## PREFACE

The development of the Tunkhannock Creek Conservation Plan is the first attempt at studying the Tunkhannock Creek Watershed as a distinct entity. The project's focus was not directed at just the main branches or a narrow corridor bordering those branches, but on all the land that drains every minor seepage and every quiet brook across 32 municipalities, all of which eventually empties into this wonderful Creek. The Plan describes today's biological, physical, and socio- economic environment within the watershed as well as portraying scenes from its geological, archeological, and historical past.

Current statuses of various wetland habitats and their values are emphasized. Observations of rare birds and mammals that do not appear on the current PA Natural Diversity Inventory lists for the watershed area were uncovered and are included in the section detailing the PNDI's Species of Special Concern and the Natural Areas Inventory of Wyoming County.

A signicant portion of the report covers current land use and development. Resource management programs including the accomplishments of specific agricultural and conservation programs that are improving land use practices within the watershed boundaries are summarized.

The Plan also includes the results of a comprehensive two page questionnaire that was answered by all 32 municipalities. The results of this questionnaire have been compiled in tables that document:

- Detailed descriptions of all the public and quasipublic recreational sites available in the watershed including fishing access sites
- Municipalities' opinions on the strongest threats to the watershed
- Municipalities' current and planned projects that will protect and enhance the Tunkhannock Creek Watershed

One-hundred and forty-four concerned individuals completed a Values To Creek/Threats to Creek Survey and these results are presented in the report.

Lastly, and perhaps most importantly, are the recommendations given by municipalities, government organizations, environmental organizations, farmers, landowners and citizens to protect the long-term health of the watershed and its enjoyment by the public.

## ACKNOWLEDGEMENTS

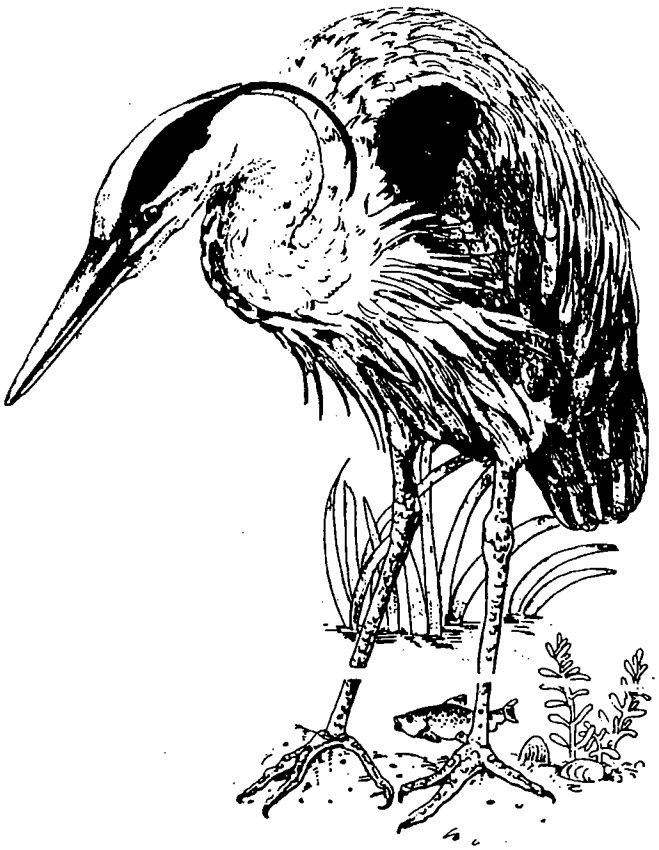
There are countless individuals and organizations to thank for their help in the completion of this project including DCNR for awarding the grant and Donald Dreese, Chief of the Rivers Conservation Program, for his dedicated support and interest, all members of the PEC staff especially Joanne Denworth, Stanley Davies, Russ Johnson, and Robert Hughes, the Economic Development Council of Northeast Pennsylvania for

their considerable socio-economic data, Wilkes University for their excellent production of the maps illustrating the document, and to the 904 individuals representing municipalities, environmentalists, farmers, sportsmen, landowners and other entities who participated in this project, in particular the members of the Countryside Conservancy for their valued counsel.

Lastly, the project manager wishes to express her deep appreciation to her family for their constant encouragement through-out the entire, lengthy project, and to two individuals in particular - Rosamond Peck of Waverly, for her incredible enthusiasm and long standing support at all times, and Hugh R. Saxton, the "amateur" archaeologist residing in Nicholson Borough, whose entire life has been in harmony with the spirit and nature of the Tunkhannock Creek Watershed, for his inspiration.

Joyce E. Barnes Stone
Project Manager,
Tunkhannock Creek Conservation Plan
Pennsylvania Environmental Council
October 1, 1997

Great Blue Heron



Art Source: Hickman, Pamela, Wetlands, Federation of Ontario Naturalists, Kids Can Press Ltd., Toronto, Canada

## EXECUTIVE SUMMARY

The Tunkhannock Creek Conservation Plan is designed to be a guidebook for municipalities, other government officials, conservation organizations, landowners, and citizens interested in protecting and enhancing the Tunkhannock Creek Watershed. The following summarizes some of the data collected from this two year study that appears in this Plan:

The Tunkhannock Creek Watershed drains 413 square miles of flat-topped mountains, rolling hills and steep-sided stream valleys within portions of Susquehanna, Lackawanna, and Wyoming Counties. The total population in the 32 townships found within the watershed is about 49,500 or one person per five acres. Forests comprise approximately 59% of the watershed, agriculture - 32%, urban/commercial - 4%, wetlands - 3%, open water - 1%, and other - 1%.

### Biological Resources

The tributaries within the watershed generally contain clean unpolluted water that support 27 species of fish. Having identified 218 bird species in the watershed, Wyoming County Commissioner William Reid has identified almost every bird species that exists in the watershed! Based on studies in an adjoining watershed, about 340 plant species, 31 mammal, 16 amphibian and 8 reptile species exist in the Tunkhannock Creek Watershed. While larger mammal species such as bear, deer, beaver, coyote and the river otter are more numerous today than 50 years ago, small mammals such as the water shrew, Allegheny woodrat and probably the northern flying squirrel have significantly decreased in numbers.

### Wetlands

Wetlands compose 2.7% of all the land surface in Lackawanna, Susquehanna and Wyoming Counties. This figure is almost twice the percentage of the wetland acreage found across the state. Seventeen slide presentations on the Tunkhannock Creek Watershed were given during the course of the project period; each program emphasized the many benefits that local wetlands provide for the watershed area.

Fourteen confirmed species on the PA Natural Diversity Inventory's List of Confirmed Species of Special Concern have been located in the watershed. In addition Mr. William Reid supplied this report with an additional 21 names of species found on the State List that he has observed in the watershed. Most of these species live in wetlands.

The PNDI also identified seven wetlands that are described in the report that contain rare, threatened or endangered species or represent a high quality natural area. These sites are currently privately owned.

Protection of wetlands was the fourth highest concern that the public expressed for the watershed in a survey that was conducted during this study. As the public is interested in protecting wetlands, and seven high quality wetlands have already been identified by the

PNDI, future land protection efforts should focus first on these wetlands.

## Values Issues and Recreational Opportunities

The values most appreciated in the watershed by the respondents to a Values to Creek Survey were Natural Beauty, Protection of Watershed, Wild and Scenic Values and Protection of Wetlands. Yet despite the public's strong interest in these values, very little of the watershed is protected for the future. Only half of the municipalities own land that can be used by the public for recreational purposes, and this only amounts to 205 acres. When State Game Lands, the Lackawanna State Park and other land owned by educational institutions is added to the acreage, the total amount of land that is protected at 36 sites is raised to 3,571 acres. This represents 1.3% of the watershed. Only 13 sites exist for public fishing totaling approximately 16,066 feet of stream frontage. Clearly, a need exists for purchasing and preserving more open space for future generations.

Increasing the amount of park land in a municipality by purchasing tax delinquent properties does not appear to be a practical solution as 97% of the municipalities reported that they did not contain any tax delinquent properties. Half of the municipalities reported that they would be interested in acquiring open space if financial and legal assistance were available.

## Threats

The major source of pollution in the watershed comes from non-point sources. It was estimated by County Conservation Districts in 1989 that an average of 6.6 tons of soil per acre per year were lost into the Creek. In addition 153 tons of nitrogen and 15.5 tons of phosphates were entering the creek system annually.

Water pollution was considered the greatest threat in the Threats To Creek Survey. Respondents felt strongly that something needs to be done to curtail the practice of using the Creek as a garbage dump. They also suspect that inadequate septic systems is seriously contributing to the pollution problem. The fourth ranking threat was losing wetlands.

The municipalities also thought that inadequate septic systems were the biggest threat. Soil erosion was ranked third. Sixty-six percent of the municipalities are currently without a wastewater treatment facility. Thirteen townships reported that it would be 30 years or more before they could foresee that a treatment plant would be constructed in their township. This reflects the rural nature of the watershed and the expectation (hope?) that it will remain this way.

With 96% of the land in the Tunkhannock Creek Watershed in forests, agriculture, and wildlands, the watershed appears safe from unwanted development. However the population increased 59% between 1960 and 1990, and 8% between 1980 and 1990. The watershed is beginning to show the signs of urban sprawl as farmlands are sold and subdivided, and new

homes, schools, roads, mini malls, etc. consume the landscape.

While all three counties have planning commissions, floodplain ordinances and two counties have a comprehensive plan and land development ordinances, the watershed would be better protected if regional planning could be conducted on issues that affect the environment.

Each of the counties needs a director of economic development who would encourage planning that draws attention to the unique natural resources that exist in the watershed. Seven municipalities expressed that having parks and recreational facilities would attract tourism or improve the quality of their community which would strengthen the tax base.

## Resource Management Accomplishments

All three counties have very dedicated personnel in every conservation and agricultural department. These individuals have accomplished many long range benefits for the watershed and could perform even greater deeds if more money were available for their programs. Although many of the land protection programs are new, the following has already been accomplished:

•Since 1989 when the Conservation Districts assessed the amount of non-point sources entering the Creek system, the Districts have prepared twenty-eight Nutrient Management Plans for farms in the watershed, reducing excess nutrients from entering surface and ground waters on 5,267 acres. Thirty-one farms are on a waiting list for a Nutrient Management Plan.

• The Agricultural Land Preservation Board approved easement purchases for four farms in the watershed, protecting 582 acres of prime farmland.

• Forty-nine farms in the watershed have 1,637 acres of land signed up in the Conservation Reserve Program.

• Although the total number of acres enrolled in the Clean and Green Act specifically for the watershed could not be determined, 488,405 acres are enrolled in this program across Susquehanna and Wyoming Counties.

• Again while the number of acres enrolled in an Agricultural Security Area could not be determined for the watershed area specifically, 29% of the land in the three counties is protected in an Agricultural Security Area!

## The Future

The fact that 18 municipalities have plans to complete projects that will protect or enhance the Creek is exciting. A total of 944 individuals attended meetings or one of the 41 workshops that were conducted during this study. A look at the long list of recommendations at the end of this report, which were generated by these individuals, is also encouraging. It is hoped that the interest and enthusiasm observed during this study will lead to a permanent watershed organization that will protect this wonderful natural resource - the Tunkhannock Creek Watershed!

# SECTION I.

# PROJECT AREA CHARACTERISTICS

## LOCATION, SIZE, MAJOR TRIBUTARIES

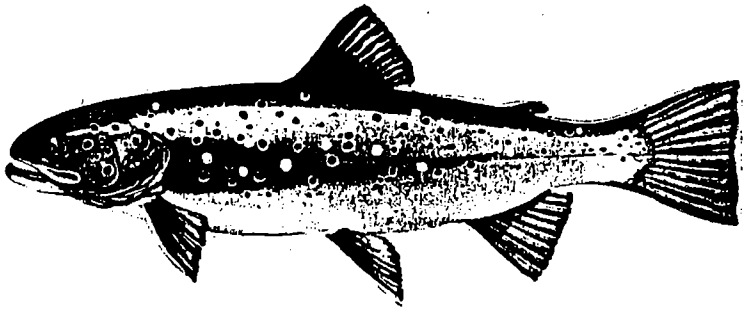
The Tunkhannock Creek Watershed is located within 32 municipalities in Susquehanna, Lackawanna, and Wyoming Counties in the northeastern part of Pennsylvania (Chart 1). Named for its major waterway, the main branch of the Tunkhannock Creek is about 44 miles long, with both a major East Branch and South Branch, and hundreds of small tributaries. Before emptying into the North Branch of the Susquehanna River in Tunkhannock Township, the Creek drains 413 square miles of flat-topped mountains, hills and steep-sided stream valleys (State Water Plan, 1979). About 60% or 159,057 acres of this watershed lie in the lower portion of Susquehanna County, 21% or 56,648 acres exist in northwestern Lackawanna County, and the remaining 19% or 48,945 acres fall within the northeastern section of Wyoming County for a total of 264,650 acres. Map 1 depicts the location of the watershed in relation to the major cities in the region.

## SUBBASIN 4

In the State Water Plan, a comprehensive report on water and watersheds in Pennsylvania, the Tunkhannock Creek Watershed falls within the area which has been designated the Upper Susquehanna River Subbasin 4. The subbasin has been divided into seven watersheds, as indicated in Figure 1 and Table 1. Proof of the fact that the Tunkhannock Creek Watershed is a significant watershed in Subbasin 4 is that the letter, F. Smaller watersheds in the subbasin were either grouped together as one watershed or excluded in the study.

## GENERAL WATERSHED DESCRIPTION

From its beginning at Cheraine Pond in Jackson Township to its end in the Tunkhannock Boro, the Tunkhannock Creek flows past lovely forested hillsides, dairy farms, rock outcroppings, and wetlands. It is the ideal stream to enjoy and protect. Most of its tributaries - Butler Creek, Nine Partners Creek, Horton Creek, Martins Creek, Hop Bottom Creek, drain sparsely populated countryside and afford excellent fishing opportunities for the angler. Because its clean, unpolluted waters support a healthy fishery on their own (Cold Water Fishery upstream on the main stem), the entire creek system is only stocked in seven locations.



Brown Trout - Stocked and Naturally Reproducing in Creek

## Chart 1. 32 Townships and Boroughs in the Tunkhannock Creek Watershed

**Susquehanna County**

Townships:

Ararat
Bridgewater
Brooklyn
Clifford
Gibson
Harford
Herrick
Jackson
Lathrop
Lenox
New Milford
Springville
Thompson

Boroughs:

Hop Bottom

**Lackawanna County**

Townships:

Abington
Benton
Glenburn
Greenfield
LaPlume
North Abington
Scott
West Abington

Boroughs:

Clarks Summit
Dalton

**Wyoming County**

Townships:

Clinton
Lemon
Nicholson
Tunkhannock
Overfield

Boroughs:

Factoryville
Nicholson
Tunkhannock

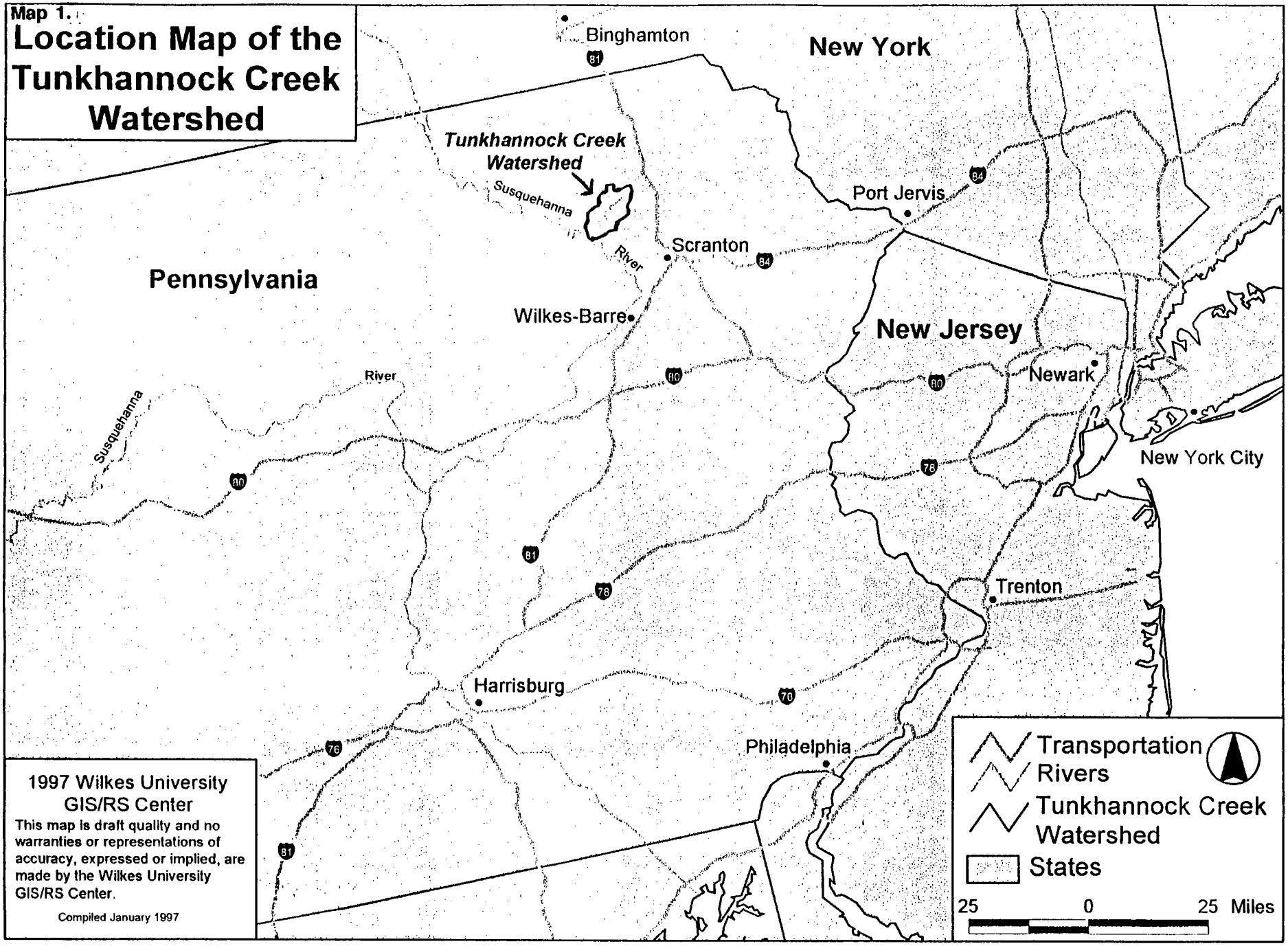
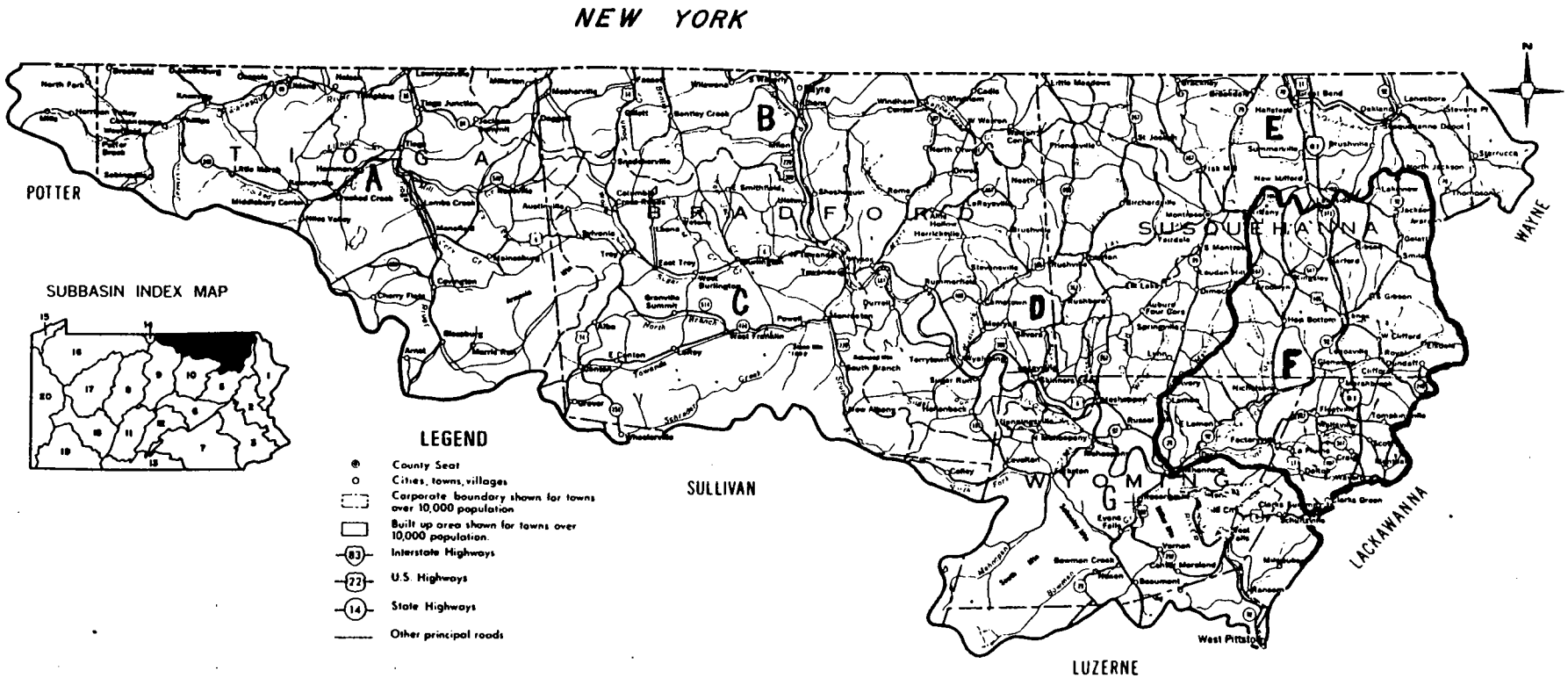

Map 1.
Location Map of the Tunkhannock Creek Watershed
Binghamton
New York
Tunkhannock Creek Watershed
Susquehanna
River
Port Jervis
Scranton
Pennsylvania
Wilkes-Barre
New Jersey
Newark
River
Susquehanna
New York City
Trenton
Harrisburg
Philadelphia
Transportation
Rivers
Tunkhannock Creek Watershed
States
25 0 25 Miles
1997 Wilkes University GIS/RS Center
This map is draft quality and no warranties or representations of accuracy, expressed or implied, are made by the Wilkes University GIS/RS Center.
Compiled January 1997

**Figure 1. Major Watersheds in the Upper Susquehanna River Subbasin 4**




Source
United States
Department of the Inter
Geological Survey

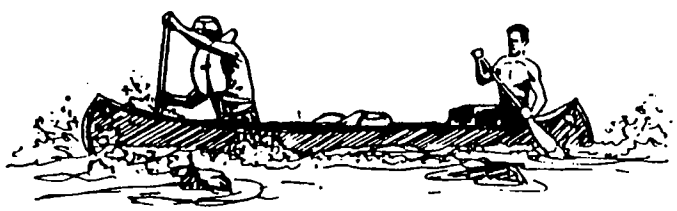
**Table 1. Major Rivers and Waterways in the Upper Susquehanna River - Subbasin 4**

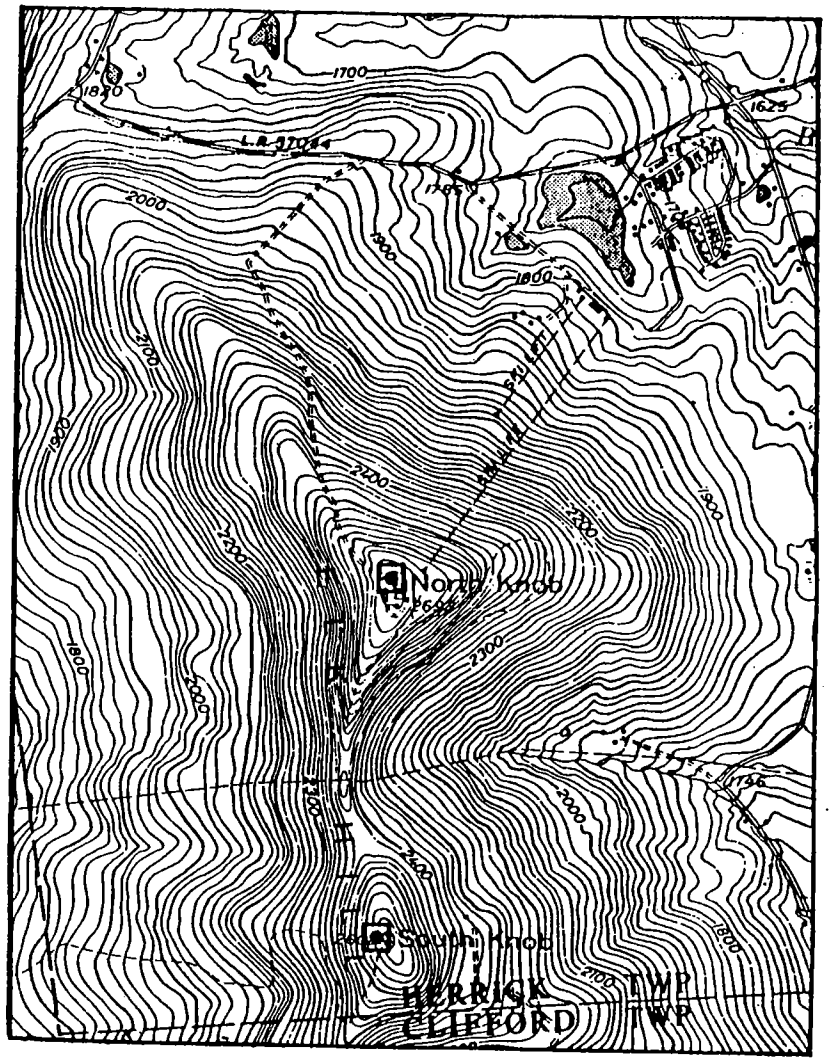
| Watershed | Drainage Area (Sq. Miles) | Major Waterway | Minor Waterway |
|---|---|---|---|
| A | 676 | Tioga & Cowanesque Rivers | - |
| B | 348 | Susquehanna River | - |
| C | 467 | Susquehanna River | Towanda & Sugar Creeks |
| D | 553 | Susquehanna River | Wyalusing Creek |
| E | 309 | Susquehanna River | |
| F | 413 | Tunkhannock Creek | |
| G | 520 | Susquehanna River | Bowman Creek |
| TOTAL | 3,286 | | |

Source: The State Water Plan, Subbasin 4,
Upper Susquehanna River, Office of Resources Managem
Bureau of Resources Programming,
Division of Comprehensive Resources Programming
Harrisburg, PA 17120, June 1979

## OUTSTANDING NATURAL FEATURES

The East Branch of Tunkhannock Creek drains North Knob, the highest peak in the watershed with an elevation of 2,693 feet (Map 2), while the South Branch offers ten miles of delightful, white-water canoeing. For the novice canoeist who shudders at the thought of canoeing the rapids through the Class 3 narrow chasms found on the South Branch, 26 miles of easy canoeing await on the roomy main branch (Gertler, 1988). Amazingly, there are no dams in all these miles. Because of its high water quality, all the tributaries are used for swimming in the summer.






Map 2 - North Knob, Elk Mountain, Herrick Township
Source: Geyer, Alan,Outstanding Scenic Geologic Features of PA, State Book Store, PO Box 1365, Harrisburg, PA 1979.

## NICHOLSON BRIDGE

While writing A Guide to Canoeable Waters of Eastern Pennsylvania, Edward Gertler discovered multiple translations on the meaning of Tunkhannock's guttural name. Translations include "meeting of the waters," "small stream," "wilderness stream," and "full of timber." Gertler states that If named today, it would probably be dubbed "creek of the long bridge." The 2,400 foot long Erie and Lackawanna Railroad Viaduct in Nicholson is indeed a massive, majestic structure that spans across the Tunkhannock Creek. Begun in 1912 and finished in 1915, the bridge's ten, soaring, concrete arches loom 240 feet above the creek. "It is odd to stand in the presence of so great a thing in the making and realize that you are looking at one of the true wonders of the world," said author Theodore Drieser (Nicholson Heritage Association). The American College of Engineers has designated the bridge "the ninth wonder of the modern world." (Figure 2 - Nicholson Viaduct).

# NICHOLSON BRIDGE

# 1912 - 1915

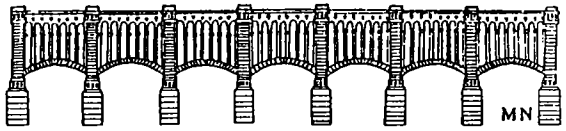



FIGURE 2 - Nicholson Bridge
Source: Nicholson Heritage Association, P.O. Box 496, Nicholson. PA 18446

# SECTION II.

# BIOLOGICAL RESOURCES

## FLORA

Were the Indians to return today, they would still find thousands of sycamore trees large enough for building dugout canoes. With their striking white, brown, and gray bark, sycamore trees line the Tunkhannock's streambanks along with red, silver and ash-leaved maples, eastern hemlock, American elm, black cherry, and a variety of other northern hardwood species. Rhododendrons grow profusely along the banks and are appreciated not only for their gorgeous pink blossoms in the spring but also for their broad evergreen leaves in the bleak days of winter.

Figure 3, Witch Hazel, is an understory shrub whose straggly yellow blossoms appear in late autumn. At one time witch hazel brought in an additional cash income for local farmers. The shrubs were cut in the fall after other farm chores were completed and were sold to the Pennsylvania Witch Hazel Company which operated in Tunkhannock until 1933 (See Historical Notes).

Based on plant identification studies both within the watershed and in areas adjoining it, the region supports over 400 different kinds of plants (Stone, 1979). (See Appendix C - Plant List of Keystone College, Ferns at Davis Crossing Sanctuary.) While walking along the gravelly beds of the Main and South Branches in early to mid-summer, one is apt to discover such gorgeous flowers as cardinal flower and bee-balm (red), larger blue flag iris (violet), square-stemmed monkey-flower and blue vervain (blue), spotted touch-me-not (orange) and Jerusalem artichoke (yellow), the latter serving as a staple food for the local Indians.

Figure 3 - WITCH HAZEL - Hamamelis virginiana
Blooms Sept. - Nov., 15 ft.

Pale yellow flowers

Fruit capsule bursts open when ripe, expelling seeds up to 50 feet.

Source of Art Work: Symonds,George W. D., The Shrub Identification Book,William Morrow & Co., New York, 1963.

## AQUATIC RESOURCES

The Pennsylvania Fish and Boat Commission has identified 26 species of fish in the Tunkhannock Creek Watershed. Appendix D contains the entire list. Some species may surprise the reader!

As was previously mentioned, the creek system is only stocked in 7 locations with Brown Trout, Brook Trout and Rainbow Trout because several tributaries support healthy, reproducing populations of Brook and Brown Trout. (See Map 3 - Trout Stocking Map of Tunkhannock Creek Watershed.) Although the creek system is not currently listed as a High Quality Trout Stream, Robert Moase, Fishery Biologist, PA Fish and Boat Commission, believes "that one or two tributaries could probably qualify; it just hasn't been looked at yet." (Telephone conversation April 23, 1996) The vast majority of tributaries and sections of the main branches have been designated a Cold Water Fishery.

Various sites are routinely monitored by the PA Fish and Boat Commission and by the Susquehanna River Basin Commission. Scott Bollinger, Environmental Specialist for the Commission, stated that "the Tunkhannock Creek near Nicholson, PA has good water quality and habitat, with an excellent macroinvertebrate population. Tunkhannock Creek near Tunkhannock, PA has good water quality. However, sand deposits at this site degrade the habitat, and contribute to an impaired macroinvertebrate population. The habitat conditions in Tunkhannock Creek change significantly between the two sites." (Letter - October 9, 1996)

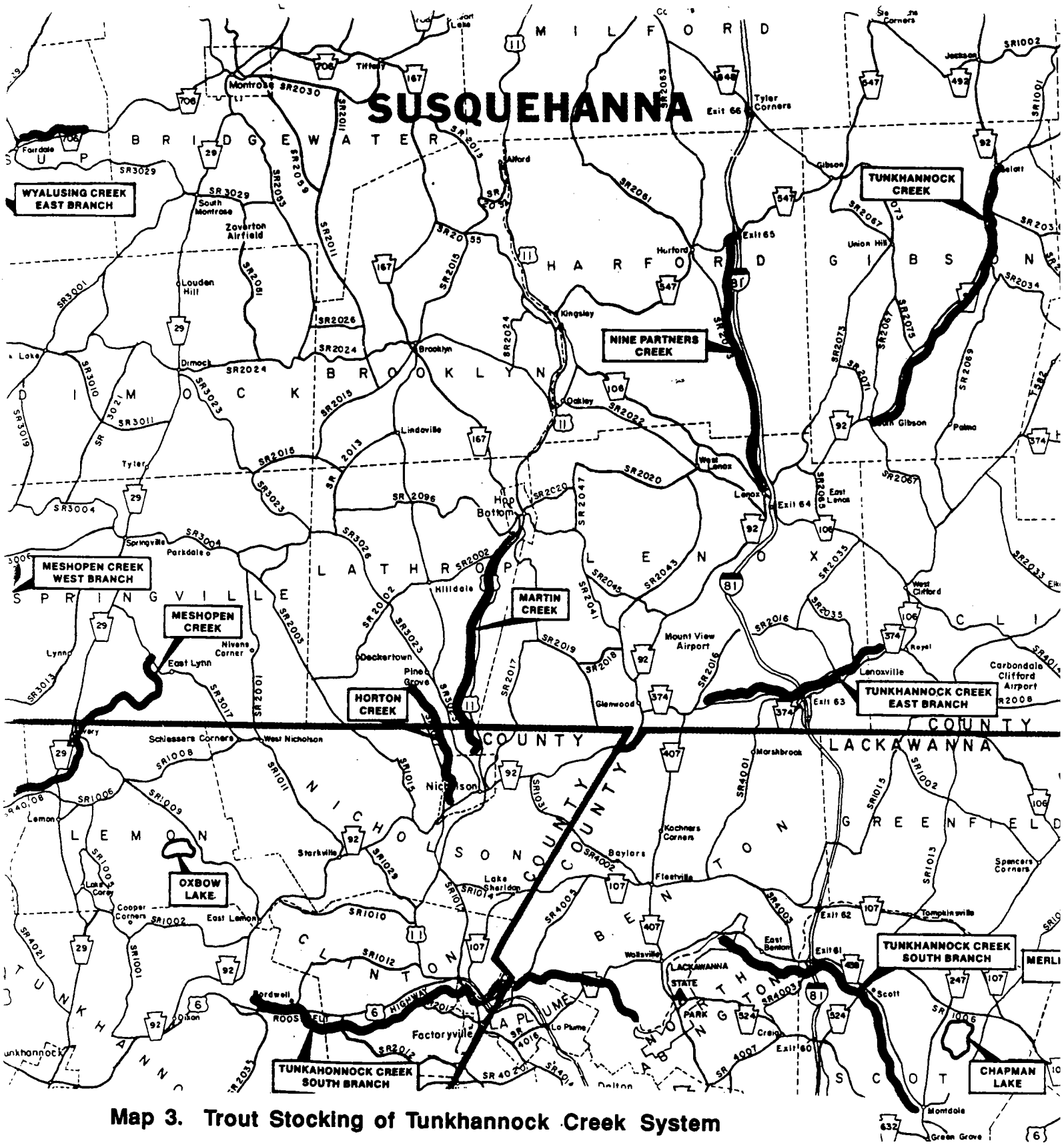
The following documents pertaining to aquatic life can be found in Appendix D.

Habitat Assessment for the Tunkhannock Creek Near Nicholson
Habitat Assessment for the Tunkhannock Creek Near Tunkhannock
Fishes Found in the Tunkhannock Creek Basin
Benthic Macroinvertebrates found in Tunkhannock Creek at PA 92 Bridge near Nicholson
Benthic Macroinvertebrates found in Tunkhannock Creek at PA 92 Bridge near Tunkhannock, PA

For further information, the reader may call or write:

Mr. Scott Bollinger, Environmental Specialist, Susquehanna River Basin Commission, 1721 North Front St., Harrisburg, PA, 17102-2391 717-238-0423.

Mr. Robert Moase, Fish and Boat Commission, P.O. Box 88, Sweet Valley, PA 18656 717-477-5717




**Map 3. Trout Stocking of Tunkhannock Creek System**

Trout Stocking, Stocked Stream

Source: 651 Miles of Trout Fishing, Northeastern PA, 1994, Gogal Publishing, PO Box 11419, Phil., PA 19111-0419

Note from PA Fish Commission concerning map: Stocking for East Branch extends 14.38 miles from SR0374 (farthest downstream) to SR0344 North of Elk Hill; South Branch stocked from Wyoming/Lackawanna Counties' Line to Mouth - Map only shows to Bardwell.

## WILDLIFE!

Due to the conversion of open fields to forest in the northeast and the protection afforded to wildlife this century, many species of wildlife are more numerous today than 100 years ago! After being extirpated from the area in the early 1900's, beaver can now be found in almost every pond as well as along every tributary. The white-tailed deer population is so large, it is seriously impacting the regeneration of the forests in the area. The river otter, which has been a protected species since 1952, with no hunting or trapping allowed, has slowly increased its numbers and has been reportedly seen in the middle of Nicholson Boro. And coyotes, which haven't existed in the watershed since colonial times, can again be heard howling at any time of day. Their population has risen to the point that biologists believe that coyotes may be helping to control the meadow vole population.

In 1996 the Pennsylvania Game Commission released fishers, tree-climbing furbearers in the weasel family, on large tracts of land managed by the Game Commission in Wyoming County. As fishers travel extensive distances over land, and occur in both conifer and mixed forests, they too may expand their range and partially restore their former population in the watershed.

Figure 4.- The Fisher

Source of Art Work: Wildlife Notes 175-40, PA Game Commission, Bureau of Information and Education, Dept. MS, 2001 Elmerton Ave., Harrisburg, PA 17110-9797.

## Small Mammals

While the status of larger mammals including the bear has improved, many of the region's smaller mammals have not fared so well. Small mammals play an important role in the food chain, continually converting vegetation to animal matter which then serves as food for predators. They are instrumental in distributing seeds and keeping the soils turned. Studies indicate that the Allegheny woodrat is now vanishing throughout eastern Pennsylvania (Keystone Wild! Notes, 1996). Michael Steele, Professor of Biology at Wilkes University, is interested in conducting studies on both the northern flying squirrel and the water shrew in the Tunkhannock Creek watershed. The Water Shrew, Sorex palustris albibarbis, has been designated a Special Animal in the 1995 Natural Areas Inventory of Wyoming County conducted by The Nature Conservancy. Because the watershed still has numerous wetlands, it could be an important stronghold for the water shrew. (See Appendix E - Mammals of Woodbourne Sanctuary, Amphibians of Woodbourne Sanctuary, Reptiles of Woodbourne Sanctuary.)

Figure 5 - Water Shrew, Sorex palustris
Source of Art Work: Wildlife Notes 175-40, PA Game Commission, Bureau of Information and Education, Dept. MS, 2001 Elmerton Ave., Harrisburg, PA 17110-9797

Figure 6 - Pileated Woodpecker
Source of Art Work: Wildlife Notes 175-13, PA Game Commission, Bureau of Information and Education, Dept. MS, 2001 Elmerton Ave., Harrisburg, PA 17110-9797

A great variety of bird species (218 ) exist in the area as evidenced by Wyoming County Commissioner William W. Reid's Bird List. (See Appendix E - William W. Reid's List of Birds for Tunkhannock Creek Watershed.) The Lackawanna Audubon Society has also identified 166 species of birds at its Davis Crossing Preserve in Overfield. Wild Turkeys, Canada Geese, Mallards, Wood Ducks, Mergansers, Great Blue Herons and Green Herons have all increased in numbers in the last 20 years due largely to pollution abatement across Pennsylvania and elsewhere and to protective efforts. However many neotropical song bird species, especially vireos and warblers, have drastically declined in numbers in the last 8 years due to the loss of their winter tropical habitats (Stone, 1996).

## WETLANDS

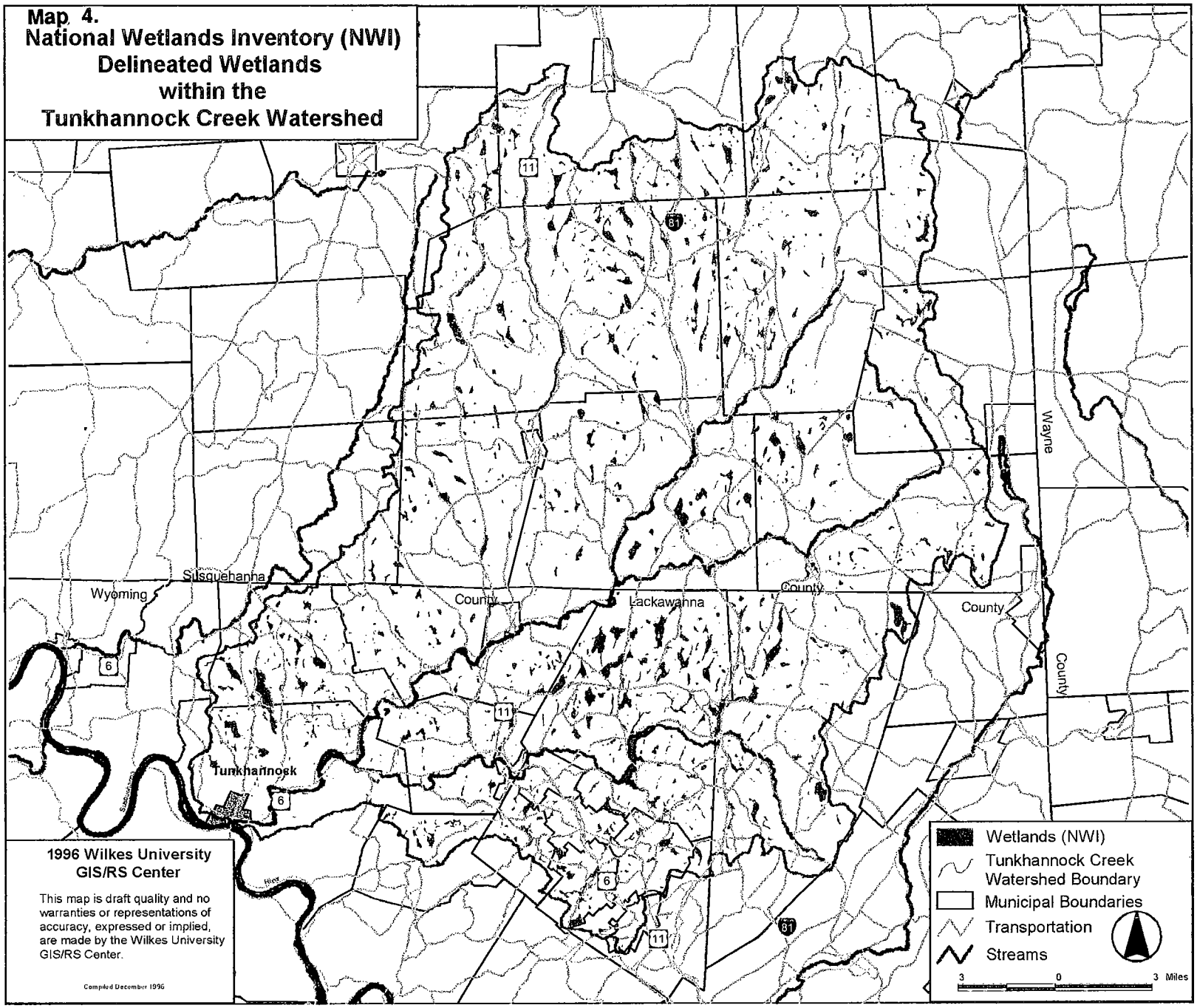
Wetlands compose 2.7% of all the land surface in Lackawanna, Susquehanna, and Wyoming Counties. The specific wetland acreage for the watershed area could not be determined. This average is based on the results of the National Wetlands Inventory on PA's wetlands conducted by the Fish and Wildlife Service over the course of several years between the late 1970s and 1987. This figure is almost twice the percentage of the wetland acreage found across the state. Map 4 depicts the thousands of wetlands that exist in the watershed area.

The acreages for palustrine, lacustrine, and riverine wetlands appear in Tables 2 and 3. About 99.4% of the wetlands fall within the palustrine system. Palustrine wetlands consist of marshes, bogs, swamps, and small shallow ponds. Lacustrine wetlands only compose .4% of the total wetland acreage. Lacustrine wetlands are less than 6.6 feet in depth and are located around the shores of lakes, reservoirs and large ponds. Riverine wetlands (rivers and streams) only comprise .2% of the total wetland acreage. Although it is generally believed that the state has lost 56% of its wetlands, there have been no historical records kept to know how much wetland acreage has been destroyed in the watershed area. Because only 2% of the area is developed, most of the wetland losses are probably due to draining for agricultural purposes. Most of these wetlands could be restored.

Wetlands provide untold services for mankind. They protect land and property from flood and storm damage. With their incredibly thick vegetation, they absorb huge amounts of water like giant sponges and slowly release that water. The rise and fall of water levels along all the branches and smaller tributaries containing wetlands is much more gradual than where wetlands have been destroyed. It should be noted that the "Lazy Brook Development", which was severely damaged during the Jan. 19th, 1996 flood, existed on a flood plain along a sharp bend in the Tunkhannock Creek not far from where the Creek enters the Susquehanna River. This was a very risky location to place the development even if all our original wetlands were intact. The wetlands that presently exist would have protected the development more had the flooding occurred in the spring, summer or fall during the growing season, instead of in January when the ground was frozen.

When vegetation slows down the movement of water, it also helps soil carried in the water from erosion and runoff, to settle out. In Pennsylvania, the number one water pollutant, by volume, is sediment. Pollutants, toxins, metals, and other poisonous substances are also caught in the wetland silt. Wetland plants absorb excess nutrients such as nitrogen and phosphorus and moves them through the food web while at the same time producing oxygen.

Wetlands are like tropical rain forests, containing a great diversity of plants (1,600 plus species in PA) and animals. Because they are shallow water areas, sunlight can penetrate to the bottom of wetlands which


Map 4.
National Wetlands Inventory (NWI)
Delineated Wetlands
within the
Tunkhannock Creek Watershed
Susquehanna
Wyoming
County
Lackawanna
County
Wayne
County
Tunkhannock
11
81
6
1996 Wilkes University
GIS/RS Center
This map is draft quality and no warranties or representations of accuracy, expressed or implied, are made by the Wilkes University GIS/RS Center.
Compiled December 1996
Wetlands (NWI)
Tunkhannock Creek Watershed Boundary
Municipal Boundaries
Transportation
Streams
3
0
3 Miles

## Table 2. Wetland Acreage Based on NWI Mapping for Lackawanna, Susquehanna, & Wyoming Counties

| **Palustrine Wetlands - Lackawanna Cty.** | **Acreage** |
|---|---|
| Aquatic Bed | 45 |
| Emergent | 693 |
| Deciduous Forested | 3,616 |
| Evergreen Forested | 1,226 |
| Deciduous Scrub-Shrub | 1,376 |
| Evergreen Scrub-Shrub | 10 |
| Mixed Deciduous Shrub Emergent | 771 |
| Open Water | 1,563 |
| **Total Palustrine Wetlands** | 9,300 |
| **Lacustrine Wetlands** | 19 |
| Total Lackawanna County Wetlands* | 9,319 |
| **Palustrine Wetlands - Susquehanna Cty.** | |
| Aquatic Bed | 107 |
| Emergent | 2,201 |
| Deciduous Forested | 2,595 |
| Evergreen Forested | 459 |
| Mixed Deciduous Forested-Shrub | 641 |
| Mixed Deciduous Forested-Emergent | 95 |
| Deciduous Scrub-Shrub | 2,076 |
| Evergreen Scrub-Shrub | 73 |
| Mixed Deciduous Shrub-Emergent | 768 |
| Open Water | 3,070 |
| **Total Palustrine Wetlands** | 12,085 |
| **Lacustrine Wetlands** | 47 |
| **Riverine Wetlands** | 2 |
| Total Susquehanna County Wetlands | 12,134 |
| **Palustrine Wetlands - Wyoming Cty.** | |
| Aquatic Bed | 53 |
| Emergent | 567 |
| Deciduous Forested | 1,713 |
| Evergreen Forested | 603 |
| Mixed Deciduous Forested-Shrub | 568 |
| Deciduous Scrub-Shrub | 1,837 |
| Evergreen Scrub-Shrub | 11 |
| Open Water | 956 |
| Total Palustrine Wetlands | 6,308 |
| **Lacustrine Wetlands** | 58 |
| **Riverine Wetlands** | 42 |
| Total Wyoming County Wetlands | 6,408 |

* Lackawanna Cty. Conservation District estimates that there are 7968 acres of hydric soils, or wetlands, comprising 14% of the total watershed.

Source: Tiner, Ralph W. Pennsylvania's Wetlands: Current Status and Recent Trends, 1990; U.S. Fish & Wildlife Service, Newton Corner, MA 02158

**Table 3. Total Wetland Acreage Based on NWI Mapping for Lackawanna, Susquehanna, & Wyoming Counties**

| County | Wetland Acreage | % of Land Area Covered by Wetland |
|---|---|---|
| Lackawanna | 9,319 | 3.2 |
| Susquehanna | 12,134 | 2.3 |
| Wyoming | 6,408 | 2.5 |
| Total | 27,861 | |

**Table 4. Total Deepwater Habitat Acreage Based on NWI Mapping for Lackawanna, Susquehanna, & Wyoming Counties**

| County | Lacustrine Waters Acreage | Rivers & Streams Acreage | Total Deepwater Habitat Acreage |
|---|---|---|---|
| Lackawanna | 3,268 | 340 | 3,680 |
| Susquehanna | 2,829 | 870 | 3,699 |
| Wyoming | 826 | 3,615 | 4,441 |
| Total | 6,923 | 4,825 | 11,820 |

Source: Tiner, Ralph W. Pennsylvania's Wetlands: Current Status and Recent Trends. 1990; U.S. Fish & Wildlife Service, Newton Corner, MA 02158

encourages tremendous plant growth. Incredible numbers of microscopic animals and invertebrates feed fishes, amphibians, and reptiles who in turn support birds and mammals. Wetlands also provide dense cover for our larger mammals such as deer and bear. Without wetlands in Pennsylvania we would loose the spawning and nursery grounds for fishes, 84% of our amphibians, 25% of our reptiles, about 122 species of birds, and many wetland mammals such as beaver, muskrats and otter. (Wetlands: Functions at the Junctions, Fact Sheet, DEP).

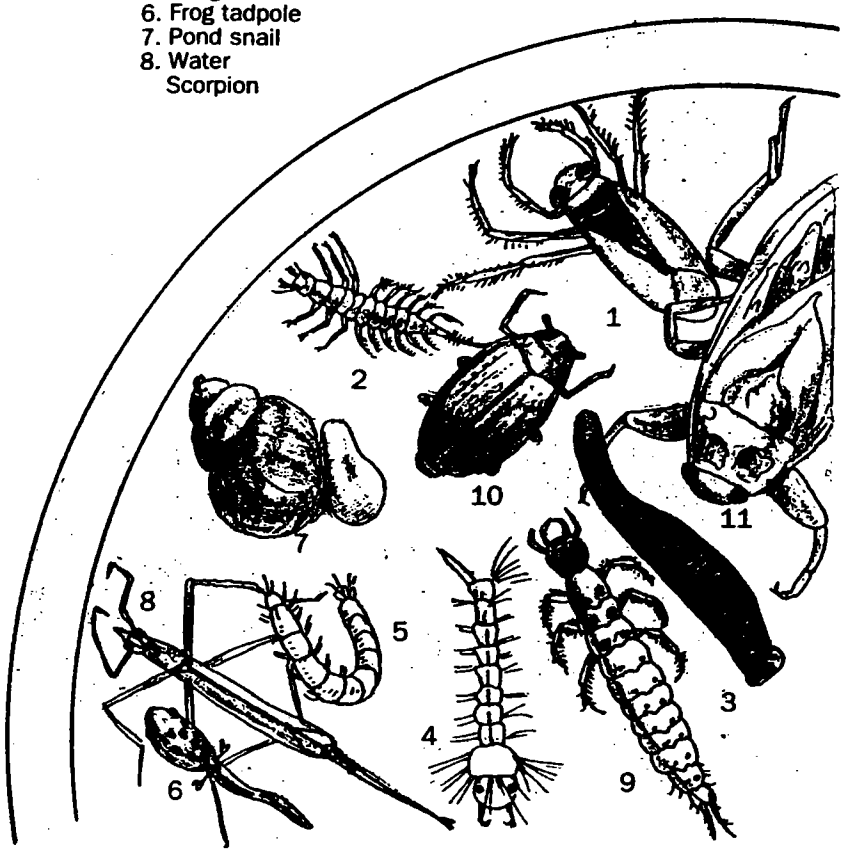
For a detailed description of an undisturbed sphagnum bog, which is one of the rarer types of wetlands found in the watershed, locate Appendix F.

## Deep Water Habitats

The total acreage of deep water habitats (11,820 acres) is less than half the wetland acreage existing in the three counties (Table 4). Deep water habitats refer to the areas on lakes, reservoirs, large ponds (Lacustrine Acreage) and rivers and streams (Riverine Acreage) that start at 6.6 feet (2 m). In these deep water habitats, water and not air is the principal medium in which dominant organisms live. The actual acreage for the Susquehanna River as it flows through Wyoming County probably accounts for the high riverine acreage for Wyoming County.

Figure 7. Wetland Aquatic Animals

1. Water Boatman
2. Alderfly larva
3. Leech
4. Mosquito larva
5. Midge larva
6. Frog tadpole
7. Pond snail
8. Water Scorpion
9. Diving Beetle larva
10. Whirligig Beetle
11. Giant Water Bug




Art Source: Hickman, Pamela, Wetlands, Federation of Ontario Naturalists, Kids Can Press Ltd., Toronto, Canada,1993.

## PENNSYLVANIA NATURAL DIVERSITY INVENTORY

The information on the lists of Confirmed Species of Special Concern (Table 5) and Historical Species of Special Concern (Table 6 ) in the Tunkhannock Creek Watershed was graciously provided by the Pennsylvania Natural Diversity Inventory. PNDI is a cooperative program among the Department of Conservation and Natural Resources (DCNR), The Nature Conservancy, and the Western Pennsylvania Conservancy. In presenting this information, the PNDI states in their cover letter that "While this information is available for preparation and review of environmental assessments, it is not a substitute for on-site surveys. ....For this reason PNDI cannot provide a definitive statement on the presence, absence, or degree of health of environmental elements in any part of Pennsylvania. PNDI welcomes coordination with individuals or organizations proposing environmental alterations, and/or conducting environmental assessments...."

The bird species on PNDI's Tunkhannock Creek Watershed lists are species which have had confirmed nesting sites, or have been sighted during the "Breeding Bird Atlas" safe dates (i.e. during a species breeding season). PNDI states that "certain mammals such as the water shrew might occur in the Tunkhannock Creek Watershed, however, it simply might not have been looked for, or not found during a survey in that area."

The list of birds and mammals species in Table 7 appear on the PNDI's State List of Animals of Concern but do not exist in their data base for the watershed area. These animals have been sighted, however, in the Tunkhannock Creek Watershed by reputable local residents. The birds were identified by Wyoming County Commissioner Bill Reid, an AVID bird watcher who worked on 75 of the census blocks for the Breeding Bird Atlas, including many blocks in the watershed. The confirmation of the Northern Goshawk, Great Blue Heron and Virginia Rail that appears on the PNDI list of Confirmed Species for the Tunkhannock Creek Watershed was provided by Mr. Reid. Because of the enormous number of blocks he undertook, and the even larger number of blocks that the coordinator for this region was responsible for reporting, some of Mr. Reid's valuable information was unfortunately lost or delayed and was never recorded in the Pennsylvania Breeding Bird Atlas. Because this information was not entered in the Breeding Bird Atlas, it is not currently in PNDI's data base. It is hoped that PNDI can add these lost observations, as presented here, to their files.

**Table 5. Confirmed Species of Special Concern in the Tunkhannock Creek Watershed**

| Scientific Name | Common Name | G/S Rank | PA Status | Wetland Indicator | Federal Status |
|---|---|---|---|---|---|
| *Potamogeton robbinsii* | Flat-leaved pondweed | G5/S3 | PR (Rare) | OBL | |
| *Eleocharis robbinsii* | Robbin's spike rush | G4G5/S2 | PT (Threatened) | OBL | |
| *Accipiter gentilis* | Northern goshawk | G4/S2S3B,SN | | | |
| *Utricularia purpurea* | Purple bladderwort | G5/S2 | PR (Rare) | OBL | |
| *Broadleaf-Conifer Swamp* | Broadleaf-conifer swamp | G?/S2S3 | | | |
| *Andromeda polifolia* | Bog-rosemary | G5/S3 | PR (Rare) | OBL | |
| *Glacial Bog* | Glacial Bog | G?/S2S3 | | | |
| *Tachopteryx thoreyi* | Thorey's grayback dragonfly | G4/S2S3 | | | |
| *Scirpus ancistrochaetus* | Northeastern bullrush | G3/S2 | PT (Threatened) | OBL | LE |
| *Carex lasiocarpa* | Slender sedge | G5/S3 | PR (Rare) | OBL | |
| *Carex disperma* | Soft-leaved sedge | G5/S2 | PR (Rare) | FACW+ | |
| *Ardea herodias* | Great Blue Heron | G5/S3S4B,S4N | | | |
| *Panicum xanthophysum* | Slender panic-grass | G5/S3 | PE (Endangered) | | |
| *Rallus limicola* | Virginia Rail | G5/S3B | | | |
| *Carex limosa* | Mud sedge | G5/S3 | PT (Threatened) | OBL | |

**Table 6. Historical Species of Special Concern in the Tunkhannock Creek Watershed**

| Scientific Name | Common Name | G/S Rank | PA Status | Wetland Indicator | Federal Status |
|---|---|---|---|---|---|
| *Glyceria borealis* | Small-floating manna-grass | G5/S2 | PE (Endangered) | OBL | |
| *Lonicera hirsuta* | Hairy honeysuckle | G4G5/S3 | TU (Undetermined) | FAC | |
| *Aletris farinosa* | Colic-root | G5/S2 | TU (Undetermined) | | |
| *Stellaris borealis* | Mountain starwart | G5/S? | TU (Undetermined) | | |
| *Dryopteris clintoniana* | Clinton's wood fern | G5/S3 | TU (Undetermined) | FACW+ | |
| *Viola selkirkii* | Great-spurred violet | G5?/S? | TU (Undetermined) | | |
| *Heterodon platyrhinos* | Eastern hognose snake | G5/S3S4 | | | |
| *Lathyrus cochroleucus* | Wild-pea | G4G5/S3 | PT (Threatened) | | |
| *Limnaea borealis* | Twinflower | G5/S2 | PT (Threatened) | FAC | |
| *Lysimachia quadriflora* | Four-flowered loosestrife | G5?/SH | TU (Undetermined) | FACU- | |
| *Carex retrorsa* | Backward sedge | G5/S2 | PE (Endangered) | FACW+ | |
| *Ceologlossum viride* | Long-bract green orchid | G5/S3 | PR (Rare) | OBL | |

The following symbols indicate the status of the birds Mr. Reid has observed: **M** = Migrant; **B** = species was observed during the species breeding season; **C** = species was a confirmed nester (In the case of the Common Moorhen, Mr. Reid observed young birds at Phelps Swamp in Nicholson Township); **P** = Possible Nester.

## Table 7. Birds/Mammals of Special Concern Identified by Local Authorities

| Scientific Name | Common Name | G/SRank | PA Status | Federal Status | Suggested Status |
|---|---|---|---|---|---|
| Botaurus lentiginosus | American Bittern **B** | G4/S1 | PT | | |
| Casmerodius albus | Great Egret **M** | G5/S1B | PT | | PT |
| Catharus ustulatus | Swainson's Thrush **M** | G5/S1S2B | | | CR |
| Chlidonias niger | Black Tern **M** | G4/S1B | PE | | PE |
| Circus cyaneus | Northern Harrier **B** | G5/S3BS4N | | | CR |
| Cistothorus palustris | Marsh Wren **B** | G5/S2S3B | | | CR |
| Cistothorus platensis | Sedge Wren **M** | G5/S1B | PT | | PT |
| Empidonax flaviventris | Yellow-b. Flycatcher **M** | G5/S1S2B | PT | | PT |
| Falco peregrinus | Peregrine Falcon **M** | G4/S1B,S1N | PE | E(S/A) | PE |
| Fulica americana | American Coot **M** | G5/S2S3N | | | CR |
| Gallinago gallinago | Common Snipe **M** | G5/S1S2B,S3N | | | PT |
| Gallinago gallinago | Common Moorhen **C** | G5/S3B | | | |
| Haliaeetus leucocephalus | Bald Eagle **M** | G4/S1S2B | PE | LTNL | PE |
| Ixobrychus exilis | Least Bittern **B** | G5/S2B | PT | | PT |
| Pandion haliaetus | Osprey **M** | G5/S1S2B | PE | | PE |
| Podilymbus podiceps | Pied-billed Grebe **M** | G5/S3B,S4N | | | CR |
| Porzana carolina | Sora **P** | G5/S3B | | | |
| Sterna hirundo | Common Tern **M** | G5/SXB | | | PX |
| Tyto alba | Barn Owl **P** | G5/S3B,S3N | | | CA |
| Felis rufus | Bobcat | G5/S3 | | | CA |
| Lutra canadensis | Northern River Otter | G5/S3 | | | CA |

The presence of the mammals was confirmed by Nancy Pordon, RR# 1, Box 205, Hop Bottom, PA, 18824. Mrs. Pordon has been a highly regarded wildlife rehabilitator in the watershed area for over 10 years.

The G/S Rank and PA Status appreviations are explained in Appendix B.

## THE NATURAL AREAS INVENTORY OF WYOMING COUNTY

In 1995 the Pennsylvania Science Office of The Nature Conservancy, (34 Airport Drive, Middletown, PA 17057) compiled and wrote a Natural Areas Inventory of Wyoming County containing "information on the locations of rare, threatened, and endangered species and of the highest quality natural areas in the county. Each site description is accompanied by general management recommendations that would help to ensure the protection and continued existence of these rare plants, animals, and natural communities. The recommendations are strictly those of The Nature Conservancy, based on the biological needs of these elements, and do not necessarily reflect the policies of the state or the policies of the county or townships for which the report was prepared."

The report states that "Implementation of the recommendations is up to the discretion of the landowners (within local and state regulations). However, cooperative efforts to protect the highest quality natural features through the develoment of site-specific management plans are greatly encouraged." A few of the highest quality natural areas identified in the Natural Areas Inventory are found in the Tunkhannock Creek watershed. The slightly edited descriptions of these natural areas is presented here with the permission of the PA Science Office to make known these wonderful areas that are in great need of permanent protecion.

**Broadbent Swamp** (Clinton Twp.)

Broadbent Swamp is a good example of the Broadleaf-Conifer Swamp Natural Community with a canopy of red maple, yellow birch, black ash, and hemlock, scattered thickets of Rhododendron maximum and a diverse herb layer. Peat moss hummocks, cinnamon fern, sensitive fern, dwarf blackberry (Rubus pubescens), azalea, and occasional patches of poison sumac (Rhus vernix) characterize the site. Possibly the best state population of a rare plant is known from this site. A good diversity of plants occurs here and, although the area was logged in the past, it is recovering well with good tree regeneration. Flooding (by beaver or humans), changes in hydrology, or increased nutrient input would be detrimental to the quality of the natural community and the rare plant population. The woodland around most of the swamp is a beneficial buffer for water quality and quantity maintenance and the prevention of exotic plant species encroachment.

Identifed as one of the top six most critical sites in Wyoming County for maintaining biological diversity into the future. Major landowner wishes to keep land natural.

**Casterline Hill Swamp** (Nicholson Twp.)

Casterline Hill Swamp is a locally significant site. It was not visited in the field but its size and its contribution to Lake Sheridan make it important. Based on color infra-red photography, the swamp is dominated by a mix of

conifers and deciduous trrees. The canopy appears to be relatively uniform which indicates past logging. If permission is granted, a field survey should be conducted to describe the site and to look for rare species.

**Phelps Swamp** (Nicholson Twp.)

A Special Animal with a TNC Global and State Rank has been observed breeding in Phelps Swamp in 1994. The site was not visited in the field by our biologists but the site is known to local naturalists as habitat for this species and several uncommon migrating and breeding birds. Disturbance during the nesting season should be avoided and as much buffer as possible should be provided to avoid impacts to water quality and vegetation in the swamp.

**Bartron Pond Swamp** (Lemon Twp.)

Bartron Pond Swamp has small populations of two PA-Rare plants typical of bog communities. This bog-like area is the result of past disturbances which have raised water levels and killed the trees. Typical bog plants invaded or became more abundant when the trees died; these include leatherleaf (Chamoedaphne calyculata) and pitcherplant (Sarracenia purpurea).

**Helman Swamp** (Tunkhannock Twp.)

Helman Swamp contains one of the best populations known in the state of a PA-Rare sedge. Hundreds of stems of this plant were discovered in 1993 growing on mossy hummocks with yellow birch, hemlock, red maple, posion sumac and a large diversity of shrubs, ferns, sedges, and native wildflowers. The surrounding woodlands protect water quality and quantity in the swamp. The area is also an important breeding area for amphibians as evidenced by the large numbers of red efts (juveniles) of the spotted newt seen during the survey. Also contained within the Helman Swamp boundary, on both sides of Whippoorwill Hollow Road, is a nice example of a cool moist hemlock-mixed hardwood forest. In addition to serving as a buffer to the swamp, this woodland has the potential for at least one rare plant species that historically occurred in the vicinity.

**Lake Carey** (Lemon & Tunkhannock Twp.)

Two stems of a pondweed of undetermined status (TU) were found along the shore of Lake Carey while searching for a historical record of another rare pondweed. Further surveys are needed to assess the extent and size of the population. Eutrophication and herbicides could be detrimental to this population. The lake is surrounded by houses and is a popular recreation area in the summer.

**Dixon Floodplain Forest** (Tunkhannock Twp.)

Dixon Floodplain Forest in Tunkhannock Creek just north of Dixon is a locally significant floodplain forest with open-grown sycamore, river birch (Betula nigra), slippery elm (Ulmus rubra), and box elder (Acer negundo) interspersed with small meadows of ostrich

fern (Matteucia struthiopteris), coneflower (Rudbeckia laciniata), goldenrods (Solidago spp.), grasses and other herbs. The site also provides habitat for resident and migratory bird species. Some non-native aggressive plants such as Japanese knotweed and multiflora rose are present and may crowd out the native species unless managed.

A Natural Areas Inventory of Wyoming County can be purchased from the Wyoming County Planning Commission, 1Court House Square, Tunkhannock, PA 18657.

A Natural Areas Inventory of Lackawanna County is currently in progress but the results are not available for this report.

Figure 8. Japanese Knotweed, Polygonum cuspidatum

Art Source: John W. Munro, Munro Ecological Services, Inc. Harleysville, PA 1997

## SIGNIFICANT NATURAL AREAS

### Davis Crossing Sanctuary

Comprises about 65 acres of woodlands, swamps, and ponds, and is located in Wyoming County near Lake Winola. The property was donated to Audubon Society (LAS) in early 1978 by Walter L. Schautz, and was dedicated in October, 1978, by the late Dr. Maurice Broun, Curator Emeritus of Hawk Mountain Sanctuary. Davis Crossing is maintained by and for members of LAS and their guests.

GUIDELINES FOR CROSSING VISITORS

Lackawanna Audubon Society asks the cooperation of visitors to protect the natural state of Davis Crossing by observing the following guidelines. Please do not molest or collect plant or animal life and keep a reasonable distance from active nests. Hunting and fishing are not permitted and fires are prohibited. Non-members must be accompanied by a member of LAS or, under special circumstances, may enter the Sanctuary by special permit issues by a Director of LAS. No toilet facilities are available on the premises.

Davis Crossing Sanctuary property is primarily unimproved and minimally maintained. All visitors enter at their own risk.

Enjoy Davis Crossing Sanctuary - A special place - Take nothing but memories - leave nothing but footprints.

### Rabbit Hollow Wildlife Sanctuary

LOCATION: Waverly, Lackawanna County

ECOLOGICAL SIGNIFICANCE: The 16-acre Rabbit Hollow preserve is comprised of three distinct habitats: a six-acre swamp, open meadows, and a forested hillside. Rabbit Hollow's swampy area is fed by a small stream - its willow and dogwood-lined channel winding through lush meadows where blue-eyed grass and wild oats punctuate the grasses, rushes, and sedges.

Located in a suburban area, this preserve boasts an impressive diversity of wildlife. Typical wetland birds such as belted kingfisher and swamp sparrow feed and rest in the wet meadows. Many other bird species, and mammals such as deer and rabbit, inhabit the drier fields which cover the adjacent slopes. Beyond these open areas rises a moist hillside covered in towering eastern hemlocks and northern hardwoods. Here, squirrels and chipmunks feed on the seeds of beech, oak, hickory, and walnut.

ACQUISITION: Mr. and Mrs. C. Welles Belin donated Rabbit Hollow to The Nature Conservancy in 1975. It has since been transferred to Abington Township to be maintained as a natural refuge.

VISITING: The preserve is open to the public for nature study, but because of limited parking and the ecological sensitivity of the wetland areas, large groups are

discouraged. For more information contact: Chairman, Board of Supervisors, Abington Township, Waverly, PA, 18471 (717) 586-0111.

## Lackawanna State Park

Lackawanna State Park is located in Lackawanna County 10 miles north of Scranton in Benton and North Abington Townships. A focal point of the 1,411 acre park is the beautiful Lackawanna Lake which encompasses 210 acres.

RECREATIONAL OPPORTUNITIES: The varied selection of opportunities offered during the year include:

FAMILY CAMPING: The 96-site campground is located within walking distance of the lake and swimming area.

SWIMMING: The 160 foot diameter pool is open 11:00 a.m. to 7:00 p.m. from Memorial Day weekend to Labor Day.

FISHING: The lake contains both cold and warm water species of fish. Some of the varied species of fish stocked in the stream and lake are trout, muskelunge, walleye, channel cat, bullhead, pickerel and largemouth bass. The lake is also fed by Kennedy Creek, a favorite of all the canoers in the park. The 2.5 mile long lake has more than 7.5 miles of shoreline for access for many anxious anglers.

HIKING: More than 5 miles of hiking trails are located through out the park.

HUNTING: Over 500 acres are open to hunting, trapping and the training of dogs.

BOATING: The lake is popular for sailing, canoeing and rowing.

# SECTION III.

# PHYSICAL ENVIRONMENT

## GEOLOGY

A study of various geologic maps of Pennsylvania (Geyer, Barnes et al) indicates that the entire Tunkhannock Creek watershed is contained within the Glaciated Low Plateaus Section of the Appalachian Plateau Physiographic Province. The bedrock underlying the watershed area consists chiefly of gray, brownish, and red fine-grained sandstone, siltstone and shale that may be 5,000 to 9,000 feet in thickness (Van Diver, 1990)! These horizontally-bedded rocks were formed during the Devonian Period, some 375 - 335 million years ago.

It was during the Devonian Period that North America made contact with Europe, an event which affected the entire length of the Appalachian basin. The collision created a whole new mountain range, the Acadian Mountains, just east of Pennsylvania. After the collision occurred and the immense Acadian Mountains rose above sea level, sediments eroded from the mountains for millions of years. These sediments were transported by rivers all the way across eastern Pennsylvania to western Ohio (Barnes et all, 1996)! Along Route 6 between Bardwell and Tunkhannock, along the main branch of the Tunkhannock Creek, this upper Devonian Catskill formation, consisting of nearly flat beds of sandstone, siltstone, and shale appears in numerous cuts. (Van Diver, 1990)

Although 169 active flagstone quarries currently operate in Susquehanna County, at one time over 800 quarries existed. A flagstone quarry operation even existed at the summit of North Knob, elevation 2,693 feet, the highest point in the watershed (Geyer, 1979)! Now owned by the Elk Mountain Ski Center, visitors can view the ancient, flaggy-bedded sandstones (Figure 9) in all seasons. While the dominant life forms during the Devonian Period consisted of fish, amphibians, insects and land plants, the only fossil impressions occasionally found in the local flagstone are of fern-like plants.

Figure 9 - Flaggy-bedded sandstones (flagstone) at the summit of Elk Mountain, Herrick.
Photograph Source: Geyer, Alan, Outstanding Geological Features of PA, PA DER, Bureau of Topographic and Geologic Survey, 1979.

The region is not underlain by either bituminous(soft) or anthracite(hard) coal. Thus, the watershed has been spared the environmental degradation that has occurred near-by in the Wyoming - Lackawanna Valley from the extraction of anthracite coal.

The Tunkhannock Creek and all the system of rivers, creeks and rivulets that drain water from Pennsylvania today were established about 10 to 15 million years ago during a period of severe erosion. The most recent geologic change in the landscape, of course, was the advance of the continental glaciers into Pennsylvania, the most recent arriving about 24,000 years ago. Glaciers have modified the landscape throughout the watershed area. The ice scraped and lowered the tops of hills, particularly in places where the underlying rock was a soft shale or siltstone. The general features of the upland area have been smoothed by glaciation, creating landscapes with curves rather than sharp, abrupt features. Deposits of rock, sand, clay and silt were distributed unevenly throughout the region by the great ice sheets. Some of these unstratified deposits, called glacial till, are as much as 300 feet thick in the Tunkhannock Creek watershed (Soil Survey of Lackawanna & Wyoming Counties). Many of the soils that developed on glacial till are too stony or wet for cultivation (Davis et al, 1995).

The numerous lakes, ponds,and wetlands in the watershed exist in depressions that were the result of glacial scouring and deposition. Stratified sands and gravels deposited by glacial meltwaters are located along the Tunkhannock Creek. Sand and gravel mining operations occur on some of the larger stratified deposits such as at Lenox.

At the point at which the Tunkhannock Creek enters the Susquehanna River, the elevation has dropped a total of 2,090 feet to 603 feet. Although some geologists describe the area as containing "smooth, rolling hills", the region is locally named the "Endless Mountains." Indeed for those early settlers coming here on horseback from Connecticut and Philadelphia, it was not only the steepness of the mountains that made traveling so strenuous, but the fact that there seemed to be no end in sight of the mountains! Whatever the region is called, the average elevation in the watershed in Susquehanna County is between 1,500 and 2,000 feet; and in places the difference in elevation is as much as 500 or 600 feet in less than a mile.

## CLIMATE

The climate in the three counties is characteristic of a humid continental type that is marked by extreme seasonal temperature changes. In Lackawanna and Wyoming Counties, summer has warm days and cool nights and generally is considered to be the most pleasant time of year. About 60% of possible sunshine is received during the summer season. The average daily maximum temperatures are in the low eighties, while nighttime daily minimum temperatures average in the high fifties. The absolute highest recorded temperature in Lackawanna County was 101 degrees on July 4, 1966. Winter is cold and cloudy with daytime daily maximum temperatures in the mid-thirties and nighttime daily minimum temperatures in the high teens to the low twenties (Soil Survey of Lackawanna and Wyoming Counties).

In Susquehanna County the winters are considerably longer, the summers cooler, and greater precipitation occurs. A sizable part of the annual precipitation falls as snow during the winter months. Prevailing westerly winds bring most of the weather systems affecting this area eastward from continental regions. As a result, Susquehanna County is subject to a wide variety of weather. Temperature and other atmospheric conditions tend to change every few days in winter and spring and somewhat less frequently in summer and fall (Soil Survey of Susquehanna County). The lowest temperature recorded in Susquehanna County in the past 80 years was -29 degrees which occurred in January, 1977; in the 1995-96 winter, 15 feet of snow fell on parts of the watershed (Lorraine Reynolds,1996)!

## SOILS

The distribution of soils in the watershed reflects both the topography, bedrock geology and the glacial history of the landscape. In turn the pattern of land use across the landscape is greatly influenced by the soils in an area and their suitability for various activities. Much of the watershed has been kept in woodland or as dairy and cattle farms because of the rocky soil and poor soil drainage.

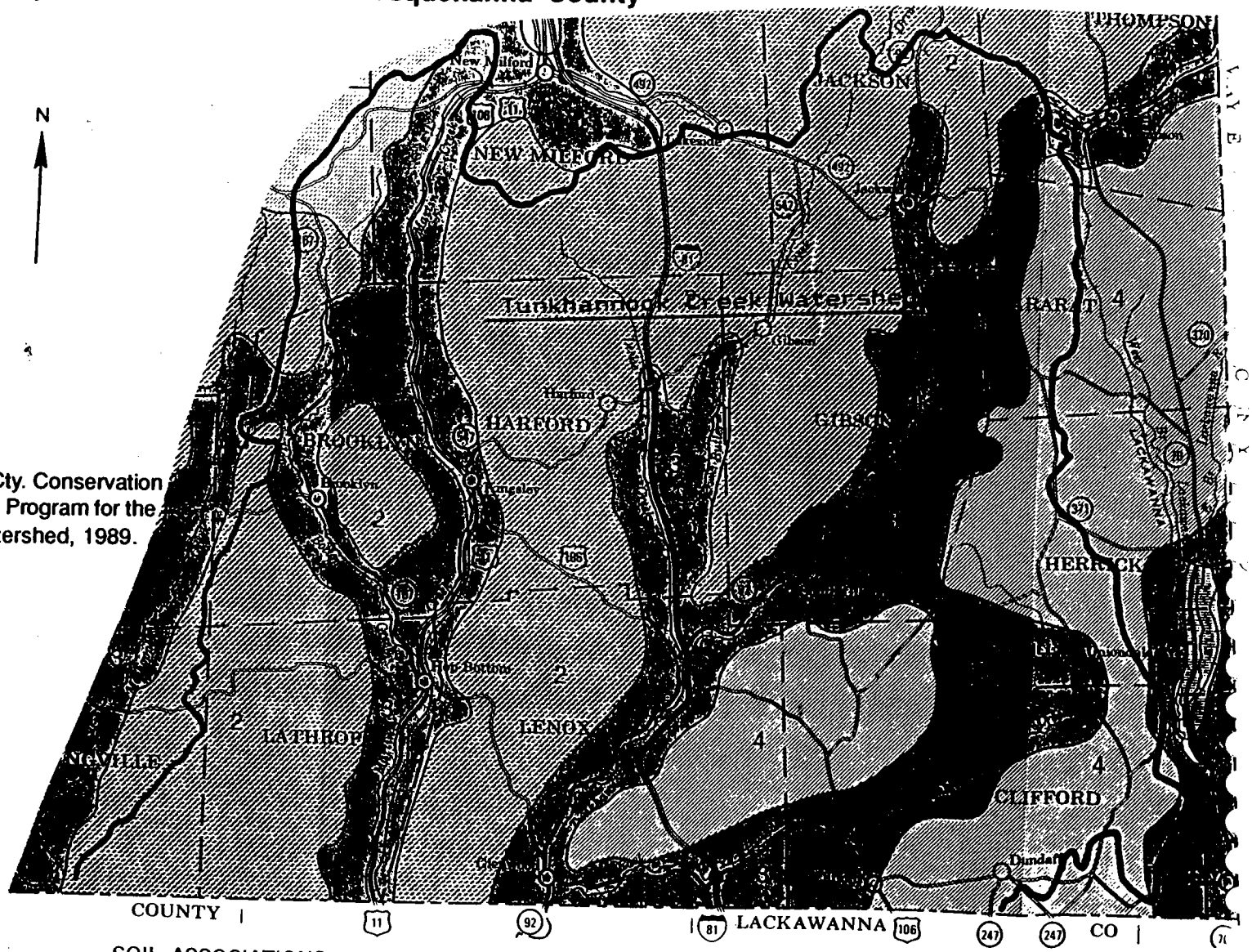
**Susquehanna County**

The predominant soil associations within the Tunkhannock Creek watershed in Susquehanna County are the Morris-Wellsboro-Volusia and the Mardin-Volusia-Oquaga (Figure 10. Soil Map of Watershed in Susquehanna County).

The soils in the Morris-Wellsboro-Volusia association are gently sloping to moderately steep, somewhat poorly drained to moderately well drained soils on a dissected plateau. Morris soils are somewhat poorly drained and have a firm fragipan that restricts the movement of water and the penetration of roots. Volusia soils are deep, somewhat poorly drained with a fragipan. Wellsboro soils are generally located upslope from the Morris and Volusia soils and have a deeper fragipan. They are deep, moderately well drained soils that developed in medium textured glacial till. All these soils are used for agriculture.

The Mardin-Volusia-Oquaga Association soils are sloping to steep, somewhat poorly drained to well-

## Figure 10. Soil Map of the Watershed in Susquehanna County




Source: Susquehanna Cty. Conservation District, Chesapeake Bay Program for the Tunkhannock Creek Watershed, 1989.

### SOIL ASSOCIATIONS

1 — Volusia-Mardin association: Nearly level to sloping, somewhat poorly drained and moderately well drained soils on a dissected plateau

2 — Morris-Wellsboro-Volusia association: Gently sloping to moderately steep, somewhat poorly drained to moderately well drained soils on a dissected plateau

Mardin-Volusia-Oquaga association: Sloping to steep, somewhat poorly drained to well-drained soils on the sides and tops of hills next to major stream valleys

4 — Morris-Wellsboro association: Level to sloping, somewhat poorly drained to moderately well drained soils on a high, undissected plateau

Chenango-Barbour-Volusia association: Level to sloping, well-drained soils on flood plains and terraces, and somewhat poorly drained soils on lower valley slopes

Compiled in 1971

drained soils on the sides and tops of hills, next to major stream valleys. Long slopes, excessive relief, and rapid surface runoff are chief characteristics of this association. Mardin soils are moderately well drained with a slowly permeable fragipan which restricts the movement of water and most roots to the permeable soil layer. The Oquaga soils consists of moderately deep, well drained soils overlying frost-fractured sandstone bedrock. These soils are used in agriculture for both crop production and pasture. (Above information from Susquehanna County Conservation District report "Chesapeake Bay Program Watershed Assessment, 1989).

Moderate to steep slopes and high groundwater conditions combine with the county's soil configuration to become the area's greatest limitations to development. The single most limiting factor to development however is the existence of a barely permeable fragipan about fifteen to forty inches below the surface. The fragipan is brittle and loamy and composed of silt and sand. The slow permeability of the fragipan diminishes the soil's capacity to assimilate sewage and solid wastes.

The following figures indicate the extent of these soil limitations.

**Percent of County Land Area Suitable For On Site Sewage Disposal By Soil Limitation Category:**

| | |
|---|---|
| Slight limitations | 1.34% |
| Moderate limitations | 7.01% |
| Severe limitations | 91.70% |

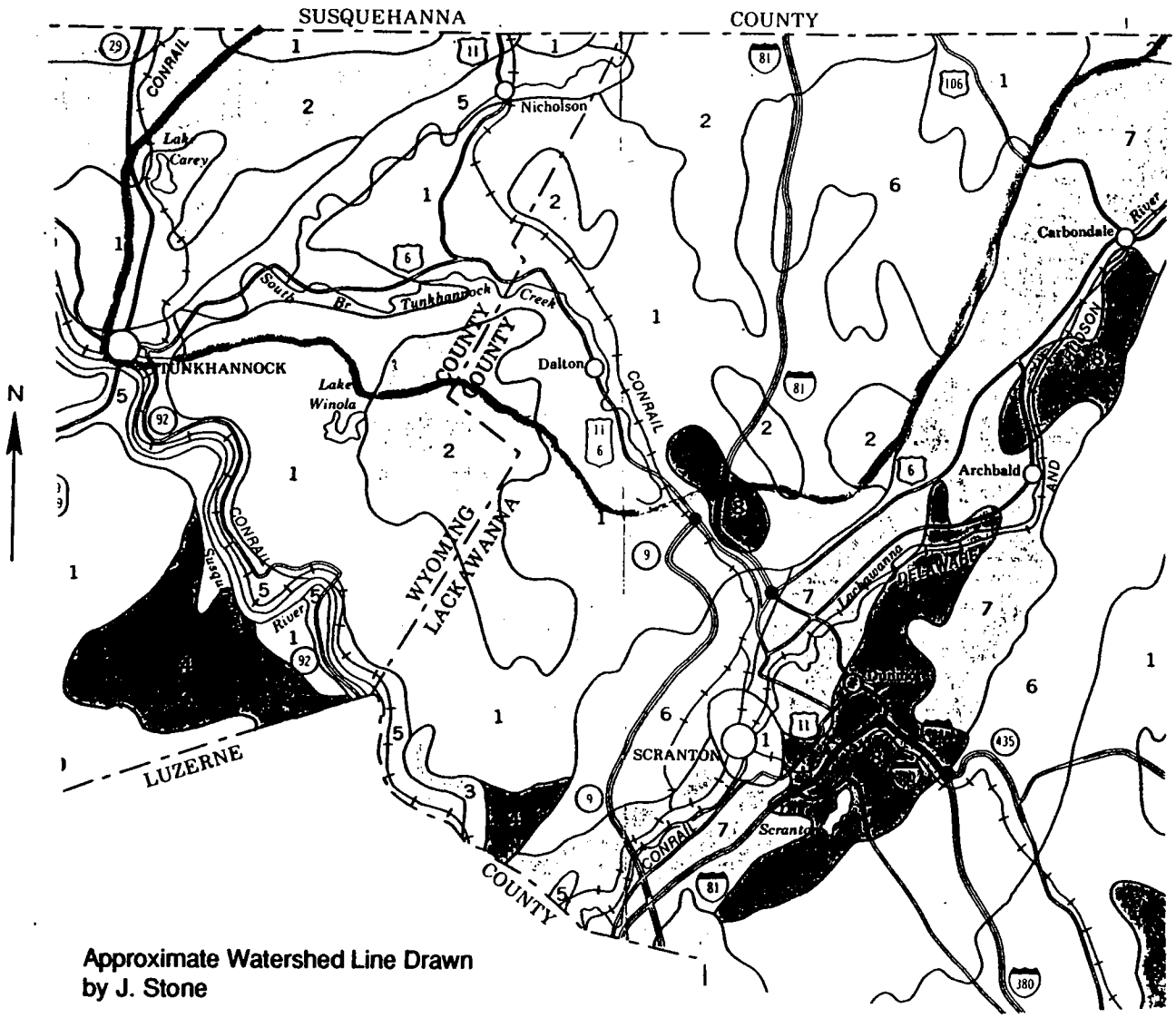
Source: Susquehanna County Comprehensive Development Plan, July, 1992.

**Wyoming County and Lackawanna County**

In Wyoming County and Lackawanna County there are mainly three soil associations that occur in the watershed area (Figures 11. Soil Map of the Watershed in Lackawanna and Wyoming Counties). The predominant soil association in these two counties is the Wellsboro-Morris-Oquaga Association It is found on the broad rolling uplands where soils formed in glacial till derived from sandstone and shale. (Wyoming Cty. Conservation District, Chesapeake Bay Watershed Assessment Report, 1989). A seasonal high water table, depth to bedrock, restricted permeability, and stoniness are major limitations in this association. The soils are suited to pastures and crops, primarily as dairy farms but today many of the farms have disappeared and development has increased. Northern hardwoods with sugar maple, beech, white ash, red oak and black cherry and hemlock appear to be fairly typical of mesic to slightly drier sites (Davis et al).

Mardin-Lordstown-Volusia Association. This association consists of soils found on rolling uplands that were formed in glacial till. This soil type is suitable for dairy or truck farming but has also seen increased building activities. Much of the acreage of this association is left wooded because the soils have so many limitations. Northern hardwoods such as sugar maple, beech and birch and hemlock are typical

## Figure 11. Soil Map of the Watershed in Lackawanna and Wyoming Counties




Approximate Watershed Line Drawn by J. Stone

### SOIL ASSOCIATIONS

1 — Wellsboro-Morris-Oquaga association: Nearly level to steep, deep and moderately deep soils that are moderately well drained, somewhat poorly drained, and somewhat excessively drained; on uplands

2 — Mardin-Lordstown-Volusia association: Nearly level to moderately steep, deep and moderately deep soils that are moderately well drained, well drained, and somewhat poorly drained; on uplands

3 — Oquaga-Lackawanna-Arnot association: Moderately steep and steep, moderately deep, deep, and shallow soils that are somewhat excessively drained and well drained; on mountainsides

4 — Mardin-Bath-Volusia association: Nearly level to steep, deep soils that are moderately well drained, well drained, and somewhat poorly drained; on uplands

5 — Wyoming-Pope association: Nearly level to steep, deep soils that are somewhat excessively drained and well drained; on terraces and flood plains

6 — Rock outcrop-Arnot-Dystrochrepts association: Rock outcrop and nearly level to steep, shallow to deep, nonstony and extremely stony soils that are well drained and somewhat excessively drained; on mountaintops and mountainsides

7 — Udorthents-Mine dumps association: Nearly level to steep, deep to shallow, well drained to poorly drained soils in areas that have been strip mined, and Mine dumps; on uplands

8 — Urban land association: Nearly level to moderately steep, deep to shallow soils that are well drained to somewhat poorly drained; in residential and industrial areas on uplands

Source: Soil Survey of Lackawanna and Wyoming Counties, USDA, Soil Conservation Service in cooperation with Penn State Univ., 1982

canopy species where forest exists on rolling upland; oaks predominate on steep south-facing slopes and hemlock is dominant on steep north-facing slopes (Davis et al).

The Wyoming-Pope-Association is found bordering the north (main) and south branches of the Tunkhannock Creek. These soils are gravelly, sandy loam on stream terraces, and are loamy on the floodplains. (Wyoming Cty. Conservation District, Chesapeake Bay Watershed Assessment Report). Most of this area has been used for fields or pasture and for industry - sand and gravel extraction primarily. Areas that have received less human disturbance are characterized by floodplain species such as sycamore, silver maple and river birch (Davis et al).

The following paragraph taken from the Lackawanna County Conservation District's report "Watershed Assessment - South Branch Tunkhannock Creek,1990" supplies interesting information that adds to one's understanding of the soils in the watershed.

"The mountains and plateaus have numerous stones and boulders mixed throughout the soil profile. Adjacent to larger streams are limited areas of sand and gravel. The plateaus contain numerous lakes also formed by glaciers. Some of the shallow lakes have become filled with vegetation and over the ages developed into muck and peat bogs containing organic soils. Most of the remaining soils are wet, shallow and stony. The wetter soils are recognized by the dark color and fine textured subsoils. These soils stay cold for long periods in the spring and are difficult to work. Size and quantity of stone fragments also regulates many of the uses for these soils. Soils are ranked according to Soil Conservation Service soil capability classification from 1 - 7, with 1 being the best for farming, 2 having few limitations, 3 having more limitations and so on up to 7, which has the severest limitations for farming. The majority of the soils in the Tunkhannock Creek Watershed were soil capability 3 (47% or 26,800 acres). The class 3 soils have severe limitations that reduce the choice of crops or require very careful management, or both."

## WATER QUALITY

As was mentioned in the section on Aquatic Resources, the Tunkhannock Creek has "good water quality." The major source of pollution is from non-point sources. Tables 8 and 9 reveal the significant losses of soil and the number of tons of Nitrogen and Phosphorus that were estimated to be entering the creek in 1989.

Each of the County's Conservation Districts has been participating for several years in the Chesapeake Bay Program to reduce non-point source pollution. For information on the success of these programs, the reader is referred to the section on Nutrient Management under Agriculture.

Appendix G contains additional water quality data on the Tunkhannock Creek.

**Table 8. Annual Soil Loss for the Tunkhannock Creek Watershed**

| County | Average Soil Loss Tons Per Acre/Year | Total Soil Loss Per Year (Tons) |
|---|---|---|
| Lackawanna Cty. | 8 | 10,040 |
| Susquehanna Cty. | 4.7 | 188,832 |
| Wyoming Cty. | 7.2 | 100,000 |
| Total --- | 6.6 | 298,872 |

**Table 9. Tons of Nitrogen and Phosphorus Entering Tunkhannock Creek Annually**

| County | Nitrogen | Phosphates |
|---|---|---|
| Lackawanna Cty. | 50 | 10 |
| Susquehanna Cty. | 103 | 5.5 |
| Wyoming Cty. * | | |
| Total--- | 153 | 15.5 |

Sources: Chesapeake Bay Watershed Assessment Reports for Susquehanna County (1989), Lackawanna County (1990), and Wyoming County (1989).

## STREAMFLOW STATISTICS and The Jan.19th,1996 FLOOD

Complete streamflow statistics for the Tunkhannock Creek collected at the U.S. Geological Survey's gaging station at Dixon can be studied in Table 10. Although during the warm months from June to September, the current in the Tunkhannock Creek permits safe wading and swimming for children and adults, like all streams it contains the potential to be both swift and somewhat dangerous. A look at Map 5 shows not only all the sub-watersheds in the Tunkhannock Creek Watershed but also the great number of streams, ponds and lakes that empty into it!

The power of the normally placid Creek was experienced on January 19th, 1996. A sudden January thaw melted record high snowfalls in the watershed, snowfalls that measured 5' deep on the level in most yards. Several inches of rainfall added to the snow melt. With the ground frozen, this incredible volume of water glided down the hillsides and into the tributaries with unexpected speed, time and force. (See APPENDIX H - Do You Have a Tunkhannock Creek Story?) The flood of January 19, 1996 was the worst recorded flood in the records of the U.S. Geological Survey which has been monitoring the Creek since 1914. It was the worst flood in the memory of any resident encountered during this project. The gage located in Dixon along Highway 6 recorded a stream flow of 30,300 cubic feet per second! The Survey believes that this figure is more accurate than the figure recorded for the 1947 flood due to better designed gauges (Table 11 ).

In the Tunkhannock Creek watershed, no lives were lost but property damage was high, particularly to the Lazy Brook Development. The development, built in 1971, existed on a flood plain along a sharp bend in the Tunkhannock Creek about two miles before the Creek enters the Susquehanna River. This was a very risky location to place the development and it had experienced flooding many times in the previous 30 years. The Lazy Brook Development cost government (FEMA, PEMA, Tunkhannock Township) $6.2 million to buy out the approximately 75 homes.

Now that the houses have been purchased, the township is developing plans to turn the area into a park! The township was able to purchase additional acres for $1.00 an acre. At 42 acres the park will become the largest park owned by a municipality in the watershed. A Committee has developed representing many organizations in the area to work on plans for the park. The National Park Service has received funds from PEMA to work on a Comprehensive Plan.

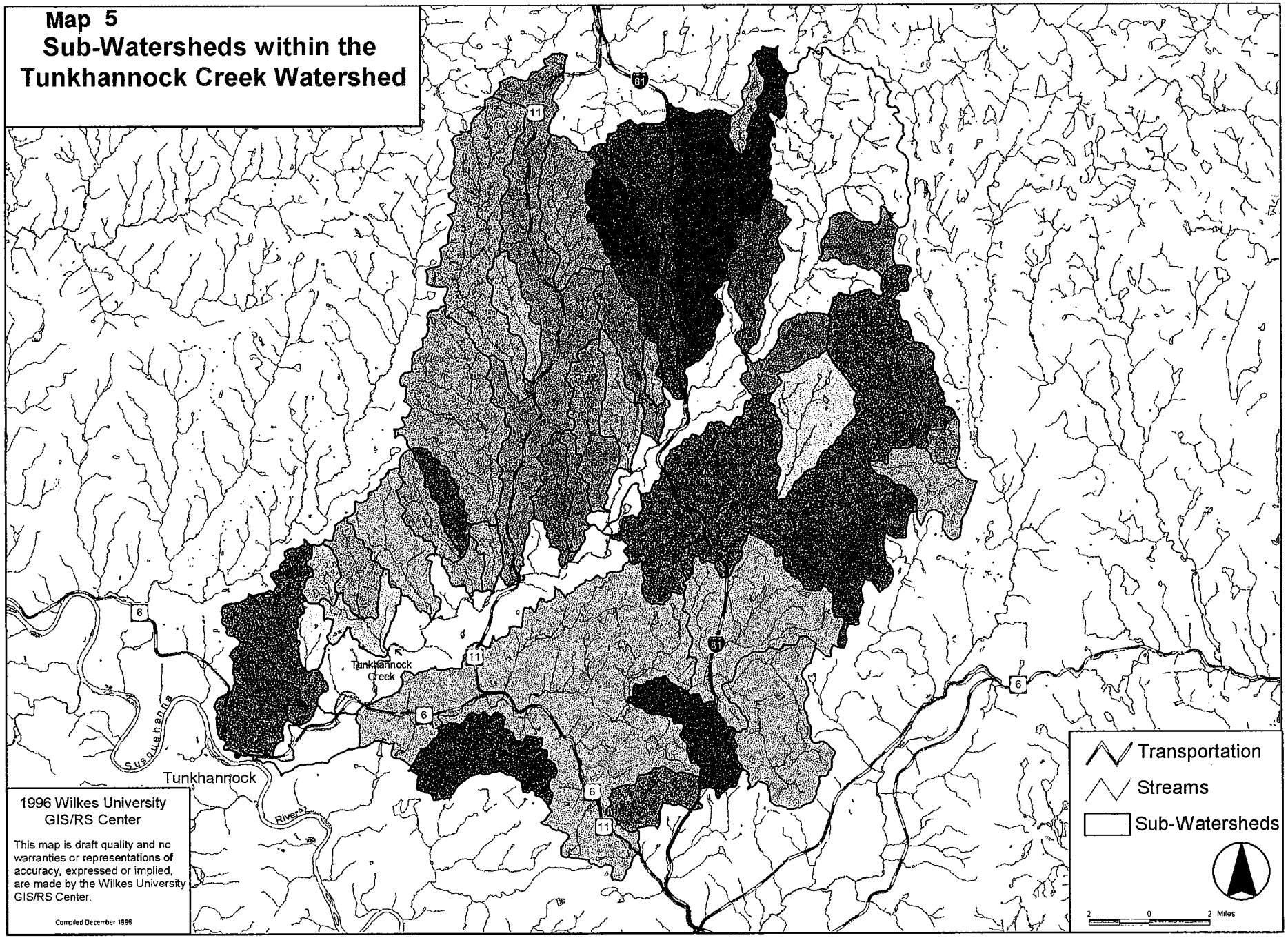
Through this Tunkhannock Creek Conservation Plan the project manager has been involved with the park concept even before the flooding occurred. In the fall prior to the flood when plans existed to build a dike at the development to protect it from flooding, PEC met with the township supervisors and developed interest in establishing a small park at the site of the dike. PEC will continue attending meetings regarding the park.

## Table 10. Streamflow Statistics for the Tunkhannock Creek Gaging Station at Dixon

| Statistic | Water Years (1914-1994) | Calendar Year (1993) | Water Year (1994) |
|---|---|---|---|
| Avg. Flow | 541 cfs | 719 cfs | 778 cfs |
| Highest Annual Mean | 897 cfs (1928) | | |
| Lowest Annual Mean | 220 cfs (1965) | | |
| Highest Daily Mean | 22,700 cfs (04/16/83) | 13,000 cfs (4/11) | 6850 cfs (11/28) |
| Lowest Daily Mean | 6.9 cfs (09/24/64) | 24 cfs (9/2) | 68 cfs (7/18) |
| Annual Runoff (CFSM) | 1.41 | 1.88 | 2.03 |
| Approx. Width at Gage | 161 ft | 168 ft | 170 ft |

Note: cfs- cubic feet of water passing by gage every second
CFSM- cubic feet per second per square mile

Source: U.S.D.I., U.S Geologival Survey, Water Resources Division, Lemoyne Subdistrict Office, 840 Market St., Lemoyne, PA 17043


Map 5
Sub-Watersheds within the
Tunkhannock Creek Watershed
11
61
6
Tunkhannock
Creek
Susquehanna
River
Tunkhannock
1996 Wilkes University
GIS/RS Center
This map is draft quality and no warranties or representations of accuracy, expressed or implied, are made by the Wilkes University GIS/RS Center.
Compiled December 1996
Transportation
Streams
Sub-Watersheds
2 0 2 Miles

## Table 11. Gage Data of Floods for Tunkhannock Creek - February, 1914 - 1996

| Flood Event | Gage Datum (height) | Stream Flow (cfs*) |
|---|---|---|
| 04-05-47 | 13.96' | 32,200** |
| 03-10-64 | 14.26' | |
| 03-15-86 | 15.77' | |
| 01-19-96 | 19.97' - inside<br>20.06' - outside | 30,300 |

Note: * cubic feet per second

** Figure may be loweredbased on new information from the 1-19-96 Flood Event

Source: U.S.D.I., U.S. Geological Survey, Water Resources Division,
Lemoyne Subdistrict Office, 840 Market St., Lemoyne, PA 17043

## Description of the Tunkhannock Creek U.S.G.S. Gage Station

**Station Number** - 01534000

**Location** - Latitude 41 33'30", Longitude 75 53'42", Wyoming County, Hydrologic Unit 02050106, on left bank at Dixon, 20 feet downstream from abutment of former highway bridge, 300 feet upstream from bridge on U.S. Highway 6, 3 miles northeast of Tunkhannock, and 4 miles upstream from mouth.

**TO REACH GAGE** - To reach station from Tunkhannock, drive northeast on Highway 6 to Dixon and third bridge over Tunkhannock Creek.

**ESTABLISHED** - January 28, 1914. Recorder installed August 9, 1938.

**DRAINAGE AREA** - 383 square miles.

**GAGE** - Fischer-Porter digital water-stage recorder, Synergetics Data Collection Platform, Belfort weighing-bucket rain gage, and Stevens telemark, installed in a cinder-block shelter and well.

**CHANNEL** - Channel is straight for a short distance upstream and downstream from gage. Bed of stream is composed of coarse gravel and some rock. Right bank is high and is not overflowed. Left bank is low and is subject to overflow at high stages, but all flow is confined to bridge opening by highway embankment.

**CONTROL** - Control is a riffle, where bed is composed of gravel and boulders, about 300 feet downstream from gage, and just upstream of the bridge.

**POINT OF ZERO FLOW** - At gage height 0.54 ft on October 15, 1986 (for low flow channel control)

**REGULATION** - There is some regulation from storage in natural and artificial lakes.

**ACCURACY** - The records in general are good.

**COOPERATION** - The station is maintained cooperatively by the PA DEP and the U.S. Geological Survey

# SECTION IV.

# ARCHAEOLOGY AND HISTORIC NOTES

## ARCHAEOLOGY

The individual containing the greatest knowledge of primitive man in the Tunkhannock Creek Watershed is without doubt Hugh R. Saxton of Nicholson Borough. Now almost an octogenarian, Hugh has been actively studying and collecting artifacts since he discovered his first knife in a field along the Tunkhannock Creek at age six. Cultivating fields with the family horse in the spring provided ample opportunity for looking for the precious primitive tools even if it meant occasionally having his foot stepped on by the horse as it turned a corner. Hugh and his brother Norman have collected over 2,500 artifacts along the Tunkhannock Creek Flood Plain within a mile north and a mile south of his home on State Street. Hugh has painstakingly identified and dated most of his findings and has created an outstanding museum display of these artifacts in the basement of his home which he and his gracious wife Helen are happy to show to interested individuals.

Even more outstanding than the knives, pitted stones and spearpoints he has collected is his discovery of a pristine rock shelter that had been used by Indians repeatedly from the Archaic to Middle Woodland times, 6,000 BC to 500 years ago (Figure 12). The original shelters used were of a natural origin, an overhanging bank, a thickly foliated tree, or a rock formation. One of the types that especially appealed to the primitive man was the rock shelter with its permanence and relative safety. The rock shelter and cave have been of special interest and value to the archeologist because its dry confines sometimes have rare and valuable preservative qualities (Whitney, 1983). The cavity of the Saxton Rock Shelter was seventeen feet long, eight feet high and nine feet front to back.

Although the shelter was merely an overhanging ledge, Saxton supposes that the Indians laid branches or logs from the ledge down to the ground to enclose the shelter when needed. The rock formation faces south and gets the full advantage of the seasonal sun's rays. An abundant spring was located some two hundred feet to the northwest. Although the Indians had abundant food in the area, many sources of water and a south facing shelter, Hugh believes that they only spent their winters at the rock shelter, returning to central New York in the spring. His theory is supported by the fact that if Indians had lived there permanently, more artifacts would have been discovered at the rock shelter than what existed. Furthermore, the Indians did not use the local shale for tools as it was too soft. All the knife and spear points found were composed of cherte or more commonly called "flint" which was brought in from the outside.

The rock shelter exists just off Route 92 on the first farm cleared in the Tunkhannock Creek Valley near a legendary Indian trail that led from the main Susquehanna River at Tunkhannock to the Great Bend of the Susquehanna River. Although the site was at one time cleared and used for pasture, it was never tilled. Local history has it that the site was used as a picnic area, a Sunday School gathering was reputed as having used the small cavern portion as a place to keep

its lemonade cool. The magnificent Tunkhannock Creek Viaduct, built from 1912 to 1915, can be seen to the southwest from the rock shelter site.

Working with the Reverend Robert Webster and Theodore Whitney of the Chenango Chapter, New York State Archeological Association, the amateur archaeologists spent five years scientifically and very carefully sifting through 4 feet of soil beneath the rock shelter and in front of the shelter to uncover artifacts. The total number, variety, and age of the artifacts discovered in "Indian Dirt", a term commonly given for occupied soil that has a greasy feel, is truly astounding and includes the following:

- Four hundred projectile points, dating back to 2,000 to 3,000 BC based on carbon dating studies in New York State of points that were created using the same techniques and style. Hundreds of sherds of pottery pieces, some 2" across dating to the Middle Woodland Period.

- Twenty thousand pieces of bone including two polished bone awl tips, and hundreds of animal bones indicating that the Indians subsisted on small birds, small mammals, elk, beaver and deer.

- Four hundred pitted stones, some used as hammer stones to crack chestnuts, acorns, etc.; many stones were possibly "boiling stones" dating back to middle Archaic Period. Before ceramics was discovered, Indians had to boil their food or water contained within a skin or bark. In order to accomplishment this task, stones had to be heated in fires. When thoroughly heated, the stones were lifted using two sticks and then placed with the cold stew in a bark or skin container. Occasionally the heated stones exploded if they contained moisture.

- About a hundred stone circles with little or no signs of fire that may have been used for a hearth, or ceremonies, games or to support a skin to boil meat or cereal stew using "boiling stones."

- A solitary burial of a young girl about 15 years old was uncovered and a careful examination of her teeth revealed that she had had two children.

Mr. Saxton also discoverd another smaller rock shelter that was only six feet by six feet by three feet high with a deposit of a foot of refuse. At this site he located 20 kernels of charred corn which reveals that some agriculture was being practiced here nine hundred to one thousand years ago.

All the artifacts discovered at the Saxton Rock Shelter are in the possession and care of Hugh Saxton. As this collection is extremely valuable, it is hoped that Nicholson Borough or Township will create a museum or historical library to permanently protect the collection. Such a museum should be named after Mr. Saxton for his numerous contributions to the area.

For further information on the Saxton Rock Shelter, the reader may contact Mr. Saxton or obtain the Chenango Chapter of the New York State Archaeological Association's Bulletin, Vol. 20, No. 2, August 1983.

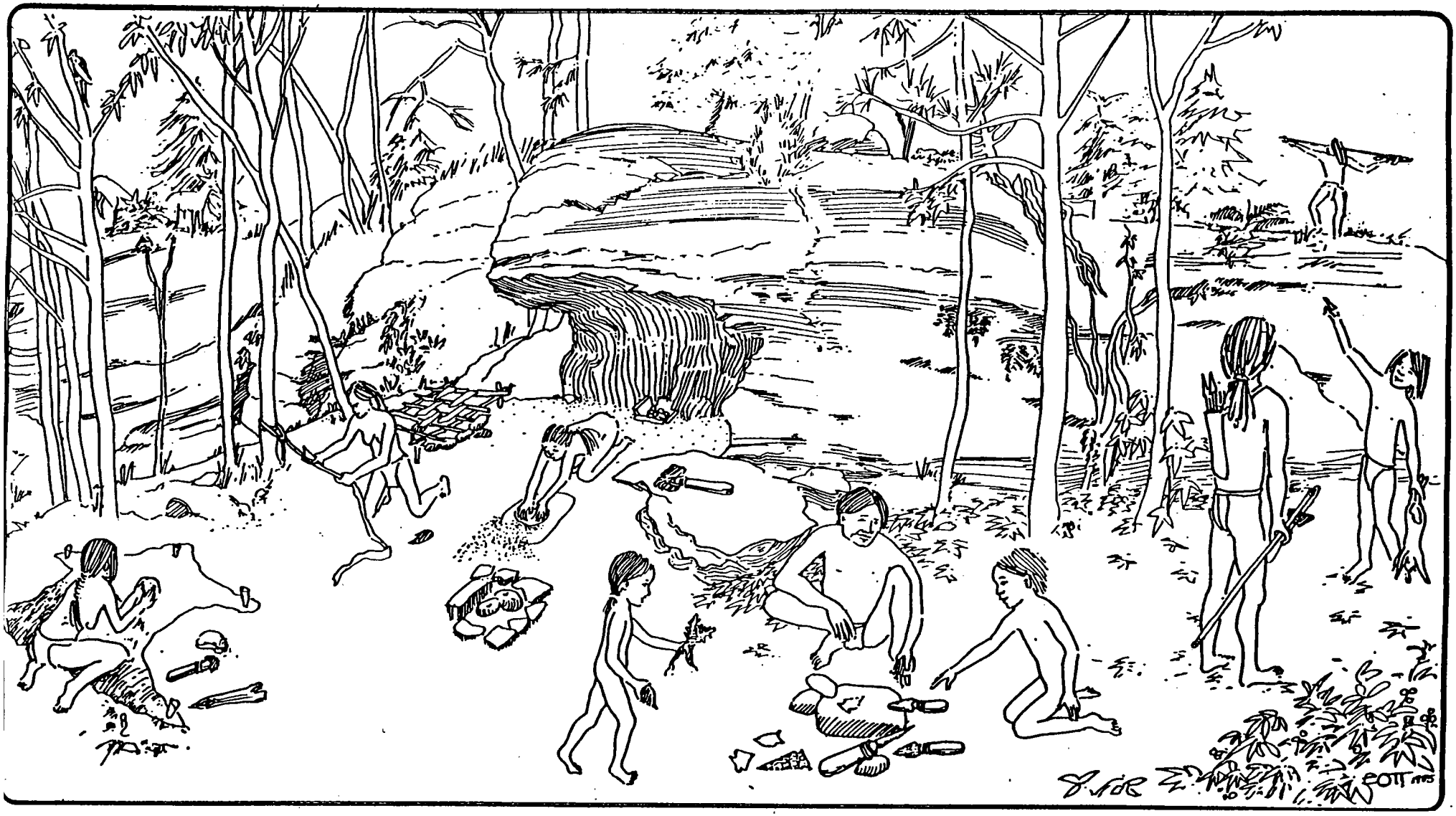


Figure 12. Rock Shelter Discovered in Nicholson Twp. Showing How the Stone Implements Uncovered in the Dig Were Used. Drawing by Elizabeth Ott.

## TUNKHANNOCK CREEK: SOME HISTORICAL NOTES

*** AUGUST 3, 1779***

William Rogers, D.D., a chaplain traveling with General Sullivan's forces, entered the following in his journal:

"Tunkhannock is a beautiful creek eight poles in breadth*. The place where we crossed it about three quarters of a mile from the Susquehanna, into which it empties, was very rapid. The path along which we came, and on each side of it as far as we could see, wild grass had grown in abundance. Some places, owing to the herbage, emitted a most fragrant smell, and we frequently has the pleasure of viewing flowers of various hues. Hazelnuts were ripening for a long tract of country in amazing quantities, and beyond doubt nature has been equally kind in causing these wilds to abound with other things delicious to taste. Several deer were seen, both by officers and men; one came running close by us."

Many of these men were militia-men from the Portsmouth area in New Hampshire, a settled area compared to the raw wilds of northern Pennsylvania. Their description of the flocks of turkeys around their campsite where the Tunkhannock Creek flows into the Susquehanna, and their amazement at the girth of walnut trees throughout the valley, are almost lyric in their enthusiasm and wonder.

*One pole is equal to 16.5 feet.

***1795***

The idyllic wilderness encountered by Sullivan's men changed quickly with the influx of settlers. By 1795 extensive economic activity is evidenced by numerous commercial ferries crossing the Susquehanna in the Tunkhannock area. Tanneries processed hides from local farms. Woodcutters supplied bark to the tanneries and shipped out timber. Grain from local farms was ground into flour, initially by water power from Tunkhannock Creek and its tributaries. Farmers and woodsmen in the Tunkhannock Creek Watershed saw the products of their lands flow out across the world: first by river boats, later by canals, and finally, after the 1850's, by railway.

***1840***

TUNKHANNOCK CREEK AQUEDUCT

The first half of the 19th Century witnessed the extension of canals from urban coastal areas into the hinterland. By the late 1840's, it was possible to load timber or livestock onto a barge in Tunkhannock for shipment north to Binghamton and south to Wilkes-Barre or Harrisburg. The return cargo to Tunkhannock consisted of manufactured goods from the New York area and coal from Wilkes Barre and Pittston.

Where today's route 92 separates from route 6 to continue south over the iron bridge (at the Tastee Freeze), there was, in the mid-19th Century, a stone and earthen viaduct which carried the canal across the

Tunkhannock Creek. Maintaining the proper water-level was always a problem, especially during dry spells in the summer. During the spring when the streams were filled with the
run-off of melting snows, and during the summer thunderstorms and cloudbursts, the problem lay in preventing earthen canal walls from washing out.

However, it was not these physical hazards which sounded the death knell of the canal boats: they were pushed off the scene after the Civil War by railroads, which presented a more reliable and more economical means of transportation. So the canal company sold its right-of-way to the newly formed rail company; and in most instances the canals were filled in and the tracks put down in the same place. But at some locations, due to the terrain or the demands of juggling rail-lines and new roadways for wagon and carriage traffic, the canals were simply abandoned and not filled in; and to this day, one can occasionally discern an overgrown depressed section along route 92 between Tunkhannock and Falls.

***1850***

Gearhart's Machine Shop, successors to a foundry built by Cyrus Avery in 1840, "...carries on a considerable business in making railroads castings, circular sawmills, stoves, and agricultural machinery, among its customers being the Lehigh Valley and Montrose Railway companies." (15 employees)

***1866***

The Tunkhannock Tannery, established in 1866, eventually employed 45 men and processed more than 30,000 hides each year. The tanning process required sixty-thousand (60,000) tons of tree bark annually. The finished product, with a top quality ranking of Al, made its way to the New York market to be used for soles of boots and shoes.

Water flowing from Lake Carey descends the hillside for several miles before emptying into Tunkhannock Creek. In 1873, at Lake Carey's outflow, F.L. Sittser opened his Tunkhannock Mills on the site of an earlier mill owned by Elisha Stark. According to a contemporary account, "The water power is immense and can always be kept uniform, no matter how high or low the stream." Each day, 400 bushels of wheat were processed.

***1876***

In 1876, the Tunkhannock Toy Company moved from its location at La Grange, today's Osterhout, to Sittser's Mill. One of its most popular products was a set of reduced-size bowling pins and balls for use in the home when cold winter weather or rainy days kept children indoors. The toy factory, which employed 12 - 20 men, remained in operation until 1887. After reconstruction it returned to its original function as a grist mill, producing flour until a fire destroyed the facility and ended production in 1896.

***1888***

One of the tributaries of Tunkhannock Creek is Swale Brook, which flows from the northwest corner of Tunkhannock, across the town in an easterly direction, until it empties into Tunkhannock Creek near the point at which route 92 turns south from route 6. On its bank, near the location of the middle school playing fields, there was once a mill which produced wooden butter pails and tubs. In 1894 the mill was producing shingles. After the 1902 flood damaged the covered bridge which spanned the Susquehanna River, the mill reprocessed the lumber salvaged from the covered bridge. A portion of the mill was also devoted to the production of cider on a seasonal basis.

***1896***

Lake Carey began to prosper as a resort and vacation spot at about this time. It became accessible to visitors form New York, New Jersey, and Philadelphia when the Montrose Railway extended its line southward to Lake Carey and then on to Tunkhannock, where it connected to the Lehigh Valley Line.

In addition to private homes and cottages on the lake, three hotels served visitors: the Pollner House, Spring Grove House, and Hotel Fern Cliff. The latter accommodated 250 guests on its six floors, until it burned to the ground in May 1906. Two steam boats -- LILY OF THE LAKE and MARIETTA -- offered excursions along the lake shore.

***1903***

A steam-generated electric plant operated for some time along Swale Brook, upon which it depended for its water supply. After continued seasonal flooding had introduced unacceptable quantities of sand and silt into the stream, the generating plant was dismantled and relocated at a site on Tunkhannock Creek in 1903. Here, just east of the present bridge, where route 92 turns south off route 6, electricity was generated by both water-power and electric power. This facility continued to operate until 1929. Less expensive electric power from sources outside the immediate area rendered the Tunkhannock Creek plant obsolete. Today, one can see some of the stones from this dam just east of the bridge, the only reminder of a bygone era of water-power.

***1906***

For some years a canning factory operated beside Swale Brook. After it had ceased operations, the building housed the Pennsylvania Witch Hazel Company, established in 1906.

Witch hazel was a good cash crop for local farmers. After their regular crops had been harvested, when heavy frosts occurred, they could begin to cut witch hazel branches. They could continue collecting witch hazel until springtime when the buds began to enlarge. Since the bush renews itself in six years, it was a continuing source of income.

Hundreds of tons of witch hazel branches were supplied to the distilling factory each year, until the final order for witch hazel extract was shipped in 1936, by rail to the port of New York, and from there through the Panama Canal to San Francisco.

Today...

Today people continue to enjoy the lakes and wooded hills in the Tunkhannock Creek watershed. During the fall season, hunters roam the wooded hills. Fishermen throw out their lines from creek banks or from the shores of lakes; and in the wintertime they brave the cold to lower their lines down holes bored through the ice. Bark from local trees no longer supplies the needs of local tanneries, but pulp is supplied for Proctor and Gamble's plant, and wood is processed for use in building homes.

Less than a mile east of where Lake Carey's waters empty into the Tunkhannock Creek, a modern saw-mill facility continues traditions of the area's past.

".. for the past twelve years Deer Park Lumber's current owners have developed the business into one of the world's leading hardwood timber suppliers...the company now produces nearly 12 million board-feet a year for the international market. Nearly 40% of the mill's product is shipped overseas, with the rest destined for manufacturers in the United States and Canada."*

Local tanneries no longer supply top quality hides to manufacturers in New York City; witch hazel extract no longer makes its way from our distilleries to San Francisco; butter is no longer shipped by rail in locally make buckets and pails. Visitors no longer reach Lake Carey by railway. But they do come, if by other means. And the products of our hills flow into the stream of economic life through the products of Proctor and Gamble or the timber from Deer Park. The wooded hills and streams of the Tunkhannock Creek watershed continue to be an important factor in our lives.

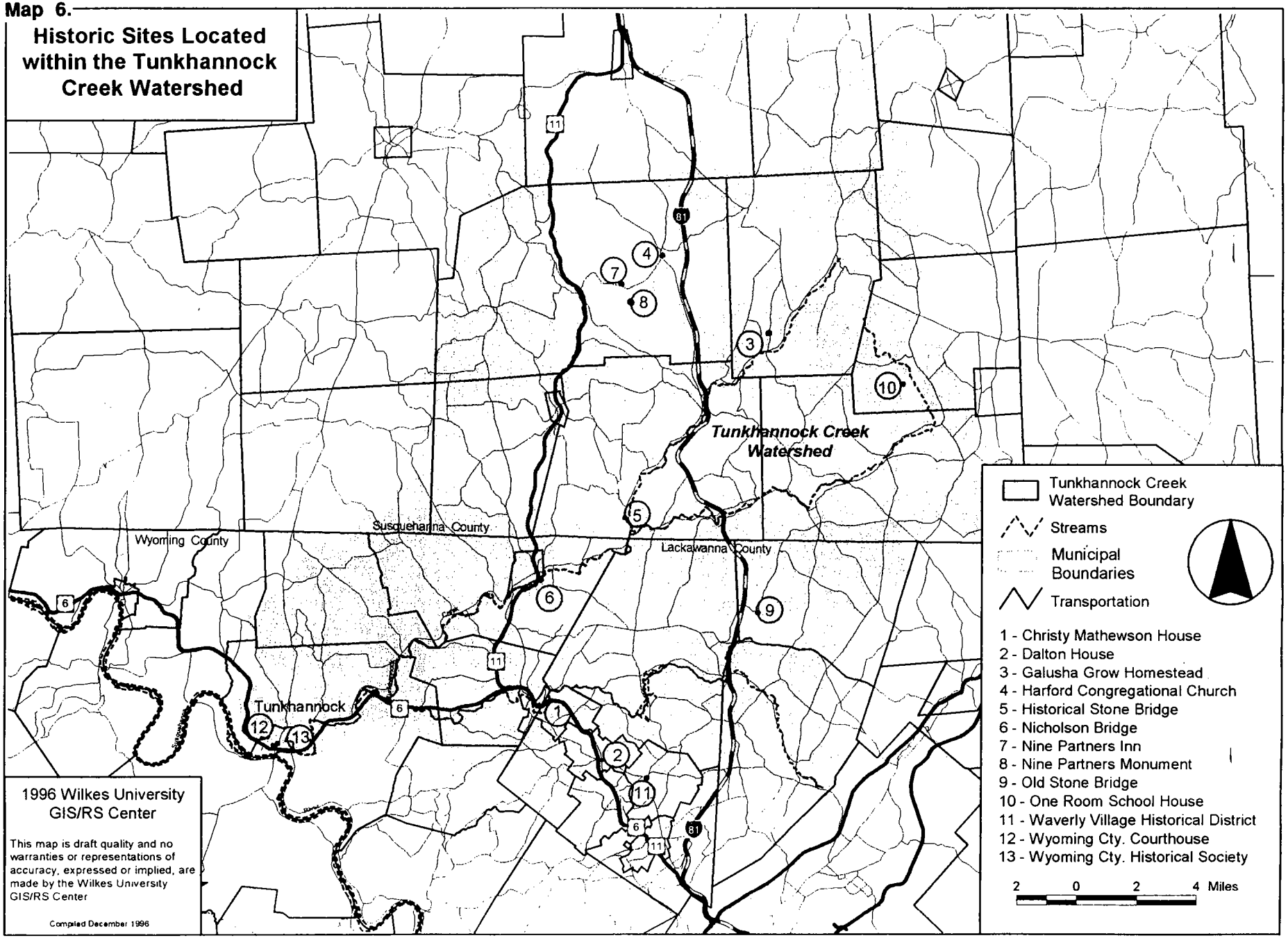
According to the rituals of Indians in this area, the Great Spirit said to them at the time of their creation, "I have made you the best people, and I have given you the best country." Preserving and conserving a part of the best country along the banks of Tunkhannock Creek would be a project very consoling to the spirits of its original inhabitants and its earliest white settlers, and even more consoling to future generations.

*This quotation is from PROGRESS '96, the New Age Examiner, p. 13. All other quotations from the "History of Wyoming County" and various issues of The Wyoming Democrat.

TUNKHANNOCK CREEK: SOME HISTORICAL NOTES was researched and written by historian Jerry Kenjorski who resides in Tunkhannock Township. PEC is deeply indebted to Jerry for this valuable contribution to the Tunkhannock Creek Conservation Plan.

**Map 6.**

## Historic Sites Located within the Tunkhannock Creek Watershed



# SECTION V.

# VALUES ISSUES and RECREATIONAL OPPORTUNITIES

## VALUES TO CREEK SURVEYS

### Participants

A Survey was conducted to determine the interests of the public in various recreational activities and environmental issues. One hundred and forty-four Values To Creek surveys were completed by individuals who either lived or worked in the Watershed. Members of many organizations completed the surveys during workshops held on the Tunkhannock Creek Watershed Plan. Those organizations include the Countryside Conservancy, Susquehanna County Federation of Sportsmen Clubs, ECOLOGIA, Sierra Cub, Susquehanna County Farm Bureau, Endless Mountains Chapter of Trout Unlimited, Return the Environment of Susquehanna Country Under Ecology and Return the Environment of Susquehanna-Wayne Counties Under Ecology. In addition many township supervisors, residents, members of the Steering Committee and individuals who attended public meetings were encouraged and did complete the surveys.

### Responses

The values most appreciated about the Tunkhannock Creek Watershed by the respondents were Natural Beauty (1st), Protection of Watershed (2nd)., and Wild and Scenic Values (3rd)! No one supplied comments regarding these values.

There was again concern for protecting wetlands, threatened and endangered species, a healthy fishery and for farm preservation. There was very little interest in promoting tourism. One person stated that "if a river greenway was not done correctly, it could cause more harm than good."

## TUNKHANNOCK CREEK CONSERVATION PLAN

### TABLE 12. - VALUES TO CREEK SUMMARY

NAME (Optional)_____

TOWNSHIP_____ COUNTY_____

| RIVER RELATED ISSUES | STRONG | MODERATE | LOW | NO RESPONSE |
|---|---|---|---|---|
| River Greenway/Path | 43 | 43 | 35 | 22 |
| Public Access to Creek | 46 | 50 | 30 | 17 |
| Healthy Fishery | 70 | 32 | 21 | 20 |
| More Trout Stocking | 45 | 31 | 45 | 22 |
| Hunting | 49 | 31 | 46 | 17 |
| Preserving Wetlands | 72 | 42 | 13 | 16 |
| Preserving Streamside Forests | 50 | 27 | 7 | 59 |
| Threatened and Endangered Species | 70 | 33 | 22 | 18 |
| Natural Beauty | 88 | 33 | 7 | 15 |
| Wild and Scenic Values | 78 | 35 | 9 | 21 |
| Protection of Watershed | 85 | 32 | 9 | 17 |
| Conservation Easements | 63 | 40 | 20 | 20 |
| Preservation of Farmland | 69 | 47 | 12 | 15 |
| Cultural and Historic Values | 54 | 44 | 26 | 19 |
| Canoeing, Kayaking, Swimming | 39 | 41 | 43 | 20 |
| Picnicking, Hiking, Camping | 41 | 46 | 34 | 22 |
| Birding, Nature Study, Photography | 45 | 49 | 28 | 21 |
| Intangible & Restorative Values | 39 | 52 | 26 | 26 |
| Tourism | 27 | 38 | 61 | 17 |
| Compatible Development | 43 | 38 | 37 | 25 |
| Other Values: | | | | |

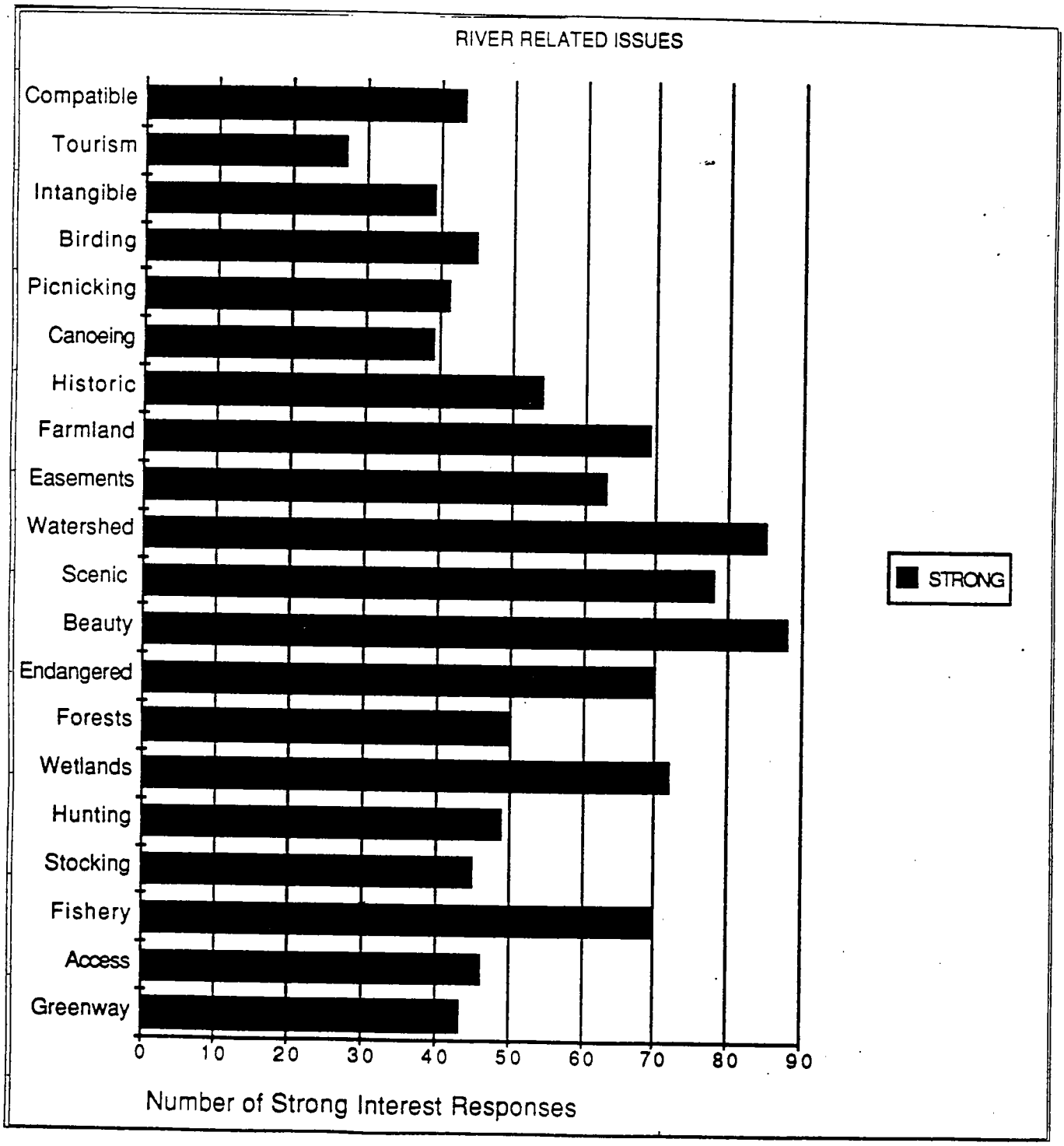
*Enter **L** for Low; **M** for Moderate; or **S** for Strong Interest in this River Issue

TUNKHANNOCK CREEK CONSERVATION PLAN

CHART 2. STRONG INTEREST IN RIVER ISSUES

NAME (Optional)_____

TOWNSHIP_____ COUNTY_____




*Enter **L** for Low; **M** for Moderate; or **S** for Strong Interest in this River Issue

## Summary of Municipalities' Responses to the Questionnaire

A two page questionnaire was mailed to the 32 municipalities to determine the total amount of open space in the watershed, recreational opportunities, and the threats to the watershed. All 32 municipalities answered the questionnaire. The following five questions concern open space and recreational opportunities.

**Question 1 - Does your municipality own any land that is currently used for parks (including those used for sports), wildlife sanctuaries, nature study, or hunting/fishing? If Yes, how many acres approximately?**

Many of the questions in the Tunkhannock Creek Questionnaire were aimed at determining how much land was currently being protected in the watershed and how much of it was available for public use. Recommendations could then be made based on the data collected. The responses to Question 1 revealed that half of the municipalities do not own any land in the watershed (Table 13). The total amount of land that the other 16 municipalities currently own is 205 acres, or an average of 6 acres per municipality for the entire watershed. If Tunkhannock Township's new Lazy Brook Park (perhaps it could be renamed the Tunkhannock Creek Park?) is removed from this list, the total acreage drops to 163 acres, or an average of 5.1 acres per municipality.

**Question 2 - Do other organizations or agencies in your township (churches, school district, Grange, Game Commission, etc.) own land that will probably remain as open space in the future? If yes, approximately how many acres? Is the public permitted to walk on most of this land?**

Nineteen municipalities (59%) contain quasipublic organizations (school districts, State Game Lands, State Park, Fire Company, Keystone College,etc.) that own land that will probably remain as open space in the future. Quasipublic organizations currently protect 3,366 acres. When this figure is added to the 205 acres owned by municipalities, the amount of land that is currently being protected by public or quasipublic institutions is 3,571 acres. (If the Lackawanna State Park and the PA State Game Lands were excluded from the list, the total acreage would drop to 755 acres.) These 3,571 protected acres represent 1.3% of the Tunkhannock Creek Watershed.

Public Access - 79% of the municipalities stated that the public was "allowed to walk on this land," reported in Questions 1 and 2. In the townships where the supervisors felt the public was not allowed, several of the sites mentioned were privately owned property including camps.

There are a number of private camps, golf courses, and

the Elk Mountain Ski Center which comprise a good 1,742 acres (See Table 14.) which were reported in the Questionnaire or to the Project Manager. These privately owned parcels for the most part currently protect open space areas but they could easily be developed and they are not generally open to the public. Therefore, their acreages were not included with the total acreages owned by quasipublic organizations.

Table 15. documents all the known sites existing in the watershed that will probably remain undeveloped for the foreseeable future, and which are open to the public. These sites are either owned by the municipalities or by an organization which permits public access. The only exceptions are the Lackawanna Audubon Society's Davis Crossing Sanctuary which requests a $7.00 membership fee and the Nicholson Volunteer Fire Company which requires groups to request permission to use their park facilities.

Table 15. includes the name, location, size, parking availability, and the recreational possibilities for 36 sites that are open to the public in the watershed. Some of this information was gathered from the Questionnaires but the majority of it was derived from personal conversations with the Supervisors. It will be seen that some townships such as Scott have as many as 5 sites available for public usage but 11 municipalities have only one site. The size of these sites varies from Hop Bottom's one acre park to the State Game Lands in Herrick which comprise 1,200 acres.

**Questions 3. Does any of the above land exist adjacent to a fishable branch or tributary of Tunkhannock Creek? If yes, about how many feet of stream frontage exists on all the above land? Is the public allowed to fish in these areas?**

Fourteen municipalities (44%) contain sites that lie adjacent to a tributary of Tunkhannock Creek that is fishable; of those municipalities, 13 (93%) reported that "the public is allowed to fish in these areas." These sites are either owned by the municipalities or by a quasipublic organization such as the Lackawanna State Park, PA Game Commission, Keystone College, Nicholson Fire Co., etc. As a description of these sites was not requested on the Questionnaire, this information was compiled from personal conversations with the municipalities after the Questionnaires were received.

Thirteen sites exist for either public fishing or nature study totaling approximately 16,066 feet of stream frontage (footage). Table 16. summarizes these sites describing their location, branch or creek along which the access exists, and the stream footage. These access areas occur along the Main Branch, South Branch, Martins Creek, Hop Bottom Creek, Kennedy Creek, and Ackerly Creek.

**Table 13. 32 Municipalities' Responses to the Tunkhannock Creek Questionnaire**

| QUESTION | #YES | #NO | % - YES | % - NO | Total Acres |
|---|---|---|---|---|---|
| 1. Does your municipality own any land that is currently used for parks (including those used for sports), wildlife sanctuaries, nature study, or hunting/fishing? | 16 | 16 | 50% | 50% | |
| If yes, how many acres approximately? | | | | | |
| TOTAL ACREAGE OWNED BY MUNICIPALITIES - | | | | | 205 |
| 2. Do other organizations in your twp. (churches, school district, Grange, Game/Fish Com., Fire Co., Audubon) own land that will probably remain as open space in the future? | 19 | 13 | 59% | 41% | |
| If yes, approximately how many total acres? | | | | | |
| TOTAL ACREAGE OWNED BY OTHER ORGANIZATIONS - | | | | | 3,366 |
| TOTAL ACREAGE OWNED BY MUNICIP. & OTHER ORGANIZATIONS - | | | | | 3,571 |
| Is the public permitted to walk on most of this land? | 15 | 4 | 79% | 21% | |
| Privately-owned Golf Courses, Camps, Ski Center | | | | | 1,742 |
| TOTAL - MUNICIPALITIES, OTHER ORGANIZ., PRIVATELY OWNED | | | | | 5,313 |
| 3. Does any of the above land exist adjacent to a fishable branch or tributary of Tunkhannock Creek? | 14 | 18 | 44% | 56% | |
| If yes, about how many feet of stream frontage exists on all the above land? | | | | | 16,066 ft. |
| Is the public allowed to fish in these areas? | 13 | 1 | 93% | 7% | |

| Table 14. Additional Open Space - Recreational Sites Privately Owned | | | | | | |
|---|---|---|---|---|---|---|
| | Mentioned by Municipalities | | | | | |
| Organization | | Acreage | | | | |
| Camps | | 618 | | | | |
| Private Conservancy | | 32 | | | | |
| Ski Center | | 640 | | | | |
| Golf Courses | | 445 | | | | |
| Other | | 7 | | | | |
| | | 1742 | | | | |

**Table 15. Public and Institutional Recreational Sites Available Within the Tunkhannock Creek Watershed**

| SITE # | NAME | CTY. | TOWNSHIP | ACRES | PARKING | BOAT RAMP | FISHING | STOCKED | SWIMMING | HUNTING | NATURE STUDY |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Lackawanna State Pk | Laca. | N. Abing/Bento | 1,411 | * | * | * | * | * | * | * |
| 2 | Chapman Lake (F&B) | Laca. | Scott | 50' Acc. | * | | * | * | | | * |
| 3 | Joe Terry Civic Center | Laca. | Scott | 6 | * | | * | * | | | * |
| 4 | Scott Twp. RT. 632 Site | Laca. | Scott | 14 | * | | | | | | * |
| 5 | Lakeland High School | Laca. | Scott | 100 | * | | | | | | * |
| 6 | State Game Lands 307 | Laca. | Scott | 60 | * | | | | | * | * |
| 7 | Benton Twp. Munici. Bldg. | Laca. | Benton | 7 | * | | | | | | * |
| 8 | Benton Twp. Rt 106 Site | Laca. | Benton | 5 | * | | | | | | * |
| 9 | Benton Fire Co. | Laca. | Benton | 100 | * | | | | | | * |
| 10 | Abing. Sewer Plt./Park | Laca. | Abington | 25 | * | | | | | | * |
| 11 | Rabbit Hollow Sanctuary | Laca. | Abington | 16 | * | | | | | | * |
| 12 | Dalton School Park | Laca. | Dalton Boro | 10 | * | | * | | | | * |
| 13 | Dalton Borough Bldg. | Laca. | Dalton Boro | 1 | * | | * | | | | * |
| 14 | Greenfield Twp. Bld. Park | Laca. | Greenfield | 7 | * | | | | | | * |
| 15 | Greenfield Park | Laca. | Greenfield | 2.5 | * | | | | | | * |

**Table 15. Public and Institutional Recreational Sites Available Within the Tunkhannock Creek Watershed**

| SITE # | NAME | CTY. | TOWNSHIP | ACRES | PARKING | BOAT RAMP | FISHING | STOCKED | SWIMMING | HUNTING | NATURE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 16 | Sheridan Ave. Park | Laca. | Clarks Summit | 5 | * | | | | | | * |
| 17 | Brooklyn Ball Field | Susq. | Brooklyn | 3.5 | * | | | | | | * |
| 18 | Hop Bottom Park | Susq. | Hop Bottom Bo | 1 | * | | * | | | | * |
| 19 | Herrick Twp. Munici. Bld | Susq. | Herrick | 5 | * | | | | | | * |
| 20 | Game Lands 236 -4 Sites | Susq. | Herrick | 1,200 | * | | * | | | * | * |
| 21 | Gibson Twp. Munici. Bldg. | Susq. | Gibson | 30 | * | | * | * | | * | * |
| 22 | Harford School Park | Susq. | Harford | 11 | * | | | | | | * |
| 23 | Harford Agri. Soc. Fairgr. | Susq. | Harford | 33 | * | | | | | | * |
| 24 | Mt. View Elem. Sch. | Susq. | Harford | 37.5 | * | | | | | | * |
| 25 | Mt. View High Sch. | Susq. | Harford | 60 | * | | | | | | * |
| 26 | Clifford Twp. Muni. Bldg. | Susq. | Clifford | 10 | * | | | | | | * |
| 27 | Stevens Lake (F & B) | Wyom. | Lemon | 12 | * | * | * | | | | * |
| 28 | Oxbow Lake (F & B)* | Wyom. | Lemon | 2.3 | * | | * | * | | | * |
| 29 | Factoryville Boro Park | Wyom. | Factoryville Bo | 4.2 | * | | * | * | | | * |
| 30 | Keystone College | Wyom. | LaPlume | 260 | * | | * | * | | | * |

**Table 15. Public and Institutional Recreational Sites Available Within the Tunkhannock Creek Watershed**

| SITE # | NAME | CTY. | TOWNSHIP | ACRES | PARKING | BOAT RAMP | FISHING | STOCKED | SWIMMING | HUNTING | NATURE STUDY |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 31 | Tunkhannock Boro Park | Wyom. | Tunkhannock B | 10 | * | * | * | | | | * |
| 32 | Lazy Brook Park | Wyom. | Tunkhannock | 42 | * | | * | * | | | * |
| 33 | Audubon's Davis Cross.** | Wyom. | Overfield | 65 | * | | | | | | * |
| 34 | Nicholson Boro Park | Wyom. | Nicholson | 1 | * | | | | | | * |
| 35 | Nicholson Fire Co.*** | Wyom. | Nicholson Bor. | 12 | * | | * | | | | * |
| 36 | State Land - Rt. 11 | Wyom. | Nicholson Bor. | 2 | * | | * | | | | * |
| | | | | | | | | | | | |
| | | | Total Acres | 3,571 | | | | | | | |
| | | | | | | | | | | | |

## Table 16. Municipalities Containing Fishing Access Areas to the Tunkhannock Creek or a Tributary

| Municipality | Approximate Stream Footage (ft) |
|---|---|
| **LACKAWANNA CTY.** | |
| Benton Twp. | |
| **S. Branch (Lackawanna State Park)** | 2,200 |
| Dalton Boro | |
| **Ackerly Creek (Former Dalton School)** | 1,500 |
| LaPlume Twp. | |
| **S. Branch (Keystone College)** | 2,500 |
| N. Abington Twp. | |
| **Kennedy Creek (Lackawanna State Park)** | 2,100 |
| Scott Twp. | |
| **S. Branch (Joe Terry Civic Center)** | 1,500 |
| **SUSQUEHANNA CTY.** | |
| Brooklyn Twp. | |
| **Hop Bottom Creek (Brooklyn Twp. Municipal Bldg.)** | 300 |
| Gibson Twp. | |
| **Main Branch (Gibson Twp. Municipal Bldg.)** | 1,000 |
| Herrick Twp. | |
| **PA State Game Lands** | 1,000 |
| Hop Bottom Boro | |
| **Martins Creek (Hop Bottom Boro Park)** | 350 |
| **WYOMING CTY.** | |
| Factoryville Boro | |
| **S. Branch (Boro Park)** | 716 |
| Nicholson Boro | |
| **Nicholson Volunteer Fire Company Lands** | 600 |
| Nicholson Twp. | |
| **Main Branch (PENNDOT)** | 300 |
| Tunkhannock Twp. | |
| **Lazy Brook Park** | 2,000 |
| **Total** | 16,066 ft |

**Question 4. Does your municipality contain tax delinquent properties that could potentially be purchased and used for open space purposes? If yes, about how many acres?**

The point of this question was to determine if municipalities could create or increase the amount of their park space by paying the generally reduced price on tax delinquent properties. Although the municipalities overwhelmingly (97%) reported that they did not contain any tax delinquent properties, this is still a viable method of acquiring land for public use. One township reported that it was the County that was in charge of the sale of tax delinquent properties.

**Question 5. Are you interested in acquiring open space or conservation easements within your municipality? If yes, please indicate what type of assistance you would need? Financial? Legal? Technical? Other?**

Half of the townships indicated that they would be interested in acquiring open space or conservation easements. All of these 16 municipalities reported that they would require both financial and legal assistance and 14 felt that they would also need technical help. One township stated that it would also need a cost/benefit analysis. The results of this question should be of interest to the Countryside Conservancy, an organization which has recently become established to facilitate conservation easements.

**Table 13A. 32 Municipalities' Responses to the Tunkhannock Creek Questionnaire, continued**

| QUESTION | #YES | #NO | % - YES | % - NO | Total Acres |
|---|---|---|---|---|---|
| 4. Does your municipality contain tax delinquent properties that could potentially be purchased and used for open space purposes? | 1 Unknown | 31 | 3% | 97% | |
| If yes, about how many acres | - - - | | | | |
| 5. Are you interested in acquiring open space or conservation easements within your municipality? If yes, please indicate what type of assistance you would need? | 16 | 16 | 50% | 50% | |
| Financial? | 16 | | 100% | | |
| Legal? | 16 | | 100% | | |
| Technical? | 14 | 2 | 87% | 13% | |
| Other? Cost/Benefits Analysis | 1 | | 6% | 94% | |

## Chart 3. Tunkhannock Creek Watershed

### Municipalities Interested in Acquiring Open Space or Conservation Easements

**Susquehanna County**

Townships:
- Bridgewater
- Brooklyn
- Clifford
- Harford
- Herrick
- Lenox

Boroughs:
- Hop Bottom

**Wyoming County**

Townships:
- Nicholson
- Tunkhannock

Boroughs:
- Factoryville
- Nicholson

**Lackawanna County**

Townships:
- Abington
- Greenfield
- Scott

Boroughs:
- Clarks Summit
- Dalton

**Question 6. Please indicate if there is a need for more public fishing access areas.**

About 1/3 or 35% of the municipalities stated that they believed that there was either a moderate or strong need for more public fishing areas. While the Fish and Boat Commission owns a 50 foot access site at Chapman Lake, 12 acres along Stevens Lake, and a 2.3 acre access to Oxbow Lake, the latter two in Lemon Township, the Commission does not own any sites along a tributary to the Tunkhannock Creek. One of the recommendations of this report is to establish more fishing access sites along the several branches of Tunkhannock Creek as 19 municipalities have no access sites. While speaking recently with a fish commissioner from this area concerning this need, he pointed out that public fishing sites now have to be handicapped accessible. Because sites along streams have a higher probability of being damaged by floods, they are not as cost effective to implement as public sites along lakes. Therefore in order for any new access site to be developed along the Tunkhannock Creek, strong input from the public will be required.

| | | | | | |
|---|---|---|---|---|---|
| 6. Please indicate if there is a need for more public fishing access areas. | Low Need | Moderate | Strong | No Response | |
| | 20/ 62 % | 5/ 16% | 6/ 19% | 1/ 3% | |

# SECTION VI.

# THREATS TO THE WATERSHED

## THREATS TO CREEK SURVEYS

### Participants

One hundred and forty-four Threats To Creek Surveys were completed by individuals who either lived or worked in the Watershed. Members of many organizations completed the surveys during workshops held on the Tunkhannock Creek Watershed Plan. Those organizations include the Countryside Conservancy, Susquehanna County Federation of Sportsmen Clubs, ECOLOGIA, Sierra Cub, Susquehanna County Farm Bureau, Endless Mountains Chapter of Trout Unlimited, Return the Environment of Susquehanna Country Under Ecology and Return the Environment of Susquehanna-Wayne Counties Under Ecology. In addition many township supervisors, residents, members of the Steering Committee and individuals who attended public meetings were encouraged and did complete the surveys.

### Responses

The threat that clearly disturbed most people was Using the Streambank as a Garbage Dump. One respondent remarked that if "all the garbage was picked up, there would be no need or excuse to use remote areas for dumps." Another individual stated that the "law was very under enforced, higher fines and more convictions were needed as well as more clean-ups." One respondent cited a specific location and said the garbage there was "tremendous."

Another individual said garbage was a low threat because the borough he lived in had an ordinance regarding garbage that was enforced.

Water Pollution and Inadequate Septic Systems ranked 2nd and 3rd in the poll. Comments concerning septic systems included "Especially around lakes", " Trailer Parks on Creek", "Need reasonable costs for new systems", "I would like to see other options to sand mounds researched."

The 4th highest concern was for the loss of wetlands in the watershed. One respondent wrote "wetland creation as buffer zones along major tributaries should be promoted." Other comments included " Needs to be addressed to prevent flooding" and "wetlands are natural purifiers."

Land Development was another major concern. One participant in the survey recommended that "development should be done considering the impacts on habitat and the watershed."

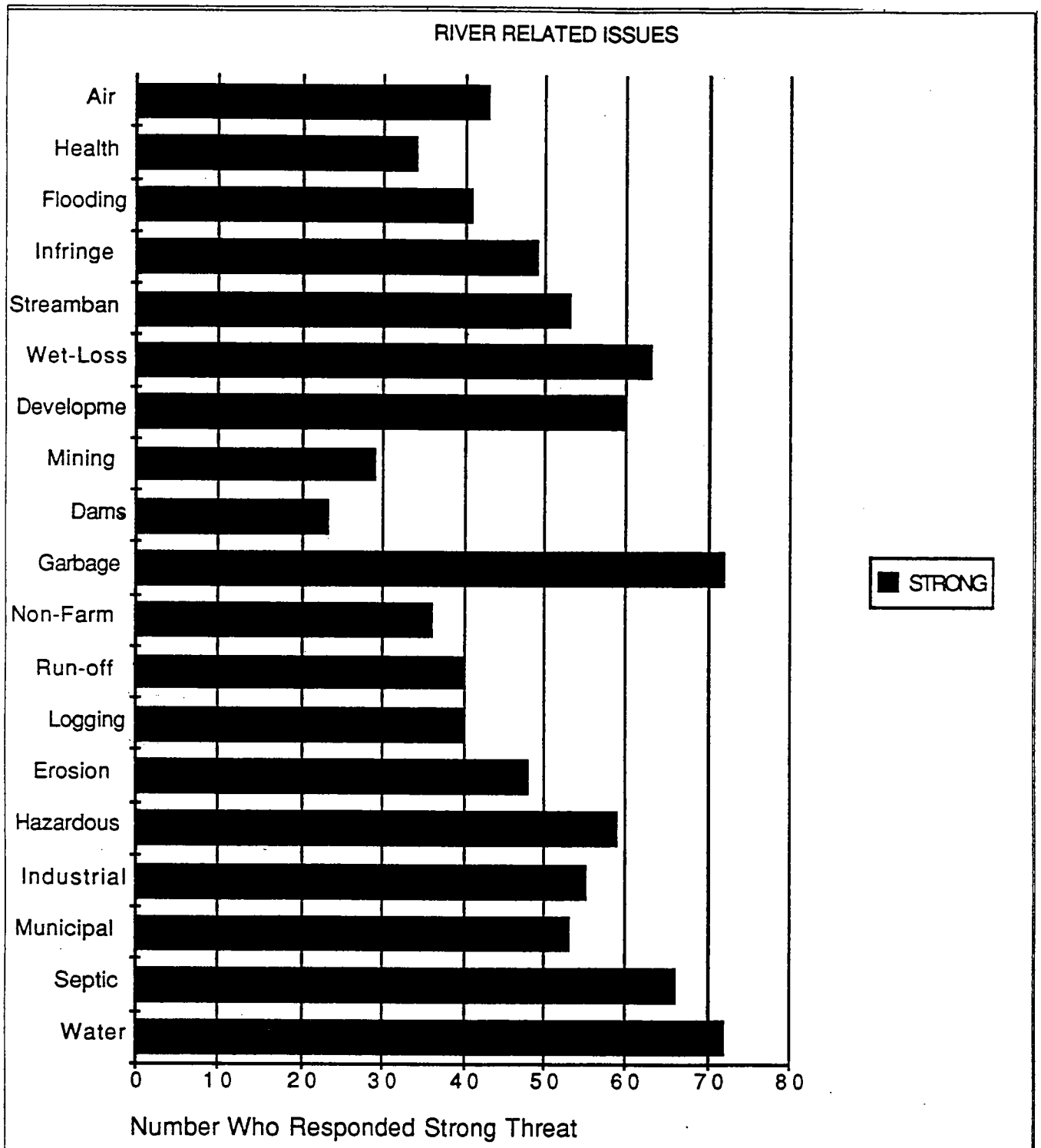
## TUNKHANNOCK CREEK CONSERVATION PLAN

### TABLE 17. THREATS TO CREEK SUMMARY

| RIVER RELATED ISSUES | STRONG | MODERATE | LOW | NO RESPONSE |
|---|---|---|---|---|
| Water Pollution | 72 | 42 | 15 | 15 |
| Inadequate Septic Systems | 66 | 40 | 18 | 20 |
| Municipal Pollution | 53 | 38 | 37 | 16 |
| Industrial Pollution | 55 | 32 | 40 | 17 |
| Hazardous Wastes | 59 | 26 | 37 | 22 |
| Soil Erosion Causing Sediment Pollution | 48 | 56 | 23 | 17 |
| Logging on Watershed Slopes | 40 | 51 | 36 | 17 |
| Run-off From Farms | 40 | 64 | 24 | 16 |
| Run-off From Non-Farm Landowners | 36 | 53 | 37 | 18 |
| Using Streambank as a Garbage Dump | 72 | 28 | 32 | 12 |
| Dams | 23 | 37 | 60 | 24 |
| Mining - Stone Quarries | 29 | 40 | 59 | 16 |
| Land Development | 60 | 47 | 25 | 12 |
| Loss of Wetlands | 63 | 38 | 25 | 18 |
| Streambank Erosion | 53 | 50 | 25 | 16 |
| Infringement on Floodplain | 49 | 38 | 32 | 25 |
| Flooding | 41 | 51 | 26 | 26 |
| Public Health and Safety | 34 | 41 | 49 | 20 |
| Air Quality - Acid Rain | 43 | 42 | 41 | 18 |
| Other Threats: | | | | |
| | | | | |
| | | | | |

*Enter **L** for Low; **M** for Moderate; or **S** if you consider the Issue is a Strong Threat to Creek

CHART 4. STRONG THREATS TO CREEK IDENTIFIED BY PUBLIC




| | | | | |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |

*Enter **L** for Low; **M** for Moderate; or **S** if you consider the Issue is a Strong Threat to Creek

Questions 7, 8, 9, and 10 on the Tunkhannock Creek Questionnaire to the Municipalities asked the municipalities for information pertaining to the water quality in each township and borough and about the threats that the supervisors/councilmembers perceive as being important.

**Question 7. Does your municipality currently have a wastewater treatment facility? Do you expect to have a facility completed within 5 years? 15 Years? 30 Years? Do you have biological nitrogen removal (BNR) measures?**

Sixty-six percent of the municipalities in the watershed do not have a wastewater treatment facility. Of the 11 municipalities that do have a system, Abington, Clarks Summit, Factoryville, Greenfield, and Tunkhannock Boro have facilities that serve their entire community. Six (Harford, Glenburn, Herrick, Dalton, LaPlume, and Benton) only have a portion of their municipality covered by a facility. These municipalities have from one to three plants that may cover a specific development. In such cases the sewer plants were privately owned.

Of the 21 municipalities that do not have any wastewater treatment plants, New Milford, Nicholson, and Scott are hoping a plant will be completed within 5 years. Another five municipalities (Clifford, Hop Bottom Boro, Lenox, Nicholson Boro, and Tunkhannock) expect a plant might be completed within 15 years indicating that they are giving the subject serious consideration. However 13 townships reported that it would be 30 years or more before they could foresee a treatment plant in their township. This of course reflects the rural nature of the watershed and the expectation that this quality will remain so in the future.

**Question 8. Do individuals, companies, etc. currently withdraw water from the Creek or a tributary for drinking purposes in your municipality?**

This question was included as another indicator of the water quality of the Tunkhannock Creek and its tributaries. Nicholson Boro reported that individuals currently withdrew water from Horton Creek but that this was expected to end in a year. Some Greenfield residents draw water from Crystal Lake and the Harford Water Association takes in water from Tyler Lake. These were the only three "Yes" answers received on this question.

The Safe Drinking Water Act was passed in Pennsylvania in 1984. The DEP 's Division of Water Planning and Allocations suggested that because of the recent 1995 requirement that all public water supply must undergo filtration, municipalities are drilling wells as a less expensive means of providing water that meet the new standards rather than filtering water from clean streams.

The Division of Water Planning and Allocations has on log 20 pages of information on permitted water withdrawals, wells, instream diversions (3), instream reservoirs and closed offstream reservoirs(25), and

**Table 17A. 32 Municipalities' Responses to the Tunkhannock Creek Questionnaire, continued**

| QUESTION | #YES | #NO | % - YES | % - NO |
|---|---|---|---|---|
| 7. Does your municipality currently have a wastewater treatment facility? | 11 | 21 | | |
| If you don't have a facility now, do you expect to have a facility completed within | | | | |
| 5 years? | 3 | | 14% | |
| 15 years? | 5 | | 24% | |
| 30 years? | 3 | | 14% | |
| More than 30 years? | 10 | | 48% | |
| Do you have biological nitrogen removal (BNR) - (Of 11 Yes's) | 1 | 10 | 9% | 91% |
| 8. Do individuals, companies, etc. currently withdraw water from the Creek or a tributary for drinking purposes in your municipality? | 3 | 29 | 9% | 91% |

sewage treatment plants that are found in the Tunkhannock Creek Watershed. Most of the approximately 115 facilities requiring permits are located in Tunkhannock Township, Tunkhannock Boro, Abington and Clifford.

Because of its length, this information concerning Water Planning and Allocations will only be included in the final report to DCNR. Copies of this information may be obtained by writing to the Bureau of Water Supply and Community Health, Rachel Carson State Office Bldg., P.O. Box 8467, Harrisburg, PA 17105-8467 or by calling 717-772-4048. The locations of 32 Point Source Outfalls, including sewage treatment plants, have been identified on the map of the Tunkhannock Creek Watershed by the Wilkes University GIS Department.

The locations of the dams to create the instream reservoirs lie along smaller tributaries and lakes, the only exception to this being the dam for Lackawanna Lake on the South Branch. This fact is appreciated by canoeists who enjoy 26 miles of free flowing waters on the Main Branch and a good 10 miles on the South Branch.

Question 9. on the Tunkhannock Creek Questionnaire asked the 32 municipalities to identify the three worst threats to the Tunkhannock Creek or its tributaries. The following summarizes the opinions of the township supervisors and borough councilmembers.

**Question 9. What do you think are the 3 worst threats to the Tunkhannock Creek or its tributaries within your municipality?** (Threats to Creek Survey, which is enclosed, lists many threats and may help you answer this question.)

**#1 Threat** - Comprising 23% of the answers given, **Inadequate Septic Systems** was clearly seen as the number 1 threat to the Tunkhannock Creek by municipalities. One township supervisor stated that " there were many elderly people living in his township and that they couldn't afford to update their septic systems." Another respondent expressed concern about the private campgrounds polluting the creek.

**#2 Threat** - None of the various **Pollution** issues received more than 5% of the total responses, but again if added together, they comprise 19% of the responses. Several townships downstream of Clarks Summit expressed concern about chromium pollution that occurred there in the past. In New Milford, where one toxic dump has existed outside the watershed, the respondent raised the concern about the potential harm a future dump would pose to the Creek if constructed inside the Tunkhannock Creek Watershed. The Dalton Boro is sponsoring a workshop to inform residents how to properly dispose of household hazardous wastes such as batteries, gasoline, and solvents.

Five municipalities listed using the Streambank as a Garbage Dump as one of the 3 worst threats to the Creek. One of these officials was worried that "someone might drop a large drum containing hazardous chemicals into a tributary or the main branch." Eight municipalities believed that run-off from farms and non-farm landowners comprised one of the three worst threats to the Tunkhannock Creek.

**#3 Threat - Soil erosion** was third with 9% and when all the different types of soil erosion categories are added together (Soil Erosion Causing Sediment Pollution, Logging on Watershed Slopes, Streambank Erosion), the figure jumps to 17%. In regard to logging on Watershed Slopes, one supervisor reported that clearcutting is causing severe soil erosion.

**Flooding** was listed as a threat from several viewpoints. Some supervisors perceived flooding as a threat in view of its damage to houses and roads. Others saw it as a threat to the Creek because "floods carry silt and debris into the Creek and may reroute it to undesirable places." Several supervisors complained that the State won't let them remove fallen trees from the Creek that are upstream of bridges which they believe made the January 19th flood more damaging. One individual expressed the opinion that "the trees in the creek affected the natural beauty of the creek.

No one considered that dams, loss of wetlands, or mining - stone quarries were a threat to the Creek.

**Table 18. Existing Threats To Tunkhannock Creek Identified By Municipalities**

| RIVER RELATED ISSUES | FREQUENCY | PERCENT |
|---|---|---|
| Water Pollution | 3 | 4% |
| Inadequate Septic Systems | 18 | 23% |
| Municipal Pollution | 1 | 1% |
| Industrial Pollution | 4 | 5% |
| Hazardous Wastes | 1 | 1% |
| Soil Erosion Causing Sediment Pollution | 7 | 9% |
| Logging on Watershed Slopes | 2 | 3% |
| Run-off From Farms | 6 | 8% |
| Run-off From Non-Farm Landowners | 1 | 1% |
| Using Streambank as a Garbage Dump | 5 | 7% |
| Dams | | |
| Mining - Stone Quarries | | |
| Land Development | 5 | 7% |
| Loss of Wetlands | | |
| Streambank Erosion | 4 | 5% |
| Infringement on Floodplain | 1 | 1% |
| Flooding | 6 | 8% |
| Public Health and Safety | 2 | 3% |
| Air Quality - Acid Rain | 2 | 3% |
| Other Threats Listed: | | |
| Illegal Dumping | 2 | 3% |
| Improper Disposal of Household Waste | 1 | 1% |
| Improper Maintenance of Streams | 1 | 1% |
| Land Fills | 1 | 1% |
| No Threats | 3 | 4% |
| No Response | 1 | 1% |
| TOTAL | 77 | 100% |

**Question 10. What facilities does your municipality maintain that through run-off or ground water seepage could measurably affect the water quality of the creek or its tributaries?**

Thirty municipalities (94%) reported that their facilities did not affect the water quality of the creek or any tributary. Twelve supervisors mentioned that they used cinders or calcium instead of salt on their roads. Many also reported that their storage buildings had a concrete floor, sides or a curb to prevent leakage. The latter two statements may be true of other municipalities as well who did not elaborate on the question.

Of the two municipalities that answered in the positive on this question, one responded that "salt and cinder piles for road maintenance, and sludge from water treatment facility" could affect the water quality. Another municipality stated that the secondary run-off of salt and cinders from the roads would contribute to the creek's pollution. Whether or not salt, cinders or calcium do leak into near-by creeks, the Supervisors and Boro Councilmembers made it clear in many meetings and discussions that they understood the potential harm that could develop from leakage and they believed that their road maintenance practices were not causing a pollution problem.

## LAND USE AND DEVELOPMENT

Map 7 depicts the Land Cover within the Tunkhannock Creek Watershed. With 96% of the land in the Tunkhannock Creek Watershed in forests, agriculture, and wildlands, (Lackawanna, Susquehanna, and Wyoming Counties Chesapeake Bay Watershed Assessment Reports ), the watershed appears safe from unwanted development (Tables 19. and 20. and Figure 13.). But a look at some statistics indicates that this region is heading in the same direction of urban sprawl as what has occurred elsewhere in the United States.

The population in the townships has grown from 31,099 in 1960 to 49,500 in 1990 for a 59% increase (Table 21.). The watershed population increased by 8% from 1980 to 1990 while the Statewide population increased by only .15% during the decade of the 1980's.

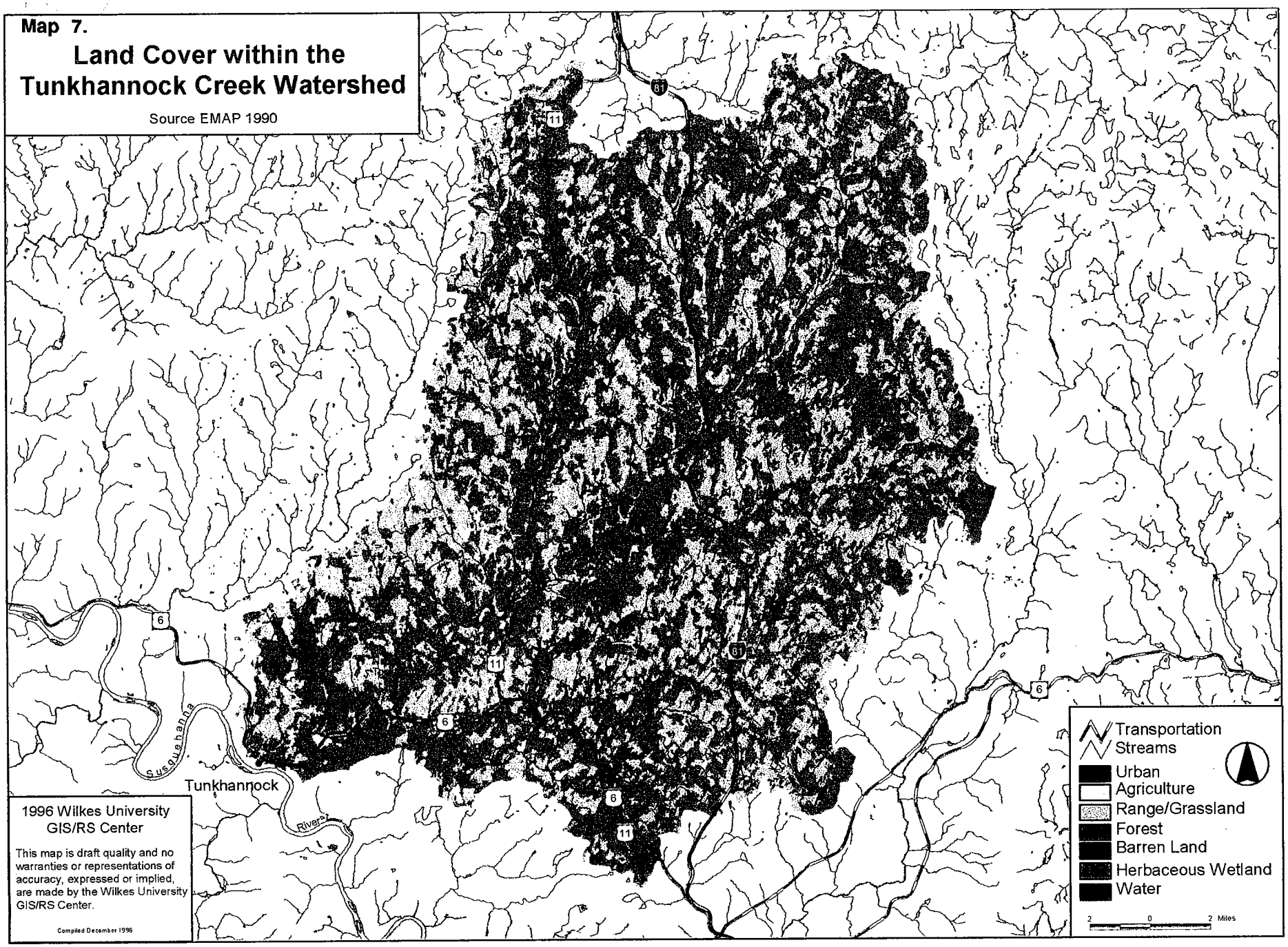
In Susquehanna County, agricultural and forest lands decreased from 504,848 acres in 1978 to 398,494 acres in 1992 or a 20% decrease (Susquehanna County Comprehensive Development Plan, 1992). Most of this agricultural land has been converted to residential (3,400 acres in 1978 to 85,278 acres in 1992), seasonal and recreational uses. This county-wide trend has occurred in the entire Tunkhannock Creek Watershed as well. While the land use has changed from agricultural to residential, the basic character or environment appears similar due to the low intensity of the development and the fact that most of the open space still remains. The enactment of the Susquehanna County Subdivision and Land Development Ordinance has undoubtedly helped preserve the rural qualities of this county.

The conversion from agriculture to residential uses in Susquehanna County is altering the basic economy from one which to a certain degree was relatively self-sufficient, utilizing its local natural resources, to a non-resource based economy which depends on the service industry and on employment from outside the county. Although farms may contribute more to the overall non-point source pollution of the watershed than the residential housing that is currently replacing it, farms preserve lovely open space and wildlife habitat, and provide a bucolic environment void of the stresses associated with concentrated human habitation.

Because the local economy does not afford the local residents to handle the large mortgage payments and high taxes necessary to buy large acreages, non-residents have acquired most of this farmland at "bargain prices." A survey in 1986 revealed that 30% of the acreage in 10 municipalities in the county were owned by absentee owners (Susquehanna County Comprehensive Development Plan). While the Susquehanna County Comprehensive Development Plan states that " this form of ownership has the potential to alter the overall character of the community or county," it may provide a few benefits to the watershed.

If property owners only visit their land occasionally,

there is less air, water and noise pollution in the watershed. Wildlife is more likely to use the land. The rate of classroom construction drops. The demand for paving dirt and gravel roads is not so loud. However while the watershed may reap these benefits for a period, the pressures of population growth in this country will soon cause these large parcels of 10 or more acres to be subdivided again and again. The number of absentee landowners can be expected to diminish in relation to the rate of development.


Map 7.
Land Cover within the Tunkhannock Creek Watershed
Source EMAP 1990
Tunkhannock
Susquehanna
River
Transportation
Streams
Urban
Agriculture
Range/Grassland
Forest
Barren Land
Herbaceous Wetland
Water
2 0 2 Miles
1996 Wilkes University GIS/RS Center
This map is draft quality and no warranties or representations of accuracy, expressed or implied, are made by the Wilkes University GIS/RS Center.
Compiled December 1996

## Table 19. Detailed Land Use Profile of the Tunkhannock Creek Watershed

| | Commercial Urban/ Acreage | Forest Land Acreage | Pasture Acreage | Hay Acreage | Row Crop Acreage | Wild Lands Acreage | Wetlands Acreage | Open Water Acreage | Other Acreage | Total Acreage |
|---|---|---|---|---|---|---|---|---|---|---|
| **Lackawanna Cty.** | 5,954 | 20,481 | 3,149 | 14,059 | 5,020 | | 7,590 | 378 | | 56,631 |
| **Susquehanna Cty.** | 3,973 | 78,486 | *4,995 | *12,876 | 40,177 | 15,006 | | 2,052 | 1,492 | 159,057 |
| **Wyoming Cty.** | 914 | 30,822 | 3,373 | 7,279 | 5,966 | | | 591 | | 48,945 |
| Total | 10,841 | 129,789 | 6,522 | 21,338 | 51,163 | 15,006 | 7,590 | 3,021 | 1,492 | 264,633 |

## Table 20. Summarized Land Use Profile of the Tunkhannock Creek Watershed

| | Commercial Urban/ Acreage | Forest Land & Wild Lands Acreage | Agriculture Acreage | Wetlands Acreage | Open Water Acreage | Other Acreage | Total Acreage |
|---|---|---|---|---|---|---|---|
| **Lackawanna Cty.** | 5,954 | 20,481 | 22,228 | 7,590 | 378 | | 56,631 |
| **Susquehanna Cty.** | 3,973 | 93,492 | 40,177 | | 2,052 | 1492 | 141,186 |
| **Wyoming Cty.** | 914 | 30,822 | 16,618 | | 591 | | 48,945 |
| Total | 10,841 | 144,795 | 79,023 | 7,590 | 3,021 | 1,492 | 264,633 |

Note: Figures taken from the Lackawanna, Susquehanna, and Wyoming Counties Chesapeake Bay Watershed Assessment Reports
* Based on 21% dairy operations surveyed in Susquehanna County Watershed Assessment Report

## Land Use Classification

Land use was based on the following land use classification categories:

1. Forest Land - Any land with continuous forest canopy cover.

2. Urban/Commercial - Lands used for cities, industry, commercial development, major highways, single or multiple family home lots and farmsteads.

3. Agricultural Row Crops - Lands that are or may be used for row crops in a typical agricultural crop rotation.

4. Wild Lands - Lands that have less than continuous forest canopy cover or agricultural crop land allowed to naturally succeed to a post-managed condition.

5. Other - Lands that are not classified as any previously described and not open surface water, including, but not limited to tree farms, fruit orchards, berry farms, nursery stock, clear-cut forested areas, and peat bogs.

6. Surface Water - Bodies of water excluding streams.

Figure 13. Percentage of Land Use within the Tunkhannock Creek Watershed

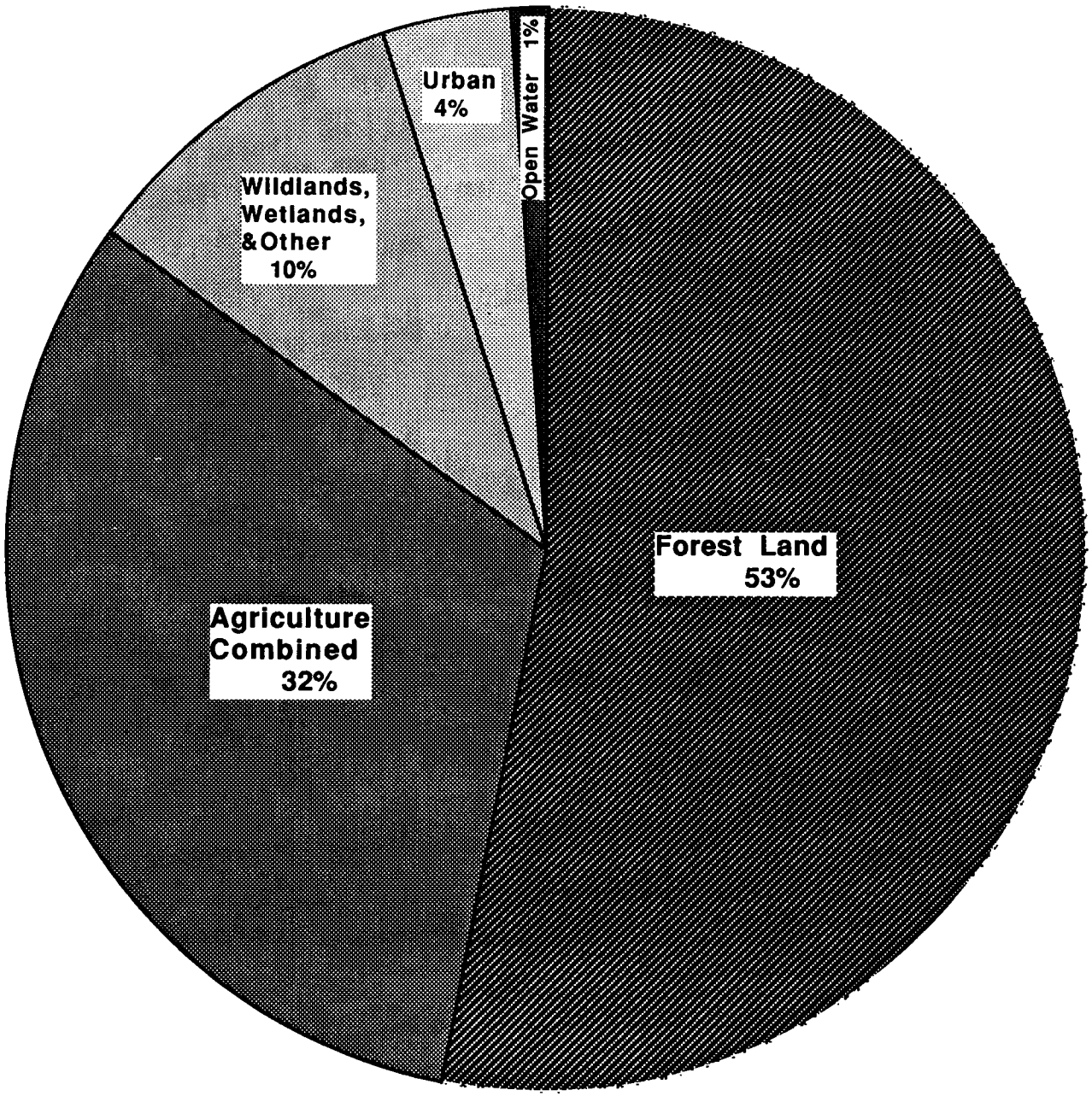


**Table 21. Total Population Townships in Tunkhannock Creek Watershed, 1960 - 1990**

| AREA | 1960 | 1970 | 1980 | 1990 | % Change 1980-90 |
|---|---|---|---|---|---|
| | | | | | |
| LACKAWANNA COUNTY | | | | | |
| Abington Township | 1,077 | 1,316 | 1,487 | 1,533 | 3.1 |
| Benton Township | 1,012 | 1,141 | 1,670 | 1,837 | 10.0 |
| Clarks Summit Borough | 3,693 | 5,376 | 5,272 | 5,433 | 3.1 |
| Dalton Borough | 1,227 | 1,282 | 1,383 | 1,369 | -1.0 |
| Glenburn Township | 731 | 1,113 | 1,257 | 1,242 | -1.2 |
| Greenfield Township | 816 | 1,140 | 1,524 | 1,743 | 14.4 |
| LaPlume Township | 475 | 971 | 1,001 | 647 | -35.4 |
| North Abington Township | 388 | 553 | 619 | 691 | 11.6 |
| Scott Township | 2,747 | 3,803 | 4,624 | 5,350 | 15.7 |
| West Abington Township | 230 | 247 | 309 | 294 | -0.3 |
| | | | | | |
| SUSQUEHANNA COUNTY | | | | | |
| Ararat Township | 307 | 325 | 356 | 420 | 18.0 |
| Bridgewater Township | 1,498 | 1,876 | 2,284 | 2,368 | 3.7 |
| Brooklyn Township | 731 | 807 | 748 | 873 | 16.7 |
| Clifford Township | 1,238 | 1,351 | 1,704 | 2,147 | 26.0 |
| Gibson Township | 745 | 674 | 869 | 1,015 | 16.8 |
| Harford Township | 985 | 918 | 1,041 | 1,100 | 5.7 |
| Herrick Township | 405 | 436 | 457 | 563 | 23.2 |
| Hop Bottom Borough | 381 | 430 | 405 | 345 | -14.8 |
| Jackson Township | 587 | 678 | 819 | 757 | -7.6 |
| Lathrop Township | 583 | 550 | 715 | 794 | 11.0 |
| Lenox Township | 983 | 1,045 | 1,382 | 1,581 | 14.4 |
| New Milford Township | 1,057 | 1,266 | 1,637 | 1,731 | 5.7 |
| Springville Township | 952 | 919 | 1,157 | 1,424 | 23.1 |
| Thompson Township | 315 | 301 | 344 | 374 | 8.7 |
| | | | | | |
| WYOMING COUNTY | | | | | |
| Clinton Township | 420 | 658 | 1,099 | 1,063 | -3.3 |
| Factoryville Borough | 991 | 922 | 924 | 1,310 | 41.8 |
| Lemon Township | 567 | 701 | 856 | 1,264 | 47.7 |
| Nicholson Borough | 942 | 877 | 945 | 857 | -9.3 |
| Nicholson Township | 686 | 737 | 1,244 | 1,287 | 3.5 |
| Overfield Township | 644 | 913 | 1,338 | 1,466 | 9.6 |
| Tunkhannock Borough | 2,297 | 2,251 | 2,144 | 2,251 | 5.0 |
| Tunkhannock Township | 1,389 | 2,200 | 4,399 | 4,371 | -0.6 |
| | | | | | |
| | | | | | |
| | | | | | |
| Total | 31,099 | 37,777 | 46,013 | 49,500 | 8.3 |

Note: The 1990 figures on this table may be different than other 1990 figures as they represent the latest adjustments made by the Census Bureau as of May, 1993. Source: 1993 Pennsylvania State Data Center

# SECTION VII.

# RESOURCE MANAGEMENT PROGRAMS and THEIR ACCOMPLISHMENTS

## LAND USE PLANNING TOOLS

Because 96% of the watershed is still undeveloped, the opportunity exists to shape the future environment of the watershed by effecting the rate and direction of development and change. Tools used in the process of effecting these elements in an efficient and orderly manner are: a comprehensive master plan, zoning ordinances, subdivision and land development ordinances, building codes and enforcement, and housing and community facility programs sponsored by county, state, or federal government.

Lackawanna, Susquehanna, and Wyoming Counties all have a County Planning Commission. Although Susquehanna and Wyoming Counties have a comprehensive plan and subdivision and land development ordinances, Lackawanna County has not yet prepared either document. However every municipality in Lackawanna County has a planning commission, zoning ordinances, subdivision and land development ordinances and 6 municipalities have created their own comprehensive plan (See Tables 22, 23, and 24). These municipal ordinances contain much more site specific regulations than the county-wide ordinances.

All the municipalities in the watershed have floodplain ordinances that control the development on any flood plain.

Recommendations regarding land use can be found in the section entitled Recommendations to Protect the Tunkhannock Creek Watershed.

| Table 22. Municipal Planning Commissions & Ordinances - As of 10-30-96 | | | | | |
|---|---|---|---|---|---|
| Municipality | Planning Comm. | Comp. Plan | Zoning | Sub/LD | Floodplain |
| | | | | | |
| **LACKAWANNA CTY.** | | | | | |
| Abington Twp. | * | * | * | * | * |
| Benton Twp. | * | | * | * | * |
| Clarks Summit Boro. | * | * | * | * | * |
| Dalton Boro. | * | | * | * | * |
| Glenburn Twp. | * | * | * | * | * |
| Greenfield Twp. | * | * | * | * | * |
| LaPlume Twp. | * | * | * | * | * |
| N. Abington Twp. | * | | * | * | * |
| Scott Twp. | * | * | * | * | * |
| W. Abington Twp. | * | | * | * | * |
| | | | | | |
| **SUSQUEHANNA CTY.** | | | | | |
| Ararat Twp. | * | In Progress | | * | * |
| Bridgewater Twp. | | | | | * |
| Brooklyn Twp. | | | | | * |
| Clifford Twp. | * | | | * | * |
| Gibson Twp. | | | | | * |
| Harford Twp. | * | | | | * |
| Herrick Twp. | * | | * | | * |
| Hop Bottom Boro. | * | | * | | * |
| Jackson Twp. | | | | | * |
| Lathrop Twp. | | | | | * |
| Lenox Twp. | | | | | * |
| New Milford Twp. | | | | | * |
| Springville Twp. | | | | | * |
| Thompson Twp. | | | | | * |
| | | | | | |
| **WYOMING CTY.** | | | | | |
| Clinton Twp. | | | | | |
| Factoryville Boro. | * | | | * | * |
| Lemon Twp. | | | | | * |
| Nicholson Boro. | | | * | | * |
| Nicholson Twp. | | | | | * |
| Overfield Twp. | * | * | | * | * |
| Tunkhannock Boro. | * | * | * | | * |
| Tunkhannock Twp. | * | | | | * |
| | | | | | * |
| NOTE: * Indicates YES | | | | | |

| Table 23. County Planning Commissions & Ordinances - As of 10-30-96 | | | | | |
|---|---|---|---|---|---|
| | | | | | |
| County | Planning Comm. | Comp. Plan | Zoning | Sub/LD | |
| | | | | | |
| Lackawanna | * | | | | |
| | | | | | |
| Susquehanna | * | * | | * | |
| | | | | | |
| Wyoming | * | * | | * | |
| | | | | | |
| | | | | | |
| NOTE: * Indicates YES | | | | | |

## Table 24. Summary of Basic Planning Data for Lackawanna, Susquehanna, & Wyoming Counties

| | # of Municipalities (3 Ctys.;32 Municipalities ) | % |
|---|---|---|
| County Planning Commissions | 3 | 100 |
| County Zoning Ordinaces | 0 | 0 |
| Local Planning Commissions | 15 | 47 |
| Local Comp. Plans | 6 | 19 |
| Local Zoning Ordinances | 14 | 44 |
| Local Subdivion Ordinances | 14 | 44 |
| Governed by County Zoning | 0 | 0 |
| Governed by County SLD | 18 | 56 |
| Total Zoning (County & Local) | 14 | |
| Total Subdivision (County & Local | 32 | |

## AGRICULTURE

Thirty-two percent of the land or 79,000 acres within the Tunkhannock Creek Watershed is used for agriculture either as pasture, hay or row crops. Although less in Lackawanna and Wyoming Counties, 11% of the work force in Susquehanna County is employed in farming or forestry. There are many reasons to strongly support farming in the watershed. Maintaining the farms in the watershed obviously reduces the rate of development that occurs. When one farm is sold, it can be divided into 100 housing lots that increases noise, air, and water pollution enormously. The farms provide beautiful vistas and a lovely bucolic quality to the region. Farms often provide and protect a variety of habitats for wildlife including open fields, woodlands, wetlands, and hedge rows. Growing and producing food near-by reduces the air pollution, gasoline consumption, etc. generated by trucks transporting milk and vegetables from across the country.

Farmers are currently being stressed to the point of selling out to developers. The price that they are receiving for milk is about what it was 20 years ago. School taxes in the region are based on the value of the land and not on income. Owning large land parcels, farmers, living on marginal income, cannot afford to pay the continuously increasing school taxes. They are selling the timber out of their woods and even their stone walls to stay in the farming business.

During this study, many farmers stated that the many programs provided by the Conservation Districts, Natural Resources Conservation Services, and Farm Service Agencies are excellent programs that improve their efficiency and protect the waterways. Both the farmers and the environment need the continued funding of these programs. A description of some of the important programs administered by these agencies follows.

## AGRICULTURAL PROGRAMS THAT PROTECT NATURAL RESOURCES

### Agricultural Security Acreage in Municipalities Found Within the Watershed

Almost one in every 3 acres found within the municipalities in the watershed is included in an Agricultural Security Area (See Table 25.). This reflects both the pastoral qualities of the Tunkhannock Creek Watershed and the concern that landowners have in protecting agricultural lands existing in the area. The Agricultural Security Area Law, (Act 43 of 1981), is a tool for strengthening and protecting agriculture in Pennsylvania. Farm landowners, working together, initiate the process of establishing such Areas in which agriculture is the primary activity. Owners of productive farmland totaling at least 500 acres may petition to form an Area. The land to be included must have soils conducive to agriculture and be used for the production of crops, livestock, livestock products, horticultural specialities and timber.

## Table 25. Agricultural Security Acreage in Municipalities

| Lackawanna Cty. | Acres Enrolled | Total Acres In Twp. | % |
|---|---|---|---|
| Benton Twp. | 5,950 | 15,923 | 37 |
| Greenfield Twp. | 2,198 | 13,664 | 16 |
| N. Abington Twp. | 1,219 | 5,946 | 21 |
| Scott Twp. | 2,575 | 17,600 | 15 |
| Total for the County | 11,942 | 53,133 | 22 |
| **Susquehanna Cty.** | | | |
| Ararat Twp. | 3,152 | 13,440 | 23 |
| Bridgewater Twp. | 12,949 | 23,680 | 55 |
| Brooklyn Twp. | 9,423 | 14,720 | 64 |
| Clifford Twp. | 2,953 | 26,880 | 11 |
| Gibson Twp. | 6,514 | 26,880 | 24 |
| Harford Twp. | 8,259 | 20,480 | 41 |
| Herrick Twp. | 6,128 | 16,640 | 37 |
| Jackson Twp. | 3,441 | 16,000 | 22 |
| Lathrop Twp. | 8,358 | 14,080 | 59 |
| Lenox Twp. | 16,536 | 25,600 | 64 |
| New Milford Twp. | 7,750 | 29,440 | 22 |
| Springville Twp. | 12,778 | 23,040 | 64 |
| Thompson Twp. | 4,484 | 14,720 | 30 |
| Total for the County | 102,725 | 265,600 | 39 |
| **Wyoming Cty.** | | | |
| Clinton Twp. | 0 | 7,808 | 0 |
| Lemon Twp. | 4,988 | 10,176 | 49 |
| Nicholson Twp. | 3,177 | 14,592 | 22 |
| Overfield Twp. | 3,748 | 6,336 | 59 |
| Tunkhannock Twp. | 2,828 | 19,904 | 14 |
| Factoryville Boro. | 0 | 448 | 0 |
| Nicholson Boro. | 0 | 768 | 0 |
| Tunkhannock Boro. | 0 | 576 | 0 |
| Total for the County | 14,741 | 60,608 | 24 |
| Total Acreage for Countie | 129,408 | 449,920 | 29 |

Participating farmers are entitled to special consideration from local and state government agencies, thus encouraging the continuing use of the

land for productive agricultural purposes. The local government may not impose ordinances that unreasonably restrict farm structures or practices within the Area, nor may normal farming operations and practices be deemed "nuisances" in a nuisance ordinance.

Land condemnations within Agricultural Security Areas, proposed by Commonwealth or local agencies (such as municipal authorities, school boards, and governing bodies), must be reviewed and approved before land may be condemned. In addition, all state-funded development projects which might affect an established Area must be reviewed. The threat of having a low-level nuclear waste dump sited in Susquehanna County has motivated many farmers to form Ag. Security Areas as the review process may protect landowners from having their land condemned for a site.

For more information on Agricultural Security Areas contact:

Mr. Bill Lang, Director, Lack. Cty. Agricultural Land Preservation, 395 Bedford St., Clarks summit, PA 18411-1801 586-1081

Ms.Eleanor Kurosky, Planner, Susq. Cty. Planning Commission,County Office Bldg., 31 Public Ave., Montrose, PA 18801 278-4600 Ext. 293

Mr. Edward Patchcoski, District Conservationist, NRCS, RR# 3, Box 178B, Tunkhannock, PA 18657 836-2589

## Agricultural Conservation Easements

Four farms amounting to 582 acres have been protected by agricultural conservation easements in the Tunkhannock Creek Watershed thus far (See Table 26). This program was established in response to the sharp drop in our state's farm acreage from 9 million acres in 1980 to 8.1 million acres in 1990. This amounts to a 10% decline in farm acreage over the past decade. The Agricultural Conservation Easement Program was approved in 1988, under an amendment to Act 43, to combat this decline to the state's economy and quality of life. The Ag Land Preservation Board (sometimes referred to as the Ag Easement Board) was formed shortly thereafter to work to protect viable agricultural lands by acquiring agricultural conservation easements which prevent the development or improvement of the land for any purposes other than agricultural production. Compensation is provided to landowners in exchange for their relinquishment of the right to develop their property. In more common terms, this means that the farmer will not develop the land but keep it in agriculture forever. If the property is sold, the Deed of Easement is part of the transaction and the new owner is also restricted from developing the land. The farmer continues to own the property and carry on the farming operation as usual.

Funding for the program is a joint effort between Counties and the Commonwealth of PA. The County Commissioners annually allocate funds which are matched on the State level. Grants are also awarded to counties with an active program. Average compensation in Susquehanna County is $600.00 per acre. This figure is determined by an appraisal completed by a certified appraiser. The appraisal must be based on comparable sales in the same area as the farm in question. Wyoming County is currently considering adopting this program. Several farmers in Wyoming County expressed interest in entering this program.

For more information contact:

Susquehanna County - Chris Lathrop, Penn State Extension Office, County Office Bldg., Public Ave., Montrose, PA 18801 278-1158.

Lackawanna County - Mr. Bill Lange, County Conservation District, 395 Bedford St., Clarks Summit, PA 18411 586-1081

### Act 319 - The Clean and Green Act

Act 319 of 1974 or the Clean and Green Act provides for land devoted to agricultural use, agricultural reserve use, or forest reserve use to be assessed at the value it has for that use rather than at development value. The intent of the act is to encourage landowners to retain their land in one of these uses, and to protect farmers from being forced to go out of agriculture or sell part of their land in order to pay unusually high taxes. The county assessor has the major responsibility for administration of the act.

The benefits to the landowner are an assurance that his land will not be assessed at the same rate as adjacent land under development pressure and not enrolled in the program. In almost all cases, the landowner will see a reduction in his property tax assessment compared to land that is being developed. Landowners have the right to exclude the public from land enrolled under agricultural uses or forest reserve. Land enrolled under the agricultural reserve must be kept open to the public but only for outdoor recreation or the enjoyment of scenic or natural beauty.

The total acres enrolled in all of Susquehanna and Wyoming Counties is 488,405 acres. The number of acres enrolled specifically in the Tunkhannock Creek Watershed could not be determined. Lackawanna County does not have a Clean and Green Program. See Table 27.

To learn if you are eligible to enroll in the Clean and Green Program, contact:

Susquehanna County - Mr. Richard Kamansky,

Susquehanna County Court House, Box 218, Montrose, PA 18801 278-4600

Wyoming County - Mr. Eric A. Brown, County Assessor, Wyoming Cty. Court House, 1 Court House Square, Tunkhannock, PA 18657. 836-3200

## Conservation Reserve Program

The Food Security Act of 1985, as amended, authorized the Conservation Reserve Program (CRP). The CRP plays a key role in meeting environmental goals in different regions of the country. In the Chesapeake Bay Watershed its aim is to reduce sedimentation and agricultural runoff. Landowners voluntarily enter into contracts with USDA to place erodible and other environmentally-sensitive cropland in long term conservation practices for ten to fifteen years. In exchange, landowners receive annual rental payments for the land and cost-share assistance for establishing those practices.

Under the continuous sign-up, landowners at any time can enroll buffer strips, riparian buffers, field windbreaks, grassed waterways, grass contour strips and other special practices and receive a higher rate payment as well as cost-share assistance. Since September, 1995 CRP has focused more on environmentally sensitive acreage thereby providing significant soil erosion, water quality, tree planting, or wildlife benefits.

For the first time in 1997, landowners can also enroll cropped wetlands in the program. As mowed wetlands return to their natural state and shrubs are allowed to grow, greater habitat will be provided for wildlife. Other wetland functions such as flood control, sediment removal, and purifying water will also improve.
As there is currently a new sign-up to either add or remove acreage, the data in Table 28 may be outdated.

To determine if land is eligible for the CRP, contact:

Lackawanna Cty. - Alice Sokoloski, Program Assistant, U.S.D.A., Farm Service Agency, 395 Bedford St., Clarks Summit, PA 18411-1801 587-3991

Susquehanna Cty. - Diane Nowalk, Program Assistant, U.S.D.A., Agric. Stabilization and Conservation Service, RR# 3, Box 27D, Lake Plaza, Rt. 706E, Montrose, PA 18801 278-1197

Wyoming Cty. - Jan Ambrutis, Program Assistant, U.S.D.A., Farm Service Agency, Wyoming - Sullivan Co., RD# 3, Box 178B, Tunkhannock, PA 18657 836-5111

## Nutrient Management

In May, 1993 Nutrient Management legislation was enacted in Pennsylvania requiring farmers to improve the way they handle chemical fertilizers and animal manure so that the amount of excess nutrients reaching surface and ground waters is reduced. While the law

## Table 26. Farms Protected by Agricultural Conservation Easements in the Tunkhannock Creek Watershed

| | # of Farms | Acres |
|---|---|---|
| Lackawanna Cty. | 3 | 476 |
| Susquehanna Cty. | 1 | 106 |
| Wyoming Cty. * | | |
| Total | 4 | 582 |

Note: * Does Not Have An Agricultural Conservation Easement Program

## Table 27. Total Acres Enrolled in Act 319 - Clean and Green Program in Susquehanna and Wyoming Counties

| | Acres |
|---|---|
| Lackawanna Cty. * | |
| Susquehanna Cty. | 362,494 |
| Wyoming Cty. | 125,911 |
| Total | 488,405 |

Note: * Does Not Have A Clean and Green Program

## Table 28. Summary of Farms Enrolled in the Conservation Reserve Program in the Tunkhannock Creek Watershed

| | # of Farms | Acres |
|---|---|---|
| Lackawanna Cty. | 15 | 371 |
| Susquehanna Cty. | 25 | 862 |
| Wyoming Cty. | 9 | 404 |
| Total | 49 | 1,637 |

contains mandates, it also provides technical, financial, and educational assistance to help farmers comply with the new regulations. The thrust for this legislation came from the many public and private environmental agencies who are working cooperatively to improve the health of the Chesapeake Bay. The Susquehanna River is the lifeline of the Chesapeake Bay, supplying half of the estuary's freshwater. The historic Chesapeake Bay Agreement is seeking to reduce the nutrients entering the Bay by 40% by the year 2000.

The Nutrient Management Program has already been enormously successful in all three counties! In only three years, diligent and highly capable nutrient management technicians have prepared and implemented 28 Plans in the Tunkhannock Creek Watershed alone, reducing excess nutrients from entering surface and ground waters on 5,267 acres! There's a waiting list of at least 31 farms in the watershed who are waiting for a NMP to be prepared. The author discussed the advantages of the NMP with a farmer living along the main branch of the Tunkhannock Creek who shared the cost of having a $56,000 manure storage facility constructed near his barn three years ago. The farmer said that he "really appreciated not having to spread the manure all winter long through the snow and freezing temperatures." If he hadn't had the storage facility built before the Jan. 1996 flood, the flood would have carried all the manure off the fields and into the creek." Another big advantage for this farm is that previously the soapy water used to clean the milking equipment, etc. used to be directed into a pond below the milk house. Because the pond was overloaded with phosphates, it contained a thick layer of algae scum. Since pumping the soapy water into the holding tank, his pond water has cleared up and "is now a much better quality for the cows to drink."

The public needs to continue urging that the Pennsylvania Legislature continue appropriating at least $2 million into the Nutrient Management Fund to sustain this valuable program.

For more information, contact:

Mr. Charley Miller, Chesapeake Bay Technician, Chesapeake Bay Nutrient Management Program, Lackawanna Cty. Conservation District, 395 Bedford St., Clarks Summit, PA 18411-1801 586-1081

Mr. John Benscoter, Nutrient Management Technician, Susquehanna Cty. Conservation District, County Office Bldg., Public Ave., Montrose, PA 18801 278-4600 (281)

Mr. Michael Fields, Chesapeake Bay Technician, Chesapeake Bay Nutrient Management Program, Wyoming Cty. Conservation District, RR# 3, Box 178B, Tunkhannock, PA 18657 836-2589

## Streambank Fencing

Streambank fencing is a simple, effective way for farmers to improve water quality in the streams flowing

**Table 29. Summary of Nutrient Management Plans (NMP) in the Tunkhannock Creek Watershed**

| | # of NMP Implemented | Acreage | # of NMP Prepared, Not Implemented | # Farms Waiting for NMP from the CCD |
|---|---|---|---|---|
| Lackawanna Cty. | 6 | 891 | 4 | |
| Susquehanna Cty. | 11 | 2,578 | | 14 |
| Wyoming Cty. | 11 | 1,798 | | 17 |
| Total | 28 | 5,267 | 4 | 31 |

through their farms. Placing a fence along stream banks controls livestock grazing and access. A buffer zone of vegetation will grow between the fence and the stream.

By volume, sediment causes the most water pollution in Pennsylvania. Much of the sediment comes from soil erosion along banks that are grazed. After a stream is fenced, new vegetation binds the soil particles to create a stable structure that resists erosion and collapse. The vegetation also absorbs some of the water's force, helping to slow the current and reduce its erosive power.

When livestock trample streambanks, the soil is left unprotected and may collapse. Limiting livestock access to streambanks is one of the best ways for a farmer to prevent erosion and loss of productive land. Fencing also protects a herd's health as cattle no longer come in contact with waterborne bacteria. Fencing provides habitat for birds, and small mammals, the wider the strip, the greater quantity and variety of wildlife.

Streamside vegetation improves fish habitat by enhancing water quality, providing protective cover, and increasing food for fish. Organic matter, such as leaves and insects that fall into the stream, greatly increases the amount and diversity of aquatic life that the stream can support. Streamside shrubs and trees shade the water in summer and help keep it cool.

Streambank fencing and the development of riparian areas is just beginning in the three counties. Due to limited funding, only one streambank fencing project per county per year will probably be performed.

Most of the above information was summarized from the PENN STATE Extension Circular 397 -Streambank Fencing Green Banks- Clean Streams.

## Environmental Quality Incentive Program

The Environmental Quality Incentive Program (EQIP) is a new program that provides technical, financial, and educational assistance to farmers to address natural resource concerns and objectives. USDA may provide cost share assistance for up to 75% of the costs of certain conservation practices on family-sized farms. At this point in time, the NRCS in Susquehanna County is stating that their priority area will be the Tunkhannock Creek Watershed. The Pennsylvania Environmental Council has been informed that this Tunkhannock Creek Conservation Plan has had a positive influence in NRCS reaching this decision.

## ENVIRONMENTAL ORGANIZATIONS IN THE WATERSHED

### Return Susquehanna Country Under Ecology

Return Susquehanna Country Under Ecology (R.E.S.C.U.E.) is a grassroots, non-profit citizens' organization devoted to preserving the environment of Susquehanna Country. R.E.S.C.U.E. is currently working with municipalities to create and enlarge Agricultural Security Areas; continuing participation in the Adopt-A-Highway and Adopt-A-Stream Programs; ongoing efforts to make environmental issues a priority, and to disseminate information on any and all issues; and specific involvement in nuclear issues including the disposal of Low-Level Radioactive Waste. Since the groups beginning in the late 1970s, it has closed and defeated attempts to reopen two landfills; squelched plans to site garbage incinerators and landfills in the area; initiated the area's volunteer recycling programs; actively participated in developing the Susquehanna and Wyoming Counties Solid Waste Plans; and established a Green Award to honor local businesses that participate in area recycling.
R.E.S.C.U.E., New Milford-Lenox Chapter, R.D. 1, Box 1025, Nicholson, PA 18446 (717) 942-6030.

### Countryside Conservancy

The Countryside Conservancy emerged out of a concern that open spaces, wooded areas, viewsheds, fields and stonewalls, so characteristic of the region, were fast disappearing. A non-profit, community based organization, The Countryside Conservancy is dedicated to the preservation of open lands and natural assets in the community for the public benefit. In the future, the Conservancy plans to publish its comprehensive inventory of natural and man made resources, making it available to the community. Visions and Vistas, a series of educational events for the general public, will further explore leading concepts in land conservation. A registry program will be established encouraging interested landowners to participate in preserving vegetation and scenic viewsheds along public roadways in the Abingtons and beyond.
Countryside Conservancy, P.O. Box 301, Waverly, PA 18471

### Lackawanna Audubon Society

Lackawanna Audubon Society, a non-profit organization, is an Affiliate Club of the National Audubon Society. Founded in 1915 as the Scranton Bird Club, with wild bird preservation as its purpose, the present society has widened the scope of its beliefs to include animals, plants, soil, and water, with particular emphasis on their ecological relationships; to maintain refuges, and otherwise aid in the protection and preservation of our natural resources; to participate in local, state, and national conservation projects; and to inspire a love of nature.
Information regarding membership in the Society and a schedule of programs, field trips, and other activities is available from: Lackawanna Audubon Society, P.O. Box 1372, Scranton, PA 18501-1372.

**Rail-Trail Council of Northeastern PA**

The Rail-Trail Council of Northeastern Pennsylvania is a non-profit corporation begun in 1991 to attempt the purchase of abandoned railbeds. It began as a very small grass-roots organization when the National Park Service in 1990 identified the Delaware & Hudson railbed and the Ontario & Western railbeds in the NE corner of PA as most feasible for conversion into recreational trails. A small group of citizens led by Nancy Ross formed the RTC and began their monthly meetings. The RTC now has over 900 members with the core membership from Susquehanna, Lackawanna and Wayne counties. Many second home residents support the work and mission of rail-trail. Public meetings are held monthly (4th Thursday) at area restaurants along the proposed trails.
The Rail-Trail Council of Northeastern Pennsylvania, P.O. Box 123, Forest City, PA 18421 (717) 785-7245.

**Endless Mountain's Trout Unlimited**

Trout Unlimited (TU) is a non-profit conservation organization which focuses on promoting and preserving fishery resources throughout the United States. The Endless Mountain's chapter is helping to execute the mission of TU at a local level. Some of the activities TU provides are: educational programs, angling presentations, fly tying courses, and stream improvement projects. Although there is a small charge for chartered annual membership at the national level, participation in activities at the local level are free and open to the general public.
Kevin Treat, P.O. Box 517, Lake Winola, PA 18625 (717) 378-3032

**ECOLOGIA**

ECOLOGIA (Ecologists Linked for Organizing Grassroots Initiatives and Action) is a private non-profit organization providing humanitarian assistance to individuals and organizations working to solve ecological problems at the local, regional, national and global levels. ECOLOGIA was founded in 1989 in order to support grassroots groups across the Soviet Union. ECOLOGIA had established a citizens water quality monitoring network at 21 sites in 11 countries. ECOLOGIA provides portable Hach spectrophotometers and training that enable citizens to test for water pollution indicators, and to carry out their own independent monitoring projects.
ECOLOGIA, P.O. Box 142, Harford, PA 18823-0142 (717) 434-9588.

**The Nature Conservancy**

A non-profit international organization, The Nature Conservancy's mission is to preserve plants, animals and natural communities that represent the diversity of life on Earth by protecting the lands and water they need to survive. Since 1951, the Conservancy and its more than 660,000 members - 25,000 in Pennsylvania - have protected more than 6.5 million acres in North America and saved thousands of species, including some 900 on the brink of extinction. The Conservancy also has Latin American, Caribbean and Pacific programs that have helped protect millions of acres outside the United States.
The Nature Conservancy, 1211 Chestnut Street, 12th Floor, Philadelphia, PA, 19107 (215) 963-1400.

# SECTION VIII.

# THE FUTURE OF THE TUNKHANNOCK CREEK WATERSHED

The last four sections pertain to the future of the Tunkhannock Creek Watershed. The first section discusses the responses to Question 11 which appeared on the two page Questionnaire previously cited that was answered by all 32 municipalities. The second section contains a description of some new projects that will provide protection of natural resources and historic sites. Table 30 in the third section contains an exciting 4 page list of Current and Potential Projects Planned by the Municipalities. This information was provided by the township supervisors and borough councilmembers on the Questionnaire as well. The fourth section contains the Recommendations to Protect the Tunkhannock Creek that have been given by the public.

The last table reveals that 944 people have attended one or more of the 76 meetings at which this project has been discussed in depth; these figures do not include the attendance at the final public meeting to discuss the Final Plan.

**Question 11. How could the Tunkhannock Creek Resources be utilized to improve your local economic base without negatively affecting the resources?**

Question 11 was a thought provoking question that would require more time to deliberate than probably all of the other questions combined. Twenty-one municipalities answered 'none' to this question, indicating that the Tunkhannock Creek resources could not be used to improve their local economic base. This may reflect more that they did not want to invest the neccesary time to answer the question than that the Tunkhannock Creek resources could not improve their economy. It is encouraging that 7 municipalities or 22% of the group expressed in some way that having parks and recreational facilities would attract tourism or improve the quality of their community which would strengthen the tax base. The following written comments were received:

**Tunkhannock Twp.**

"The new Lazy Brook Park along the Tunkhannock Creek will encourage hikers, bikers, fishermen, etc. to visit the area which will help the economy."

**Brooklyn Twp.**

"By creating greenways, hiking trail, bike paths along stream; park or public recreational area beside the Hop Bottom Creek."

**Dalton Twp.**

"By improving the recreational facilities in the community, you improve the tax base."

**Scott Twp.**

Maintain the quality 'of Tunkhannock Creek' through preservation efforts so that community use can be maintained."

**Bridgewater Twp.**
"By Promoting tourism."

**Factoryville Boro**
"Could improve use for fishing, hiking, or other public use."

**Clifford Twp.**
"A lot of fishermen catch both native and stocked trout in the East Branch. Quite a few tourists shop at the local stores and buy hunting, fishing, and ski equipment and stay at the motel."

**Abington Twp.**
'Not probable - all lies within privately held property."

**Thompson Twp.**
"The portion of the creek running through the town is so small it can have no effect on the township."

**New Milford Twp.**
"Martins Creek is surrounded by steep hillsides so not much development can occur there."

**Nicholson Boro**
'Within our municipality, we don't see any way this could happen."

**Benton Twp.**
"If any more land were removed from the tax roll due to conservation easements, etc., our economic base would be weakened." Note: Much of Benton Township was purchased for inclusion in the Lackawanna State Park. The State does not pay taxes on the land or contribute any monetary payment in lieu of taxes.

## NEW PROJECTS THAT WILL PROVIDE PROTECTION OF NATURAL RESOURCES AND HISTORIC SITES

### Tunkhannock Creek at Keystone College

If all goes well, Wyoming County will receive another Delayed Harvest - Artificial Lures Only area. The proposed location has been the Keystone College section of the Tunkhannock Creek and is currently pending approval from the PA Fish Commission for 1997. This is a beautiful area with great shade cover to provide low water temperatures. Hopefully, this area will be conducive to an indigenous trout population which anglers will realize and apply effective conservation practices. This is a great resource for premium angling opportunities. Such projects may continue to exist as long as concerned sportsmen show support of these special regulation areas. Remember to express your appreciation to WCO's so that they can relay and confirm this interest to management levels of the Fish Commission.

### An Old Spot With A New Lot

Thanks to the Pennsylvania Fish Commission, a beautiful Endless Mountain's lake which was once only accessible by a modest little hike will soon have better accessibility for all. Lake Oxbow has been frequented by many anglers over the years and has also been a favorite destination of mine when other areas become overcrowded with motorboats, jet skis, and swimmers. The solitude I experienced here has developed some everlasting angling memories and a deep appreciation for this natural resource. As I have enjoyed locations such as this, I have also become grateful for my health and ability to access these areas. However, some people are not as fortunate. Therefore, they can not share these same experiences without having special accommodations for their disability or diminished health condition. Anglers having such disabilities can resurrect some youthful memories at the special handicapped access which will soon be provided for them at Lake Oxbow. When fishing Lake Oxbow, please be sure to extend sportsman courtesy to disabled anglers at their new designated location.

### Lazybrook Acres - What could we expect in angling opportunities?

The January flooding of 1996 was a devastating experience for residents of Lazybrook Acres as their homes and property were damaged by flooding banks of the nearby Tunkhannock Creek. Recovering from this adversity became routine for some residents while others decided that they would not tolerate any more flooding by relocating to higher and dryer homes. Since this location has become a reoccurring flooding problem, FEMA has worked with home owners and Tunkhannock Township to purchase this area from its owners. For some, this provided an excellent opportunity to escape the probability of future flooding. For others, leaving property with more pleasant memories had been a difficult resolution to the torment of flooding.

Additionally, Tunkhannock township was able to obtain adjacent property which was also available. Although it may be too early to determine the specifics of what this area will provide in the near future, recreation facilities and nature trails appear to be the intent of this 42 acre acquisition. With a wealth of opportunity, anglers will probably benefit from additional access to Tunkhannock Creek. While additional access will probably warrant greater stocking, hopefully these anglers will realize and apply conservation practices to maintain a quality fishery resource for all to enjoy. The outcome will remain to be seen as the logistics of this project develop.

The proceeding 3 articles were written by Kevin Treat, Endless Mountains Chapter, Trout Unlimited.

## The Bristol Budd Center for Anti-Slavery Studies

Beginning in 1995, a group of interested citizens in Susquehanna County have been working to establish The Bristol Budd Center for Anti-Slavery Studies. The National Park Service is also interested because it is required to establish historic sites to commemorate the Underground Railroad.

Negotiations are going on to obtain title to the 153 acre Dennis farm in Brooklyn and Harford Townships which was the home of African-American settlers. On that farm is the Perkins-Dennis cemetery where some 50 graves exist including Price Perkins, probably the first black settler in the country as he arrived from Connecticut in 1793, Bristol Budd Sampson, a veteran of the Revolutionary War, escaped slaves and other blacks who settled in the area.

Besides maintaining a research library, volunteers working on this project hope the Bristol Budd Center will sponsor youth camps, teacher training workshops, a speakers bureau, conferences and trips to historic sites.

**Table 30. Current and Potential Projects Planned by Municipalities**

| MUNICI-PALITY | PRIMARY CONTACT | ACTIVITIES COMPLETED 1996 | PLANNED SUBSEQUENT YEARS | PROJECT COST | RESOURCE COMMITMENT | BENEFITS |
|---|---|---|---|---|---|---|
| Abington Twp. | John Hennemuth Twp. Supervi. 563-2354 | Required & enforced Stormwater and Erosion measures at new construction sites; recently passed storm water management ordinance to amend Subdivision Ordinance | Plan to develop a park on current sewer plant site with nature trails and ball fields; plan to acquire additional land at site | 1,000's | Abington Twp. Supervi. | Reduce pollution of Ackerly Ck; protection of additional open space easier access for nature study |
| Benton Twp. | Larry Seymour Twp. Supervi. 563-2661 | Preliminary plans to sewer Lakes Sheridan, Baylor, & Kewana | Implement sewer plan | 0 | Benton Twp. Supervi. | Pollution will be reduce in lakes and So. Branch of Tunkhannock Creek |
| Bridge-water Twp. | Guy Wells Twp. Supervi. 278-1570 | Preliminary plans to construct sewers along Rt 706 in the Heart Lake area | Uncertain as to when sewers will be constructed | 1,000's | Bridgewater Twp. Supervi. | Reduced pollution to Heart Lake and to Hop Bottom Creek |
| Brooklyn Twp. | Kenneth Ely Twp. Supervi. 289-4783 | Began planning annual cultural event (Brooklyn Days) that will include nature walks along Hop Bottom Creek | Will implement Brooklyn Days Aug. 1997. Plan to acquire land for a community park along creek north of the Dimock Road. | 1,000's | Brooklyn Twp. Supervi. | May lead to permanent greenway, bike path along creek. Creation of new recreational facility; fishing access area, habitat protection |
| Clifford Twp. | T. Robert Williams Twp. Supervi. 222-3518 | Planning to sewer whole township | Expect to have wastewater treatment plant completed in in 15 years | 1,000's | Clifford Twp. Supervi. | Reduced pollution to East Branch of Tunk-hannock Creek |

## Table 30. Current and Potential Projects Planned by Municipalities

| MUNICI-PALITY | PRIMARY CONTACT | ACTIVITIES COMPLETED 1996 | PLANNED SUBSEQUENT YEARS | PROJECT COST | RESOURCE COMMITMENT | BENEFITS |
|---|---|---|---|---|---|---|
| Dalton Borough | Paul AAckarey Councilmem. 563-1800 | Iniated purchase of 10 acre site from school district to make into a community park | Complete purchase of school property; develop trails, picnic facility. Provide public wksp. on proper disposal household hazardous waste. | 1,000's | Dalton Borough Council | Provide permanent protection and access site along Ackerly Creek. Develop envir. awareness. |
| Factory-ville Borough | Ray Schneider Councilmemb 945-3811 Civic Men's Club | Constructed Covered Bridge across S. Branch Tunk. Ck. at Boro Park - Handicapped Accessible | Construct Nature/Walking Trail around public park; purchase additional land to expand park | 1000's | Factoryville Borough Men's Club | Provides better access to study natural areas; If facility is enlarged, more wetland habitat will be protected. |
| Greenfield Twp. | Joseph Slebodnik 282-2899 | Developed plans to create a park behind Twp. Bldg. | Will relocate a one room school house at entrance to site. Build nature trails, picnicking facilities on 7.5 acre site. | 1,000's | Greenfield Twp. Supervi. | Permanent protection of site & historic bldg.; Better access to natural area; Development of new recreational facility. |
| Harford Twp. | James Ketterer Twp. Supervi. 434-2214 | Developed plans to tear down old school, will build senior citizen aptms. and community park on site | Will develop a park with trails ballfields, picnicking facilities; will convert wet ditch to pond. Plan to purchase additional land to add to park in future. | 1,000's | Harford Twp. Supervi. | New recreational facility; habitat protection. |
| Harford Twp. | Randy Krikausky Dir. Ecologia 434-9588 | Purchased 22 Spectronometers Water Quality Kits | Plans to have local schools use test kits to monitor tributaries of Tunkhannock Creek | ? | Ecologia Staff | Develop environmental awareness of teachers & students. |

**Table 30. Current and Potential Projects Planned by Municipalities**

| MUNICI-PALITY | PRIMARY CONTACT | ACTIVITIES COMPLETED 1996 | PLANNED SUBSEQUENT YEARS | PROJECT COST | RESOURCE COMMITMENT | BENEFITS |
|---|---|---|---|---|---|---|
| Herrick Twp. | Elliot Ross Twp. Supervi. 679-2887 | Village of Four Seasons is currently performing a study to determine how to correct a problem with inadequately treated sewage | Problem will be corrected | 1,000's | Herrick Twp. Supervi. | Pollution to East Branch reduced |
| Hop Bottom Borough | Arlene Zablotsky Councilchair 289-4426 | Received grant to upgrade playground along Martins Creek | Will implement project | | Hop Bottom Borough Council | Improved recreational facility |
| Nicholson Borough | Fred Lally Councilchair 942-6031 | None | Acquire additional land to Boro Park | 1,000's | Nicholson Borough Council | Additional recreational site and public access to Martins Creek, protection of flood plain |
| North Abington Twp. | Gary Wilding Twp. Supervi. 563-1836 | Currently revising and updating Zoning & Land Development Ord. partly to avoid future claims of discrimination against commercial development | On-going | 1,000's | N. Abington Twp. Supervi. | Protection of highest quality land against development |
| Overfield Twp. | Charles Kennedy,Jr. Twp. Supervi. 378-2741 | None | Land currently in an agricultural area will be zoned Agricultural | None | Overfield Twp. Supervi. | Agricultural land will be protected from development |

## Table 30. Current and Potential Projects Planned by Municipalities

| MUNICI-PALITY | PRIMARY CONTACT | ACTIVITIES COMPLETED 1996 | PLANNED SUBSEQUENT YEARS | PROJECT COST | RESOURCE COMMITMENT | BENEFITS |
|---|---|---|---|---|---|---|
| Scott Twp. | Donald Noll Zoning Officer 254-9227 | Established Envir. Advis. Counc.; planted 250 trees along South Branch Tunkhannock Ck. in cooperation with PEC | Community Sewage System to be developed in approx. 3 years; develop a park at Sewer site | Millions | Scott Supervisors | Reduce Pollution of South Branch; Protectic of Natural Areas; Creation of new recreational facility |
| Tunkhannock Borough | Norman Ball Councilchair 836-3324 | Established a Riverside Park Commission that has legal status to make decisions | Commission will make decisions to protect park | None | Tunkhannock Borough Council Riverside Com | Stronger protection of 10 acre park; may lead to establishment of other parks |
| Tunkhannock Twp. | Carl Gable Twp. Supervi. 836-2891 | Worked with FEMA/PEMA and purchased 42 acre Lazy Brook Development | Construct Nature Trail and recreational facilities Develop fishing access area | 6.2 mil. | FEMA/PEMA Tunkhannock Twp. Supervi. | Conversion of developed site to natural area; new, large, recreationa site available for fishin access, nature study, etc. |

## Table 31. Recommendations to Protect the Tunkhannock Creek Watershed

| AGENCY | RECOMMENDATIONS | WHEN |
|---|---|---|
| PA FISH & BOAT COMMISSION | With landowners' permission, designate more sections of the creek "Special Regulation Areas" such as Delayed Harvest, Artificial Lures Only, Catch & Release, etc. to maintain quality fishing for all sportsmen to enjoy and improve land-owner public relations. | Ongoing |
| | Purchase and develop public fishing access sites along each branch of Tunkhannock Creek. | Begin 97 |
| | Acquire conservation easements or outright purchase of land bordering the branches & tributaries and establish trails to restore and preserve heritage of creek. | Ongoing |
| | Conduct more studies on restoring native trout habitat. | Ongoing |
| | Strengthen public education programs on importance of restoring and preserving heritage of Creek. | Ongoing |
| | Purchase or acquire conservation easements on sites containing reptiles, amphibians, or fishes that are endangered or threatened species. | Ongoing |
| PA DEP | | |
| | Increase surveillance and enforcement of water quality standards. | Ongoing |
| | Conduct workshops for township road supervisors on ways to reduce soil erosion during road maintenance. | Begin 97 |
| | Develop a law and method of enforcement that requires the periodic pumping of private septic tanks. | Begin 97 |
| | Develop less expensive waste treatment alternatives than sewer lines and conduct regional workshops to promote alternatives. Evaluate possibility of subsidizing homeowners to replace septic tanks instead of giving out large PENN Vest grants. Determine waste systems that avoid gray water entering septic systems. | Begin 97 |
| | Encourage each county to purchase sites for disposal of septic tank wastes insuring that wastes will not pollute near-by streams. | Begin 97 |
| | Request legislature to appropriate additional funding for the Nutrient Management Fund to increase the rate of NMP Implementation | Begin 97 |

## Table 31. Recommendations to Protect the Tunkhannock Creek Watershed

| AGENCY | RECOMMENDATIONS | WHEN |
|---|---|---|
| PA DEP, cont. | Request legislature to appropriate additional funding for DEP Stream Bank Fencing Program to increase landowner participation. | Ongoing |
| | Develop and enforce legislation to protect riparian corridors. Develop programs that will encourage landowners to restore streamside forests. | Begin 97 |
| | Increase surveillance and enforcement of wetland regulations. | Ongoing |
| | Increase surveillance and enforcement of laws protecting endangered and threatened species. | Ongoing |
| | Continue with "Adopt a Highway" using incentives to reward outstanding efforts. | Ongoing |
| | Establish regional recycling stations that can collect used motor oil, leftover paints, solvents and other environmentally harmful wastes. | Begin 97 |
| PA Game Commission | Conduct studies to determine population status of non-game species such as bats, shrews (water shrew), moles and mice and purchase sites containing species if threatened. | Begin 97 |
| | Purchase game lands on eastern and southern sides of water-shed and along Main and South Branches of Creek with emphasis on areas that contain wetlands. | Begin 97 |
| | Increase the number of does that can be taken to reduce the deer population to improve forest regeneration. | Begin 97 |
| DCNR | Purchase lands that focus on protecting stream corridors and wetlands and that will protect habitat for threatened and endangered species. | Ongoing |
| | Continue providing funding for municipalities and non-profit conservation and rail-trail organizations to purchase and develop parkland for public usage. | Ongoing |

**Table 31. Recommendations to Protect the Tunkhannock Creek Watershed**

| AGENCY | RECOMMENDATIONS | WHEN |
|---|---|---|
| COUNTY COMMISSIONERS | Wyoming Cty. should establish an Agricultural Preservation Board to ensure future of maintaining some farms in county. In Lancaster Cty., farms with easements are growing in value! | Begin 1997 |
| | As only 50% of twps. in watershed have park land, purchase land now to develop a park for present and future residents. | Begin 1997 |
| | Continue financial support of recycling coordinator's position, recycling center and concept of recycling. | Begin 1997 |
| | Keep recycling as low cost as possible in order to encourage participation. Some residents who either burn or bury their trash still bring recycleables to drop-off centers. | Ongoing |
| MUNICIPALITIES | Establish Environmental Advisory Councils to protect resources in municipality. | Begin 97 |
| | Work together with adjoining municipalities or thru COG to prepare a comprehensive plan. Socially objectionable uses of land can be adjoining as well as park land, etc. | Begin 97 |
| | Purchase additional land for parks for future generations to enjoy. Emphasize saving stream corridors and wetlands to also protect wildlife and reduce flooding. Maintain and protect flood plains. | Begin 97 |
| | Maintain salt piles away from creeks and ensure that concrete floor and sides to storage buildings are maintained. | Ongoing |
| | Work with private landowners to build nature trails along a section of a creek for public usage. | Begin 97 |
| | Develop Shade Tree Commissions that will maintain or increase shade trees in municipality. Such Commissions also prevent utilities from performing unwanted tree removal. | Begin 97 |

## Table 31. Recommendations to Protect the Tunkhannock Creek Watershed

| | | |
|---|---|---|
| CONSERVATION DISTRICTS | Because funds for Nutrient Management Plans are unstable, continue conducting workshops for farmers on benefits of not using more Nitrogen and Phosphorous than needed and on best practices to reduce erosion to encourage them to perform these practices voluntarily. | Ongoing |
| | Develop programs that encourages spray irrigation, using wastes that fall within approved chemical limits. | Ongoing |
| | Continue enforcing wetland, sedimentation control, and other land, soil and water protective legislation. | Ongoing |
| | Develop a Stormwater Management Plan for the Tunkhannock Creek Watershed. | Ongoing |
| CITIZENS | Don't litter or dispose of garbage by dumping on other people's property or along stream banks. Dispose of used oil and other chemicals at proper recyling stations. | Ongoing |
| | Form partnerships with conservation organizations and governmental agencies to establish a Tunkhannock Creek Watershed Association. Apply for non-profit status. | Ongoing |
| | Have septic tank pumped out every three years. | Ongoing |
| | Recycle, participate in litter clean-ups and volunteer at Recycling Centers nearest you. | Ongoing |

Table 32. Summary of Public Participation at Meetings to Develop the Tunkhannock Creek Conservation Plan

| | | |
|---|---|---|
| **1st PERIOD** | **NUMBER** | **ATTENDANCE** |
| Meetings with Municipalities | 13 | 146 |
| Workshops | 10 | 162 |
| Advertised Informational Meetings | 3 | 25 |
| | | |
| **2nd PERIOD** | | |
| Meetings with Municipalities | 10 | 90 |
| Workshops | 13 | 163 |
| Advertised Informational Meetings | - - - | - - - |
| | | |
| **3rd PERIOD** | | |
| Meetings with Municipalities | 6 | 40 |
| Workshops | 18 | 284 |
| Advertised Informational Meetings | 2 | 28 |
| | | |
| | | |
| **TOTAL TO DATE** | | |
| Meetings with Municipalities | 29 | 276 |
| Workshops | 41 | 609 |
| Advertised Informational Meetings | 6 | 59 |
| **TOTAL** | **76** | **944** |

1st Period - 07/01/95 - 01/19/96
2nd Period - 01/20/96 - 06/30/96
3rd Period - 07/01/96 - 10/20/97