- ▲ COUNTY
- ▲ MUNICIPALITY
- ▲ NON-PROFIT
- ▲ PRIVATE
- ▲ STATE
- STATE ROUTE
- INTERSTATE ROAD
- US TRAFFIC ROUTE
- ~ RIVER/STREAMS
- STATE LINE
- COUNTY BOUNDARY
- TOWNSHIP BOUNDARIES
- BOROUGHS, CITIES
- SUSQUEHANNA RIVER BASIN
- AREA OUTSIDE OF THE SUSQUEHANNA RIVER BASIN
- WATER BODY
- ~ RAILS TO TRAILS (Locations of these trails are approximate.)
- ~ ALTERNATE ROUTE
- ~ BLUE ROUTE
- ~ HIGHWAY
- ~ BIKE ROUTE
- ~ MAIN TRAIL

*See Tables 11 - Parks & Trails
11a - Gamelands*





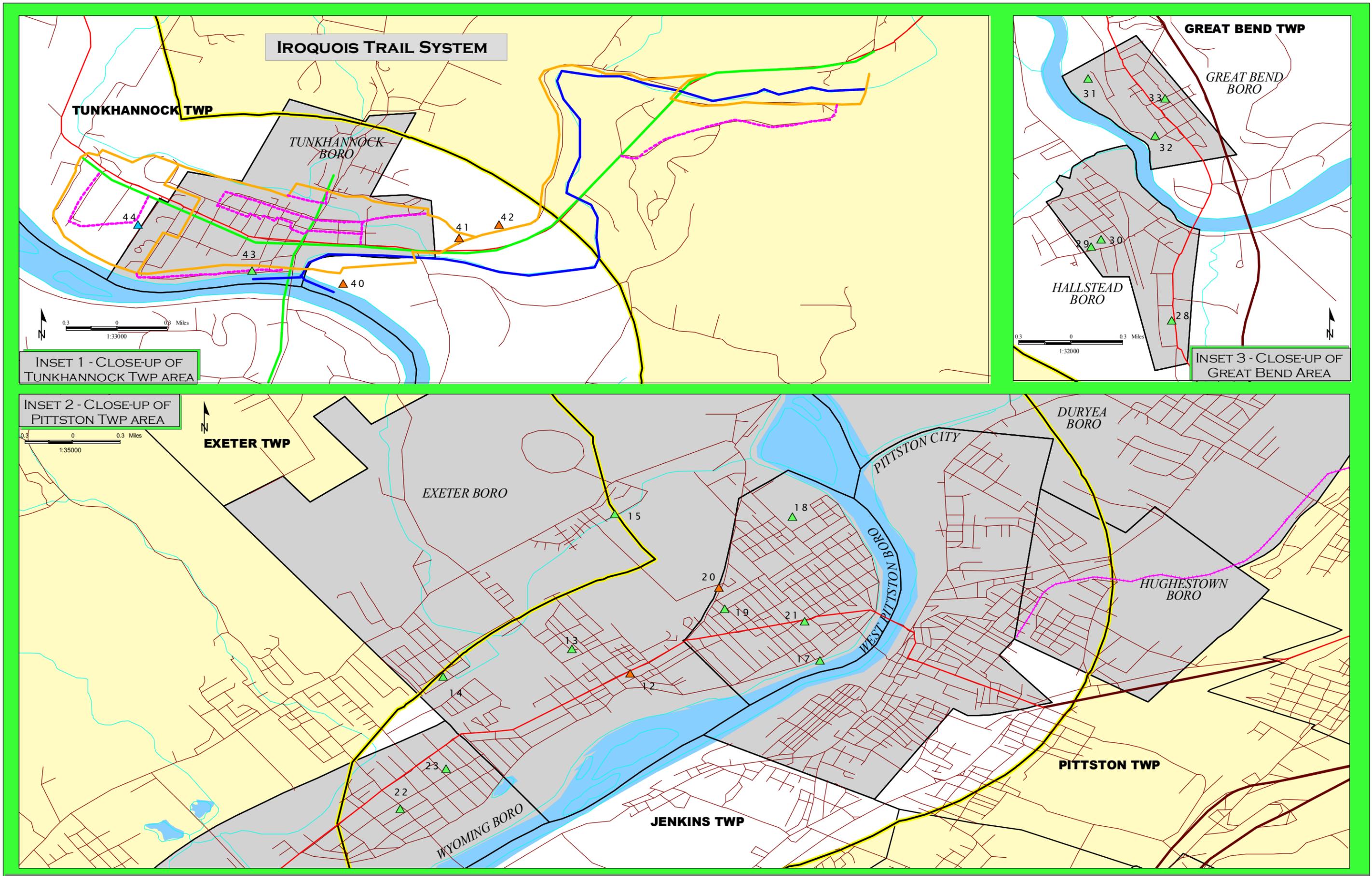

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FIGURE 11A. PARKS, TRAILS, AND GAMESLANDS

SRBC (FIG 05) 09-11-2002



INSET 1 - CLOSE-UP OF TUNKHANNOCK TWP AREA

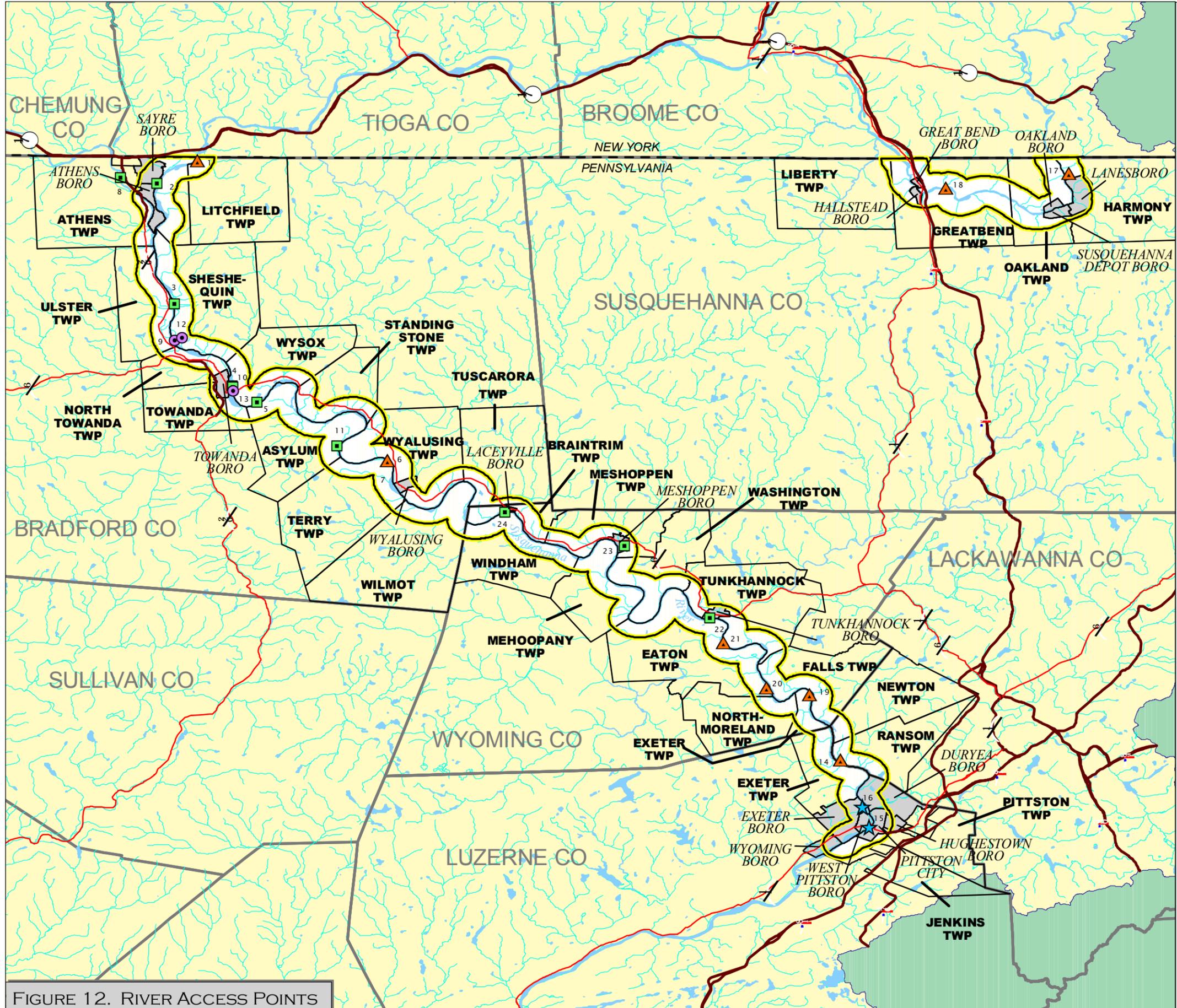
INSET 2 - CLOSE-UP OF PITSTON TWP AREA

INSET 3 - CLOSE-UP OF GREAT BEND AREA

FIGURE 11B: ENLARGED AREAS OF PARKS AND TRAILS

SEE FIGURE 11A FOR CORRESPONDING LEGEND.

NORTH BRANCH SUSQUEHANNA RIVER CONSERVATION PLAN



- STUDY CORRIDOR: 1 MILE BUFFER OF THE SUSQUEHANNA RIVER
- RIVER ACCESS POINTS
- COUNTY GOVERNMENT
- LOCAL GOVERNMENT
- PA FISH & BOAT COMMISSION
- ★ PRIVATE
- STATE ROUTE
- INTERSTATE ROAD
- US TRAFFIC ROUTE
- ~ RIVER/STREAMS
- STATE LINE
- COUNTY BOUNDARY
- TOWNSHIP BOUNDARIES
- BOROUGH, CITIES
- SUSQUEHANNA RIVER BASIN
- AREA OUTSIDE OF THE SUSQUEHANNA RIVER BASIN
- WATER BODY

See Table 12 - River Access Points

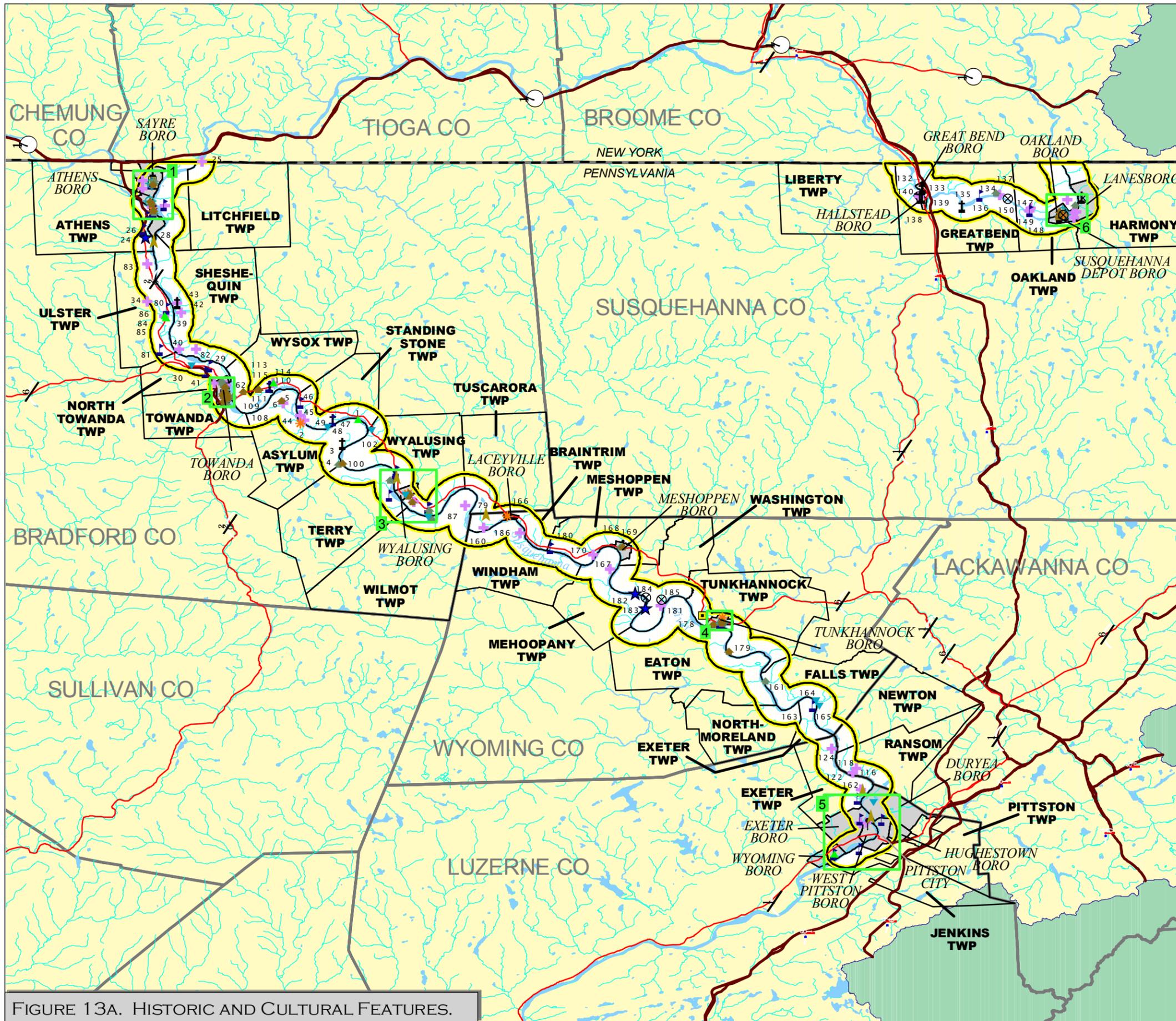


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SRBC (FIG 12) 12-31-2002

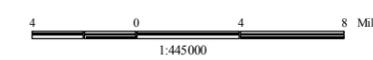
FIGURE 12. RIVER ACCESS POINTS



NORTH BRANCH SUSQUEHANNA RIVER CONSERVATION PLAN

★ CANAL SYSTEM	▭ STUDY CORRIDOR: 1 MILE BUFFER OF THE SUSQUEHANNA RIVER
✚ CEMETARY	○ STATE ROUTE
⚡ CHURCH	⚡ INTERSTATE ROAD
⚡ COAL INDUSTRY	⚡ US TRAFFIC ROUTE
⚡ CULTURAL EVENTS	⚡ RIVER/STREAMS
⚡ HISTORICAL DISTRICT	⚡ STATE LINE
⚡ HISTORICAL MARKER	⚡ COUNTY BOUNDARY
▲ MONUMENT	⚡ TOWNSHIP BOUNDARIES
★ MUSEUM	⚡ BOROUGH, CITIES
▲ NATIVE AMERICAN	⚡ SUSQUEHANNA RIVER BASIN
▲ PRIVATE RESIDENCE	⚡ AREA OUTSIDE OF THE SUSQUEHANNA RIVER BASIN
▲ PUBLIC BUILDING	⚡ WATER BODY
⊗ RAILROAD	
▼ SCENIC	
▭ INSET IN FIGURE 2B	
▭ HISTORICAL DISTRICT AREAS	

*See Table 13 -
Historical and Cultural Sites*






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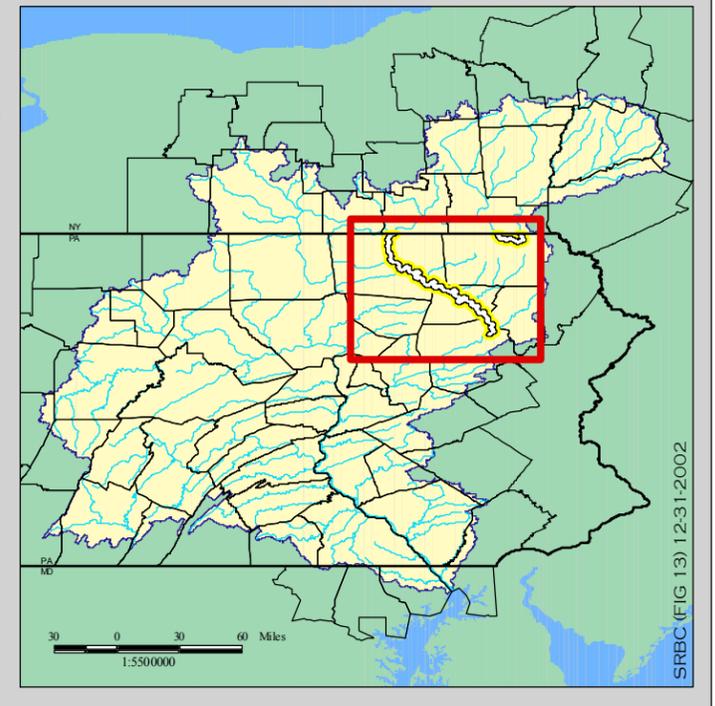


FIGURE 13A. HISTORIC AND CULTURAL FEATURES.

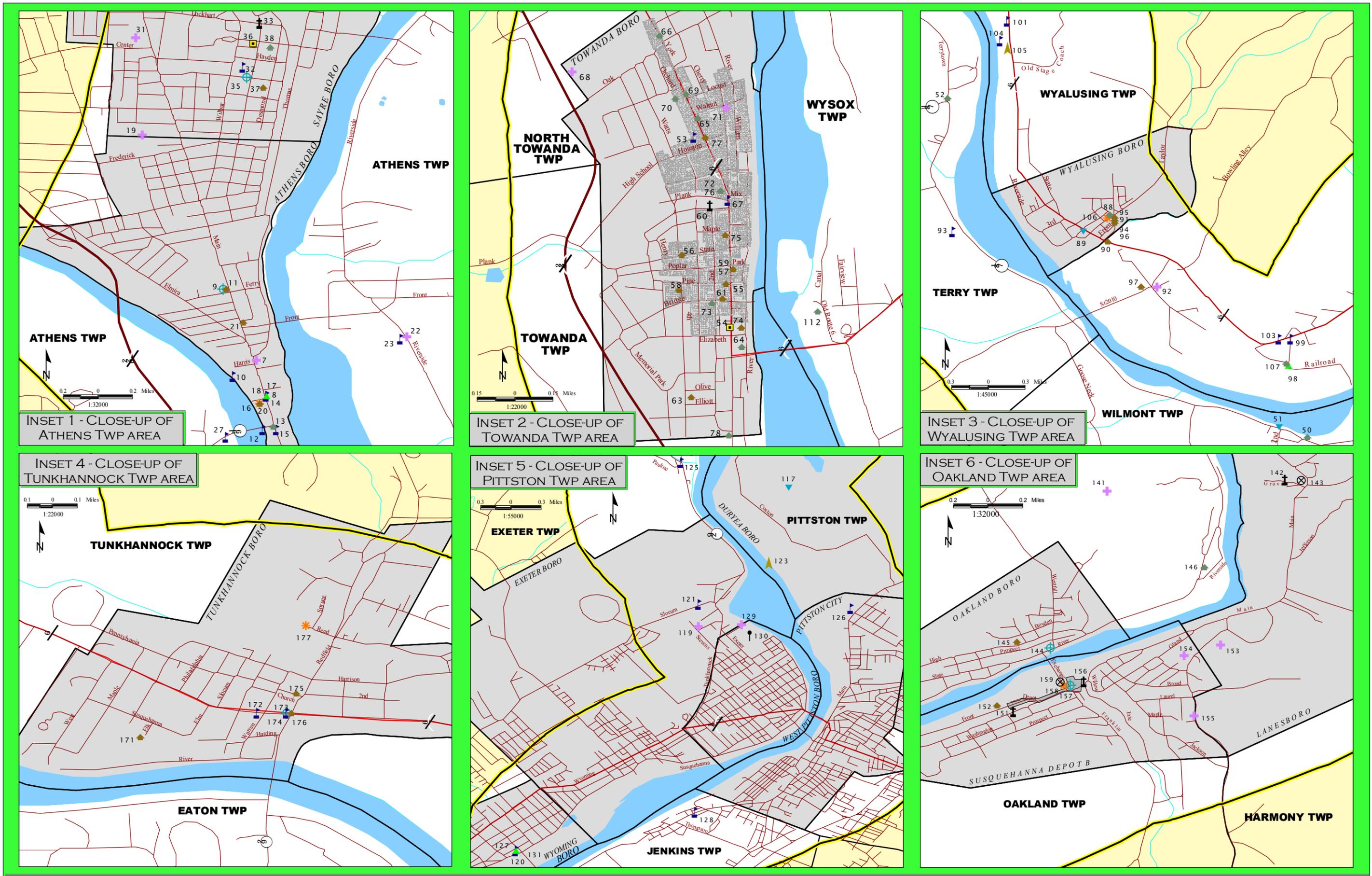


FIGURE 13B: ENLARGED AREAS OF CONCENTRATED HISTORICAL AND CULTURAL FEATURES.

SEE FIGURE 13A FOR THE CORRESPONDING LEGEND.

NORTH BRANCH SUSQUEHANNA RIVER CONSERVATION PLAN

- ACTION PLAN ITEMS**
- STUDY CORRIDOR: 1 MILE BUFFER OF THE SUSQUEHANNA RIVER
 - RECREATION AND PUBLIC ACCESS DEVELOPMENT
 - ECOLOGICAL AND ENVIRONMENTAL DEVELOPMENT
 - HISTORIC AND CULTURAL SITE DEVELOPMENT
 - ECONOMIC AND TOURISM DEVELOPMENT
 - INFORMATION AND EDUCATION DEVELOPMENT
 - 1 - DEVELOP MAPPED RIVER TRAIL
 - STATE ROUTE
 - INTERSTATE ROAD
 - US TRAFFIC ROUTE
 - RIVER/STREAMS
 - STATE LINE
 - COUNTY BOUNDARY
 - TOWNSHIP BOUNDARIES
 - BOROUGH, CITIES
 - SUSQUEHANNA RIVER BASIN
 - AREA OUTSIDE OF THE SUSQUEHANNA RIVER BASIN
 - WATER BODY

See Appendix A for a complete list of Action Plan Items



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SRBC (FIG 14) 12-31-2002

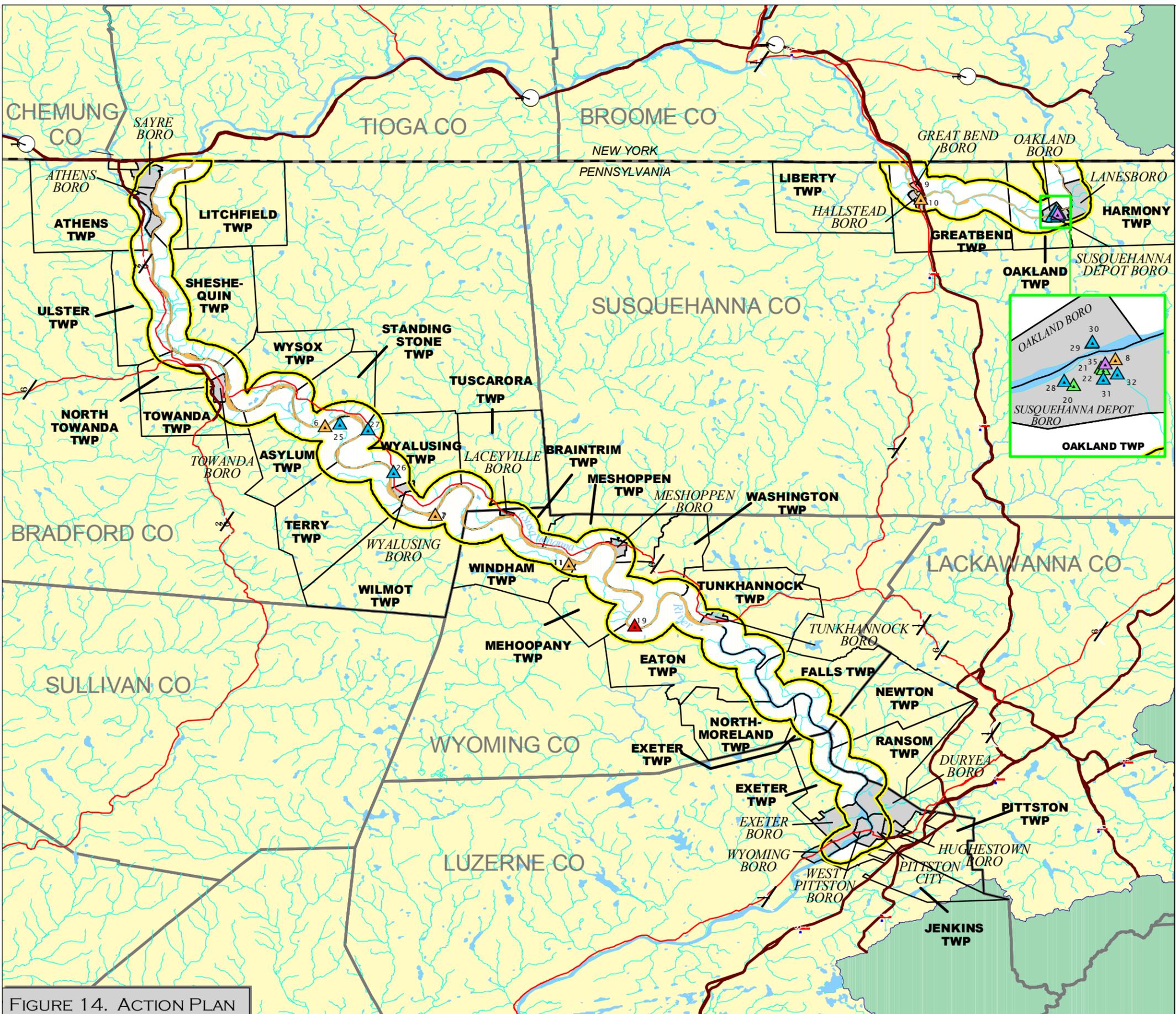


FIGURE 14. ACTION PLAN